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The Nypro chemical plant at Flixborough after the disastrous explosion and fire of June 1974**.**
Source: http://aria.ecologie.gouv.fr/ressources/h_flixborough1974_2.jpg

Occupational Health and Safety in the British Chemical Industry, 1914-1974

A thesis presented in fulfilment of the requirements for the degree of Doctor of Philosophy
2007

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Acknowledgments

The Economic and Social Research Council provided me with financial support to undertake this research and I am extremely grateful to them for this. The ESRC funding also allowed me to travel and interview respondents who agreed to share the memories of their lives with me. Therefore, thank you to Peter Dodds, Richard Fitzpatrick, Hilda Langley, Doug May, Gladys and Derek Rogerson, Brian Watson, and to the others who wished to remain anonymous. The information that they provided me with has enriched this thesis. I would also like to thank Ray Collins, Assistant General Secretary (Administration and Services) of the Transport and General Workers Union who allowed me to access the TGWU archive lodged at the Modern Records Office, Warwick University. I am also grateful for the assistance provided by the archivists at the Modern Records Office at Warwick and to those in the Chester and Cheshire Record Office, the University of Strathclyde, the University of Glasgow, Glasgow Caledonian University and the Mitchell Library archives. I am also indebted to Paul Meara at the Catalyst Museum in Widnes for providing me with photographic images of chemical workers and for providing information relating to these.

My thanks are owed to the many colleagues and staff who attend the ‘Cradle to the Grave’ series of seminars held regularly at Glasgow Caledonian University. In this forum many ideas are exchanged and early findings are commented upon and here I must thank Dr Ronnie Johnston and Sue Morrison for helping to make this possible. Researching for this thesis has often been a lonely experience and without the friendship, humour and support provided by my postgraduate colleagues it would have been a social desert. I would therefore also like to thank all those who have joined me in paying homage to Bacchus.

My sincere thanks are owed to both my supervisor Professor Arthur McIvor and internal examiner Dr Jim Mills. Whilst the funding gave me the opportunity to write the thesis Arthur and Jim provided me with the guidance, enthusiasm, and friendship that was necessary for me to complete it. Many thanks.

All the people mentioned above have helped me in various ways to reach this point but I would also like to add to that list my daughter Bechaela and son Russell who along with other family members and close friends have always been encouraging and supportive. However, none of this journey would have been possible at all without the unqualified love, understanding and support given to me by my partner Kath to whom I will always be truly grateful.

Abstract

This thesis probes a neglected area lying at the interface between medical and labour history and is concerned with issues of occupational health and safety in the British chemical industry between the First World War and the passage of the Health and Safety at Work Act of 1974. The research is presented thematically and draws on a wide variety of primary and secondary source material to reveal the causes of ill health, the politics of reform and the role of the key players, such as the government, medical profession, employers and trade unions. As such, it engages critically with hypotheses in this contested field of historical research. The results of open-ended interviews also provides new testimony to show how occupational health issues impacted directly on the workers themselves as well as on the lives of their families.

It is argued that the outputs of the chemical industry had social, economic, and political benefits but that the human cost in producing these was often hidden by poor data collection, a lack of investigation and by the fact that the effects of exposure only became evident after latency periods of many years. Some of the obvious and insidious hazards to heath were addressed over time but only so long as the costs of these measures did not adversely impact on the profit making capabilities of the firms involved. Therefore, working within a system that prioritised profit over health many chemical workers continued to be exposed to hazardous and lethal processes. The main response to this by both the employers and the state was to pay compensation. This was the cheaper alternative to prevention and also had the effect of hiding the destitution that arose when a chemical worker no longer had the ability to sell his labour power.

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Abbreviations

ABCM	Association of British Chemical Manufacturers
AC & AE	Association of Chemical and Allied Employers
ARC	Asbestos Research Council
AUEW	Amalgamated Union of Engineering Workers
BDC	British Dyestuffs Corporation
BMA	British Medical Association
CBI	Confederation of British Industries
CIA	Chemical Industries Association
CIF	Chief Inspector of Factories
CWU	Chemical Workers' Union
HASAWA	Health and Safety at Work Act
HMWC	Health of Munition Workers Committee
HSE	Health and Safety Executive
IARC	International Agency for Research on Cancer
ICI	Imperial Chemical Industries
IHES	Industrial Heath Education Society
IHRB	Industrial Health Research Board
ILP	Independent Labour Party
JIC	Joint Industrial Council
MCA	Manufacturing Chemists' Association
MRC	Medical Research Council
NEDC	National Economic and Development Council
NHS	National Health Service
NIOSH	National Institute for Occupational Health and Safety
NUDCW	National Union of Drug and Chemical Workers
NUGMW	National Union of General and Municipal Workers
OPEC	Organisation of the Petroleum Exporting Countries
PVC	Polyvinyl Chloride
RMEA	Rubber Manufacturing Employers' Organisation
TGWU	Transport and General Workers Union

TLV	Threshold Limit Value
TNT	Trinitrotoluene
TUC	Trades Union Congress
UAC	United Alkali Company
UCATT	Union of Construction and Allied Trades and Technicians
USDAW	Union of Shop, Distributive and Allied Workers
VCM	Vinyl Chloride Monomer

Introduction

> *Dad worked at ICI in the caustic plant. At the time we were living out at Rushton, which is about ten mile…twelve mile away from Winnington and he used to cycle there and back. I remember him coming home, well being brought home in the ambulance when he'd had nasty burns through the caustic.*[1]

Between 1914 and 1974 thousands of 'dads' risked their lives each day in British chemical works in an effort to earn a living. With the passing of each decade the demand for the goods they produced increased and in 1943 the Chemical Workers Union (CWU) claimed that, 'without the toil of the chemical process worker, life as it is lived today would be impossible.'[2] For example, and by way of attempting to define the industry, in the mid 1970s the Department of Trade and Industry utilised the following Standard Industrial Classification Order for the Annual Census of Production providing an indication of the range of products produced. The classification included sixteen divisions which were as follows; 1) General Chemicals, 2) Inorganic, 3) Organic, 4) Miscellaneous, 5) Pharmaceuticals, 6) Toilet Preparations, 7) Paint, 8) Soap and Detergents, 9) Synthetic Resins, Plastics, and Synthetic Rubber, 10) Dyestuffs and Pigments, 11) Fertilisers, 12) Polishes, 13) Adhesives and Gelatines, 14) Explosives, Fireworks, Matches, 15) Pesticides, Disinfectants and 16) Printing Ink.[3] The problems in attempting to define the industry will be identified below but what can be deduced from the list above is that the chemical industry differs from most others in that its product range and methods of manufacture are very wide-ranging, indeed it has been described as 'a constellation of different industries.'[4] Various aspects of everyday life have undoubtedly benefited from the many chemical products listed above but this study will examine the actual costs to humankind as experienced by those who toiled to produce the multitude of chemical substances that are often found in the products of other industries.

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[1] Interview D. Walker with Gladys Rogerson, 21 March, 2005, p.5
[2] B. Edwards, *War on the People*, Independent Labour Party, (London 1943), p.4
[3] C.Gill, R. Morris and J. Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.xvi
[4] C.Gill, R. Morris and J. Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.xvi

In their 1978 study, *Industrial Relations in the Chemical Industry,* Gill Eaton and Morris noted that industrial injuries were substantially under reported. More importantly with regard to the chemical industry many cases of industrial disease, a greater hazard in chemicals than industrial injury, also went unreported.[5] These omissions immediately confront any researcher of occupational health with an obvious problem - and one that Sellers has identified in *Hazards of the Job* - as an epistemological dilemma whereby 'workplace causes and their bodily effects often remain frustratingly obscure, remote, and difficult to establish.'[6] Nonetheless, using a combination of documentary analysis and oral testimony this study will explore the main characteristics of the British chemical worker's experience in relation to occupational health and safety, providing an analysis of the continuities and changes that occurred over the period 1914 to 1974.

An important aspect of this research is to explore the causes of ill health, the politics of reform and the role of key players, such as government, medical profession, employers and trade unions. More than twenty years ago Weindling argued in *The Social History of Occupational Health*, that the study of occupational health should form part of the social history of industrialisation as, 'only a fraction of the historical literature on industry, the labour movement and medicine is concerned with occupational health.'[7] Social historians rose to this challenge and many important studies have since been published but the history of occupational disease and injury within the British chemical industry is largely absent. The outcomes of this research should provide a more detailed survey of the interaction between health and work in this important sector of British industry. The fundamental questions that require explanations are, to what extent, in what form, and for what reasons were British chemical workers exposed to dangers and hazards within the workplace between the outbreak of World War One and the introduction of the Health and Safety at Work Act (1974)? The thesis will concentrate on the industrial health issues that affected the workers who were directly involved in the production of chemical

[5] C.Gill, R. Morris and J. Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), pp.237-239
[6] C. C. Sellers, *Hazards of the Job*, University of North Carolina Press, ((London 1997), p.4
[7] P. Weindling, 'Linking Self Help and Medical Science: The Social History of Occupational Health, pp.2-31 in P. Weindling (ed) *The Social History of Occupational Health*, Croom Helm, (London 1985), p.2

compounds but not those who *used* chemical substances within the other industries such as the textile, glass, and paper industries. One of the main objectives in examining this area is to build upon the contemporaneous body of social historical research relating to the impact of work upon health. Recent work on other industries has provided a better understanding of how workers have contracted a range of life threatening illnesses such as asbestosis, mesothelioma, pneumoconiosis, bronchitis, emphysema, silicosis, and byssinosis.[8] This study will attempt to fill the gap that presently exists providing a study of occupational health and safety amongst British chemical process workers, an especially neglected group in the literature.

Methodology

In researching for this thesis a combination of both qualitative and quantitative methods were used although qualitative methods were the more dominant. Quantitative methods were used to provide information on the numbers employed in the industry as well as to indicate the membership and densities of the main trade unions that recruited and organised within this sector. Official data drawn from Factory Inspector's reports and the Annual Abstract of Statistics provide an indication of the numbers affected by fatal and non-fatal accidents as well as helping to quantify those who suffered from a variety of occupational diseases that resulted from exposure to toxic gases, fumes or dusts. For example, data has been extracted from Factory Inspectors reports to construct new tables that show the numbers of officially reported cases of chrome ulceration within the chromate-manufacturing sector. These tables cover two ten-year periods that sit either side of the 1939-45 war: the former period being one during which occupational health issues received negligible attention whilst the latter witnessed more significant progress. This data is then compared with factory inspector's reports, quantitative environmental and technical data, as well as with worker's testimony and by doing so the official

[8] For example, see: S. Bowden, and G. Tweedale, G. 'Mondays Without Dread: The Trade Union Response to Byssinosis in the Lancashire Cotton Industry in the Twentieth Century' pp.79-95 in *Social History of Medicine*, Volume 16, No.1, 2003, G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), R. Johnston, and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, (East Lothian 2000), R. Johnston, and A. McIvor, *Miners' Lung, A History of Dust Disease in British Coal Mining*, Ashgate, (Hampshire 2007), M.W. Bufton, and J. Melling, 'Coming Up for Air: Experts, Employers, and Workers in Campaigns to Compensate Silicosis Sufferers in Britain, 1918-1939' pp.63-86 in *Social History of Medicine*, Volume 18, No.1, 2005, S. Morrison 'The Factory Inspectorate and the Silica Dust Problem in UK Foundries, 1939-1970, pp.31-49 in *Scottish Labour History Journal*, Volume 40, 2005

statistical data is subjected to a cross-method triangulation and its reliability tested.[9] New data is also presented from twelve volumes of the United Alkali Company Accident Books. These volumes contain reports of fatal and non-fatal accidents that occurred within this large chemical manufacturer over the fourteen-year period, 1914 to 1928. They therefore provide a means to present quantifiable data to show the total numbers of employees affected and a monthly pattern of injury that extends from the beginning of the First World War through to the era of economic Depression. Statistical evidence has also been drawn from epidemiological reports, such as that found within the *British Journal of Industrial Medicine,* to indicate the numbers affected by occupational cancers within the dyestuffs, chromate, and vinyl chloride sectors of the industry.

Russell notes that only a small percentage of the records held by the chemical industry have actually survived with fire, explosion, air raids, and programmes of modernisation being cited as responsible agents for much of the destruction.[10] Russell further suggests that documentary material was destroyed because some owners of chemical plant were anxious to rid themselves of 'irritating reminders of an out-of-date image.'[11] Despite this pattern of destruction qualitative methods have been used to analyse both primary and secondary documentary source material that includes various public records, media reports, private papers, company records, photographs and journal articles. For example, the archives of the Chester and Cheshire Record Office were identified as holders of documentary papers belonging to Brunner Mond, Fleetwood Ammonia, and Castner Kellner chemical companies as well as having minute books of the Federation of Trade Unions of Salt Workers, Alkali Workers, Mechanics and General Labourers. This source material revealed pertinent information, such as the Accident Books belonging to the United Alkali Company, although the trade union (handwritten) minute books were sparse in content and offered up little that was relevant to this study. More recent archival

[9] Discussion of this methodology is found in K. Macdonald and C. Tipton, 'Using Documents,' pp.187-200 in N. Gilbert (ed) *Researching Social Life*, Sage, (London 1993) and P. Bellaby, 'Histories of Sickness: Making Use of Multiple Accounts of the Same Process,' pp.20-42 in S. Dex (ed) *Life and Work History Analyses: Qualitative and Quantitative Developments*, Routledge, (London 1991)

[10] C.A. Russell, (ed) *Chemistry, Society and Environment, A New History of the British Chemical Industry*, Royal Society of Chemistry, (Cambridge 2000), p.2

[11] *Ibid*, p.2

material belonging to companies such as Imperial Chemical Industries were not found and therefore a wide variety of sources were used to cover the inter-war and post-war periods that included government publications, journal articles and oral testimony. A significant documentary source was found within the Mitchell Library Archives that related to the chromate-manufacturing firm of J & J White of Rutherglen, near Glasgow. This document was an original internal company memo dated from the 1950s that outlined the response made by the firm to the fact that occupational lung cancer had been officially associated with the industry for the first time. The text of this document is critically analysed to show how the firm selected particular words and phrases that sought to minimise the significance of the threat posed by this deadly occupational health hazard.

New evidence is presented from the recently deposited Minutes and Reports of the Chemical and Allied Trades National Committee held at the Modern Records Office at Warwick University. From the same archive a variety of TUC papers relating to occupational health issues were also examined. What emerges from these primary sources is that both the TUC and TGWU used their limited resources over many years to campaign on various occupational health issues and that in doing so met with some success. The information contained within these archival sources is supplemented by information retrieved from the TUC annual reports. In contrast to the limited information that has been made available by most chemical companies the TUC annual reports dating from 1914 to 1974 detail the discussions held and the decisions taken by the workers' representatives and are available online in their entirety at http://www.unionhistory.info/

Oral History Project

In order to discover the human experience of working within the chemical industry it was decided to design an oral history project. The desired outcome was to find several respondents with a range of job descriptions that had worked in different types of plant. The text used to advertise for respondents did not specify any specific occupational group but simply requested that they should have had experience of working within the industry or related in some way to someone who had. To help recruit respondents it was decided to send notices to local libraries and community centres and to write articles that were likely to be published in local newspapers (short, concise and with a local interest). The trade union that represented most chemical workers was the TGWU and they were also contacted to see if a cohort of former shop stewards or activists could be generated. Doug May in Bristol was the only respondent who was generated by this method. As some early evidence suggested that Polish and Pakistani workers had entered the chemical industry contact was also made with Mr Bashir Maan, a senior representative of the Pakistani community in Glasgow, and with a national Polish newspaper based in England. Unfortunately, neither of these contacts produced respondents although Mr Maan did admit that some Pakistanis who came to Glasgow did work in the chemical industry but had since died. His offer to contact their wives to see if they would be willing to participate proved fruitless. Equally, contact was made and correspondence entered into with a Mr Christopher Storey QC, a professional lawyer who represents trade unions in legal cases against British Chrome and Chemicals Ltd. Due to time and business commitments this source also proved barren. Paul Holleran, a former journalist with the *Rutherglen Reformer* and now area secretary with the National Union of Journalists was contacted to ascertain if he had retained details of people he had interviewed in the early 1990s about the chemical plant in Rutherglen. He had not and therefore this path generated no respondents.

The response to the recruiting material harvested a total of thirteen respondents. Four were from the Dumfries area, one from Bristol and eight were from Rutherglen near Glasgow. Of the respondents from Rutherglen seven were not interviewed as their sole interest and knowledge was concentrated on the current environmental damage allegedly being caused by the dumping of chromate waste (CRVI) in their district. These respondents had little or no direct knowledge of the workplace or processes. The local newspaper article in Rutherglen also led to a television appearance on Thistle TV (a local cable company) to discuss the project and to see if a further cohort could be generated. This proved fruitless. A further three respondents were contacted in Cheshire via information provided by an acquaintance. Therefore, in total, nine respondents were interviewed with one, Richard Fitzpatrick, being interviewed twice. This was done in the interest of Mr Fitzpatrick who being 87 years old at the time of the interview grew visibly tired as the first interview had progressed.

The average age of those interviewed was 71, with birth dates ranging from 1917 to 1945, while the employment histories of the respondents ranged from the late 1930s to the late 1970s. Although a smaller sample was generated than had been desired the cohort did represent a good coverage of the industry in that the plastic, chromate, explosive and fertiliser sectors were all represented. With the exception of a former manager of a chemical plant all the respondents had worked as process workers or were related to family members who also worked as process workers. Why no former directors or technologists came forward to participate in this study cannot be explained by reference to the design of the recruitment material. Perhaps, with hindsight, specific mention could have been made to encourage these former workers. One reason that may explain the general problem in recruiting respondents was made by two former process workers from Dumfries who admitted that their former colleagues had seen the article published in the local press but had refused to make contact because they were fearful that ICI would stop their pension if they talked to an outsider.

All respondents were informed beforehand of the purpose of the research study and two documents were sent to their homes in advance of the visit and interview. The first was an 'informed consent statement' that outlined how the interview would be recorded, what the aims of the research were, what the rights of the respondent were, and how the transcript of any interview was to be processed before being deposited with the Scottish Oral History Centre at the University of Strathclyde. The second document was a 'copyright clearance form' issued by the SOHC. The interviews were conducted on a one-to-one basis in the homes of the respondents although wives and other family members were also present in all cases with the exception of one of the anonymous respondents from Dumfries who was alone. The three respondents from Cheshire who were related to one another were interviewed as a group. All those interviewed were asked standard questions at the outset that were designed to gain some information but also to allow the respondent to become familiar with the microphone and the situation. The first questions always asked for the respondent's name, date of birth, where they were born, if they had brothers or sisters, if they had children, at what age did they leave school and what was their first job? Thereafter, in a relatively unstructured manner questions were asked of the respondents about the experiences they had in connection with the chemical industry.

It is acknowledged that there is always the possibility that respondents 'private memory' can be influenced over time by 'public memory', that is by exposure to other people's memories fed through media reports, books, films etc and that this 'hegemonic process' can help create a false or different past for respondents.[12] Self evidently, this is more likely to happen when the subject matter under discussion has received some interest and information about it has been widely disseminated. The wars fought between 1914-18 and 1939 -1945 provide good examples of such subject matter. Nonetheless, this does not detract from the fact that people can and do remember events quite clearly and that by recalling these they create a 'voice of the past' that helps fill the gaps within the documentary sources.[13] Moreover, the 'private memory' of the respondents in this study would have been highly unlikely to have been influenced by 'public memory' as so little public information exists about the working conditions that existed within the British chemical industry.

Prior to embarking on this project it is perhaps appropriate to provide a brief background to this industry. Although being the nineteenth century world leader in heavy chemicals the British chemical industry was not as important to British business as their other real industrial giants such as iron, steel, coal, and textiles. One area of the industry that did receive some early attention was pollution, the notorious *bête noire* of chemical production. Public criticisms about pollution led to the introduction of limited legislation in 1864 dealing specifically with the emissions of hydrochloric acid. Indeed, it was around this time that the first Alkali Inspector, Dr Robert Angus Smith, coined the phrase 'acid rain' which offered one explanation as to how hydrochloric acid emissions were being transported causing much environmental damage. A limited number of minor amendments to the initial legislation were introduced over the next 42 years until the Liberal government passed the Alkali &c Works Regulation Act (1906). This legislation began to address

[12] For example see A. Thomson, 'Anzac Memories: Putting Popular Memory Theory into Practice in Australia,' pp.239-252 in A. Green and K. Troup (eds), *The Houses of History, A Critical Reader in Twentieth-Century History and Theory,* Manchester University Press, (Manchester 1999)
[13] P. Thompson, *The Voice of the Past, Oral History*, Oxford University Press, (1978)

the problem of noxious fumes arising from a wider range of industries but as Ashby and Anderson have noted in *The Politics of Clean Air*, 'there it (the Act) remained, unchanged apart from additions made to the schedules of processes, until 1975.'[14]

With the exception of pollution, little attention was paid to the late nineteenth and early twentieth century British chemical industry which was sited predominantly in south Lancashire, Tyneside and Glasgow with some subsidiaries in Teeside, London, Bristol and Birmingham. One government enquiry of 1893 reported on the conditions of work within alkali and chromate plants and made recommendations to improve these. However, it was not until the outbreak of the First World War that a more intense interest was taken in the industry when it was discovered just what a limited range of products it manufactured.[15] By 1915, criticisms could be found on the pages of the trade industry journal, *The Chemical News,* that included blistering attacks on the 'sloth and apathy' shown by most British manufacturers.[16] Confirming this view seventy-five years later, Dintenfass, in an economic and historical account of *The Decline of Industrial Britain* has referred to the chemical masters 'excessive technological conservatism.'[17] This trait was witnessed in the decision made by many chemical masters to stick with the LeBlanc system rather than the more efficient Solvay system as well as ignoring the synthetic dye processes, developed by Perkin, an 18 year old British chemist, who sold his discovery to German capitalists thus allowing the German industry to achieve a virtual monopoly of this market by 1914.[18] Accordingly, at the beginning of 1915, dyestuffs, medicines and fertilisers

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[14] E. Ashby and M. Anderson, *The Politics of Clean Air*, Oxford University Press, (Oxford 1981), p.80

[15] The colours for the army khaki and navy blue had been imported from Germany. The British chemical industry was also largely dependent on natural constituents that were shipped large distances and had to be protected from German attack by the British Navy. The German industry was more sophisticated and self-sufficient. For a more detailed discussion on the shortcomings and British responses see M. Sanderson, *The Universities and British Industry 1850-1970*, Routledge & Kegan Paul, (London 1972), pp.214-242

[16] *The Chemical News*, January 1, 1915, p.8. Allegation made by William Reginald Ormandy DSC, FCS

[17] M. Dintenfass, *The Decline of Industrial Britain, 1870-1980*, Historical Connections Series, Routledge, (London 1992), p.14

[18] H, Braverman, *Labour and Monopoly Capital, The Degradation of Work in the Twentieth Century*, (New York 1998), p.111

The LeBlanc system was invented in France in 1791 and was used by most British alkali manufactures that also made some improvements to the process. Despite these improvements the process was labour intensive and a heavy polluter of the atmosphere and surrounding environment. In 1861,Ernest Solvay invented a cleaner and more efficient system of manufacture and in 1873 the British firm of Brunner Mond began to manufacture alkali by this method. They soon began to were all failing to be supplied in sufficient quantities in Britain although of primary concern to the government was the poor supply of munitions for the war effort. Following government intervention and encouragement chemical firms began to extend their range of products whilst the government took responsibility for the production of synthetic dyes and explosives.[19] Looking back at the chemical industry in 1953 Williams notes in his account that the First World War was the pivotal point in the industries history and one that led to its structural reorganisation.[20]

Anticipating post-war modernisation, the Ministry of Reconstruction appointed a standing committee in 1917, 'fully representative of the whole of the trade,' to consider a closer collaboration between the government and representatives of the trade.[21] No trade union was consulted and the Association of British Chemical Manufacturers were identified as being 'the most representative' group.[22] Thereafter, the post-war British government and chemical industrialists made a concerted effort to bring the British industry to the same level of expertise and development that had been demonstrated by the German manufacturers.[23] By 1919, and in pursuit of this aim, a 'British Mission' was sent to the occupied zone in Germany to investigate and report on the methods that had been adopted for the production of explosives and poison gases by the German chemical industry. Having identified that the German dye industry had been swiftly converted to the production of munitions the British Mission noted that:

> In the future it is clear that every chemical factory must be regarded as a potential arsenal … for military security it is essential that each country should have its chemical industry firmly established … the rapid growth of the British chemical industry during the war proves

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threaten the LeBlanc industry in Britain and consequently 48 LeBlanc manufacturers joined forces in 1890 under the name of the United Alkali Company to protect prices and share research costs. The UAC folded in 1926 when it became a part of ICI.

[19] G.C. Allen, *British Industries and Their Organization*, Longman, (London 1970), p.209

[20] T. I. Williams, *The Chemical Industry, Past and Present*, Penguin, (London 1953), p.87

[21] Ministry of Reconstruction, Committee on the Chemical Trade, To Advise as to the Procedure which should be adopted for dealing with the Chemical Trade, HMSO, PP 1917, (Cd.8882), p.3

[22] *Ibid*, p.3

[23] W.J. Reader, 'The Chemical Industry' pp.156-178 in N.K. Buxton and D.H. Aldcroft (eds) *British Industry Between the Wars, Instability and Industrial Development, 1919-1939*, Scolar Press, (London 1979), p.156

> that it can compete successfully with Germany provided that reconstruction is undertaken on a sufficiently large scale.[24]

Thus, it was decided that a modern and complete chemical industry was essential for Britain and that this should be protected against imports by The Dyestuffs (Import Regulation) Act of 1920, legislation that was intended to last ten years but in fact remained unaltered until 1960.

Showing no lack of willingness to intervene in the business of the chemical industry the government also helped establish the British Dyestuffs Corporation (BDC) in 1919. The BDC had a short lived independent existence when in 1926 it became part of Imperial Chemical Industries (ICI), a firm that exemplified the shift in Britain towards a more concentrated production structure such as was found in the motor vehicle and electrical goods industries.[25] Bringing together the largest British chemical concerns at the time such as Brunner Mond, Nobel Industries and the United Alkali Company, the formation of ICI was the British chemical industries defensive response to overseas competition specifically from the German and American industries.[26] The main German industries had amalgamated in 1925 forming *IG Farbenindustrie AG* and in America, DuPont and Allied Chemical and Dye had emerged during World War One as well resourced and powerful competitors. International agreements were entered into by all of these chemical giants that allocated appropriate monopolistic markets to each. For ICI this meant the British Commonwealth, for *IG Farben* the Continental market, and for DuPont and Allied Chemical and Dye the markets of North and South America.[27] Until the Second World War these agreements remained in place with many new processes being developed and the range of products being enlarged as witnessed for example by the new plastics, industrial gases, synthetic fibres, insecticides, drugs and disinfectants. Again, preparations for war drew government interest in the products

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[24] British Mission Appointed to Visit Enemy Chemical Factories in the Occupied Zone Engaged in the Production of Munitions of War in February 1919, HMSO, PP1921, (Cmd. 1137), pp.9-10

[25] C. More, *The Industrial Age, Economy and Society in Britain, 1750-1985*, Longman, (London 1989), p.323

[26] W.J. Reader, 'The Chemical Industry' pp.156-178 in N.K. Buxton and D.H. Aldcroft (eds) *British Industry Between the Wars, Instability and Industrial Development, 1919-1939*, Scolar Press, (London 1979), p.165

[27] W.J Reader, 'The Chemical Industry' provides a detailed historical account of this period.

of the industry when in 1938 £204,000 was invested in poison gas research with the Chemical Warfare (Defence) Department.[28] Given the changes made to the industry highlighted above, by 1939, Britain was no longer reliant on large imported supplies of chemical products as had been the case in 1914.

The Second World War further stimulated the chemical industry bringing new branches of the industry into being such as the petrochemical industry and from 1950 to 1960 the percentage of chemical products produced from oil (rather than coal or coke) rose from 6 per cent to 50 per cent.[29] Indeed, Allen has calculated that between 1958 and 1968 output from the chemical industry grew by 85 per cent compared with 43 per cent for the manufacturing industry as a whole.[30] Nonetheless, in the 1960s the British chemical industry faced new competition from the Japanese along with that of the European and American industries. The National Economic Development Council (NEDC) in collaboration with the Chemical Industries Association (formerly the Association of British Chemical Manufacturers) formed a team that included three leading trade union representatives to study the American chemical industry. Following their visit to the USA in 1966 the NEDC published a series of recommendations aimed at improving the 'efficiency and competitiveness' of the British chemical industry.[31] Of specific interest to this study was the finding by the NEDC that the American companies devoted greater attention to safety measures with the result that accident frequency rates within the American chemical industry were one-third of the corresponding British figure.[32] In 1973-74, the Organisation of Petroleum Exporting Countries (OPEC) raised the price of a barrel of oil from $2.46 to $9.76 thereby hitting the now oil reliant chemical industry hard.[33] The industries almost immediate response was to cut their labour forces and move many processes overseas where cheaper labour markets were to be found.[34] Thus within ICI's

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[28] J.D. Bernal, *The Social Function of Science*, Routledge, (London 1944), p.50
[29] P. Pagnamenta and R. Overy, *All Our Working Lives*, British Broadcasting Corporation, (London 1984), p.162
[30] G.C. Allen, *British Industries and Their Organization*, Longman, (London 1970), p.211
[31] National Economic Development Office, 'Manpower in the Chemical Industry, A Comparison of British and American Practices', HMSO, (London 1967)
[32] *Ibid*, p.43
[33] C. More, *The Industrial Age, Economy and Society in Britain, 1750-1985*, Longman, (London), p.233
[34] P. Pagnamenta and R. Overy, *All Our Working Lives*, British Broadcasting Corporation, (London 1984), p.166

Annual Report for 1975 it was stated that they had reduced their employee numbers by 3,000.[35]

It can be seen from the overview above that over the period in question the chemical industry had taken on an increasingly important role within Britain. From 1914 the main impetus had been to meet the demands of war with explosives manufacture and the defence of the realm taking precedence. Public money in the form of government subsidies were put into the industry to shore up the gaps that had been allowed to exist under private ownership. Having built up the dyestuffs industry through direct governmental funding from 1917 the British chemical industry began its transformation towards self-sufficiency. Dyestuff production increased dramatically between 1913 and 1933 from 9,114,134 lbs. to 52,944,866 lbs. and by 1945 exports by the chemical industry amounted to £37,414,951 making it the third largest exporter in Britain just behind cotton and machinery.[36] The shortages of natural raw materials during World War Two helped to further develop the manufacture of alternative synthetic materials. The industry became important politically in helping to secure Britain's kudos as a major independent world power and although the staple sectors of British industry such as coal mining, shipbuilding and the steel industry faltered after 1918, the inter-war years saw the growth of the 'new' sectors such as the electricity supply industry, the motor vehicle as well as the chemical industry. Cronin notes that between 1920 and 1938 the coal, cotton, woollen, shipbuilding and steel industries had shed around 915,000 workers whilst during the same period more than 600,000 had been added to the chemical, electrical engineering, vehicles, electricity supply, silk and rayon as well as the hosiery industries.[37] The Second World War further stimulated the industry and in the decades thereafter the chemical industry contributed increasingly to economic, political and social roles in the development of the nation. As stated earlier, the chemical industry fed into other industries and these industries were helping to meet the demands being made by an increasingly affluent consumerist society. The demise of the Empire from the late 1940s also led to the increased use of new synthetic

[35] Imperial Chemical Industries Limited, Annual Report, 1975, p.9
[36] B. Edwards, *Chemicals, Servant or Master? Life or Death?* National Labour Press, (London 1945), pp.15-16
[37] J. E. Cronin, *Labour and Society in Britain, 1918-1979*, Batsford, (London 1984), p.53

fibres and substances that offered cheaper and more sustainable alternatives to the natural products such as rubber, silk, wood and cotton.

Calculating the numbers employed in the industry is a process that is at best confusing and at worst wholly inaccurate, particularly for the earlier periods. This is due mostly to the changes that were made in occupational classifications. The task is further complicated by a lack of a clear and indisputable definition of the chemical industry. For example, in 1948 the President of the Board of Trade called for a comprehensive survey of the whole industry but the study group were immediately faced with the problem of defining it. Contemporary definitions that were available included those belonging to: The 5th Census of Production, the Trade and Navigation Accounts, the Wartime Essential Works Orders, the Partial Census of Production (1946), the Association of British Chemical Manufacturers (ABCM), the Standard Industrial Classification of the Government Inter-Department Committee of Statisticians and that of the International Labour Office.[38]

Nonetheless, academic writers probing this subject area have estimated that in 1914 there were around 30,100 employed in the ‘alkali and manufacturing chemists’ sectors.[39] By 1921, the Ministry of Labour calculated that there were 74,477 males and 18,714 women employed although Buxton and Aldcroft claim that the numbers dipped during the recession of the early 1930s before rising again to around 57,000 by 1937.[40] As stated above, the Second World War witnessed further expansion of the industry and by 1948 the total numbers employed had more than doubled reaching 142,000 of which 102,000 were process workers.[41] By way of demonstrating the unreliability of this data the figures for 1948 are quadrupled when using the method adopted by the Ministry of Labour in 1949, which estimated the numbers employed as 429,600.[42] The reason for this difference is that the Ministry of Labour did not work from a specific definition but utilised the heading ‘chemical and allied trades’ that included some processes that were not taken into account by the

[38] T. I. Williams, *The Chemical Industry, Past and Present*, Penguin, (London 1953), pp.87-88
[39] L. F. Haber, *The Chemical Industry During the Nineteenth Century, A Study of the Economic Aspect of Applied Chemistry in Europe and North America*, Oxford University Press, (Oxford 1958), p.232
[40] Eighteenth Abstract of Labour Statistics of the United Kingdom, PP1926, (Cmd. 2740), p.16 and N.K. Buxton and D.H. Aldcroft, *British Industry Between the Wars, Instability and Industrial Development 1919-1939*, Scolar Press, (London 1979), p.176
[41] T. I. Williams, *The Chemical Industry, Past and Present*, Penguin, (London 1953), p.91
[42] *Ibid*, p.91

ABCM or the Board of Trade. By 1963, the National Economic Development Office calculated that 410,000 people were employed in the industry and as Gill *et al* have noted this level of employment remained almost constant up to 1974 when 432,600 workers were employed making the chemical industry the ninth largest employer in the United Kingdom.[43]

The scale and the speed with which the industry expanded can perhaps account for the sparsity of information that is available: the expansion outpaced the administration. Added to this is the fact that the industry has been associated with corporate secrecy due to the high capital investment involved in the development of products and processes. Perhaps this explains why the industry has received less attention from social historians than other industries? Regardless of these potential barriers Chapter One will analyse the existing literature on occupational health and safety and will engage with relevant historical research. Although touching on many studies this chapter will also specifically engage with the research undertaken by Tweedale, and Johnston and McIvor on the asbestos industry, Markowitz and Rosner's recent critique of the American chemical industry and Woolfson and Beck's sociological study of the occupational dangers associated with the oil industry. In addition, there will be an analysis of the research undertaken by Bartrip, Fenn and Burman that has analysed the impact of state intervention as evidenced by the introduction of the Workmen's Compensation Act in 1897 and the subsequent amendments made to this legislation. Navarro's class-based critique of the dominant interpretations of health and medicine will also be examined. In addition, primary source material will be probed for evidence of the attitudes and strategies of the workers, trade unions, employers, the state and the medical establishment. This will result in a comprehensive interpretation of the available literature and provide a range of viewpoints. Interpretations are varied and this chapter should offer the reader a clear understanding of how the main theoretical frameworks inform and influence historical accounts of occupational health and safety issues.

Chapter Two is divided into two parts with the first of these addressing the impact made on the health and welfare of the workers by the hours and pace of work.

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[43] *Manpower in the Chemical Industry, A Comparison of British and American Practices*, National Economic Development Office, HMSO, (London 1967), p.52 and C.Gill, R. Morris and J. Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.xviii

This requires an analysis of the labour process within the chemical industry to establish what changes occurred in the way that the work was organised and how this impacted on the working environment and the body. Whilst some large firms had operated within the British chemical sector up to 1914 the shape of the industry changed quite radically in response to foreign competition from the mid 1920s. This resulted in a rationalisation of the industry and it became one that was dominated by large-scale firms whose methods of work organisation were adapted to suit an increasingly technological and scientific based process. In part two there will be an examination of the causes and impact of accidents upon the workforce. Many obvious dangers existed within the workplace such as that caused by fire, explosion, splashes from caustic, ore crushing machinery, poorly lit or badly ventilated workplaces and from injuries incurred in the maintenance of the large process equipment. In Chapter Three there will be an examination of the damage caused to the body of the chemical worker by the exposure to a variety of toxic fumes, gases or liquids. This could result in temporary or permanent damage being caused to the skin, lungs, teeth or eyes of the operatives. A more insidious risk existed from the long-term exposures to toxic and carcinogenic substances that could result in death. Three specific areas of the industry will be examined to measure the consequences of exposure to chromates, intermediate dyestuffs, and vinyl chloride monomer. Both Chapters Two and Three will draw on new primary source material, the accident books that belonged to the United Alkali Company, and will also draw on government reports, occupational health journals and oral testimony to probe the attitudes and perceptions that existed amongst those who were directly exposed to the dangers within the workplace.

The role played by the state, the factory inspectors, and medical research will be the main focus for Chapter Four. From 1914, both local and national government bodies increasingly intervened in the regulation of the workplace. Extensions to the franchise, the emergence of the Labour Party as a sustained political force and the demands of both World Wars are frequently cited as factors to explain this changed approach. Factory inspectors were appointed by the state to police, investigate, advise and ensure that rules and regulations were implemented. Their reports on the number of accidents, fatalities and dangerous practices in the workplace provided some insight into the conditions that existed in the workplace and of the willingness or otherwise of employers and workers to adhere to the legislation. The role that the state and the factory inspectorate played in occupational health and safety will be examined to measure how effective they both were in implementing and policing workplace legislation. Whilst many accidents and much physical damage was immediate and visible, the effects of industrial disease could remain hidden for years. As the industry expanded rapidly from 1914 onwards many newly discovered processes and chemicals were introduced without the full understanding of their effects being known. The status of medical science in society meant that in most cases medical research became an essential tool for the verification of most industrial diseases. The ownership, publication and distribution of such medical research was therefore a vital element of the decision making process undertaken by that section of society entrusted to formulate preventative health and safety measures. Given the importance that was attributed to medical research this chapter will examine where, when, and how medical evidence was gathered, presented, and acted upon.

Chapter Five examines the trade unions and their attitudes to occupational health. The chemical industry was capital intensive and from 1914 onwards technological and product change accelerated. Under such circumstances economies of scale were vital for the 'efficient' manufacture of many chemical products and this led to a high degree of ownership concentration with a few companies having a virtual monopoly on chemical production. At the beginning of the period in question the employers were confronted by three main developments that affected industrial relations. These were the growth and stabilisation of trade unionism, increasing foreign competition, and state intervention. This chapter will examine the interactions that existed between the employers, management and the trade unions and will analyse the attitudes and responses to occupational hazards within the working environment. Did the trade unions have enough power to force concessions from the employers? Did trade unions campaign for improved health and safety measures and if so did this merely remove some of the worst excesses of the capitalist production process and thereby humanise it? This examination will make use of new primary source material belonging to the Transport and General Workers Union (TGWU) as well as that of the Trades Union Congress (TUC) and measure the trade union response to these issues. An analysis of company responses will include that of ICI, the largest firm in Britain, as well as from a more specialist producer, J&J White, chromate manufacturers of Rutherglen near Glasgow.

What were the strategies and attitudes that the employers took to prevent or promote improved working conditions? Chapter Six provides an analysis of these with a specific focus on occupational cancers, the most insidious of risks faced by the chemical worker. Despite the inherently dangerous processes associated with chemical manufacturing this chapter will begin by offering an explanation as to why it was that the employers were rarely bothered by government legislation or interference. This necessitates a brief analysis of the role played by the industry's own organisation, the Association of British Chemical Manufacturers who helped to create a positive perception of the industry. This chapter will examine both large and small firms to see if the responses made by these employers to the evidence of occupational cancer differed in either style or substance.

Chapter One

Historiography

> *To be sure many chemical authors have written books purporting to show their science as entirely benevolent, and that the chemical industry deserved public support and encouragement. However, many of these works of mild propaganda originated at a time when science, chemistry and the chemical industry were undergoing nothing like the public resentment or suspicion that marks the end of the twentieth century.*[1]

Inevitably, the historical analysis of occupational health attracts a variety of interpretations. At an early point there were those who took an optimistic view of how dangers within the workplace could be dealt with and who emphasised the improvements that could be made through a combination of scientific knowledge, improved technology, trade union campaigning, and state intervention. This view had a tendency to present a long and mostly uninterrupted progress curve from the poor and unregulated to improved and regulated working conditions where the neglect of the past was to be replaced with care and concern for the worker. The Webbs, who belonged to the scientific gradualist group of socialists, took such a view and had much faith in the emancipating powers offered by 'bureaucratic expertise.'[2] This type of analysis is seen by many as naïve and therefore more recent critical examinations of occupational health have questioned the validity of the long smooth trajectory of progress as posited by these writers.

One area of critical analysis is that belonging to the Marxist school of social scientists. They have claimed that the system of capitalist production determines the working conditions and that it is this system that undermines the health and well being of those who sell their labour power.[3] Undoubtedly, outside the western capitalist systems such as in the former Soviet Union poor working conditions also existed and these inevitably led to injury and death of workers. Nonetheless, as Braverman has correctly argued:

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[1] C.A. Russell (ed), *Chemistry, Society and Environment, A New History of the British Chemical Industry*, Royal Society of Chemistry, (Cambridge 2000), p.v

[2] S. Ingle, The British Party System, Third Edition, Pinter, (London 2000), p.179

[3] For such analyses see T. Nichols, *The Sociology of Industrial Injury*, Mansell, (London 1997) and V. Navarro, *Class Struggle, the State and Medicine*, Martin Robertson, (London 1978)

> Whatever view one takes of Soviet industrialization, one cannot conscientiously interpret its history, even in its earliest and most revolutionary period, as an attempt to organize labour processes in a way fundamentally different from those of capitalism.[4]

This study will deal with the capitalist mode of production as operated within Britain and the effects this has had on the working population within the chemical industry. For the vast majority of the population, work constituted a large and important part of life. That their daily toil was, and continues to be, conducted under the rules of the capitalist system is not in question. Most economists view the capitalist system as an axiomatic process, constructing various economic models around it whilst reinforcing certain assumptions such as private property, profits, and the free market.[5] In contrast to this view, during the second half of the nineteenth century Marx constructed his theory of the materialist conception of history, an essential element of which was his analysis of productive activity. Marx asserted that within the capitalist system there are those who buy and there are those who sell labour power with that labour power being bought and sold as if it was a commodity. As a commodity it sells on the market and its price is wages. For Marx, those who purchase labour power need to do so in order to capitalise on their ownership of the means of production and in *Wage, Labour and Capital*, he identified that the value of labour power was the difference between the wage paid and the amount by which the value of the raw materials increases in value in the process of manufacture.[6] Therefore, according to Marx's theory there is a certain amount of labour power that has not been paid for by the buyer. Within *Capital*, Marx described this particular exploitation of labour power as an equation: labour – labour power = surplus value. Thus capitalism gets surplus value for nothing, and it is the source both of profit and of capital accumulation. To increase the amount of surplus value the buyer of labour power could increase the amount of time the seller spends working (absolute surplus

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[4] H. Braverman, *Labor and Monopoly Capital, The Degradation of Work in the Twentieth Century*, Monthly Review Press, (New York 1998), p.15
[5] D. McLellan, *Marx, Second Edition*, Fontana Press, (London 1975), p.51
[6] J. S. McClelland, *A History of Western Political Thought*, Routledge, (London 1999), p.556

value), work could be driven at a more intensive pace, new machinery could be introduced, and the organisation of work could be altered.

Within such a system it has been acknowledged by Marxist writers that agency was demonstrated by a variety of active players who combined to push for health and safety legislation although this was never against an open door. Indeed, it took time for capitalists to realise that maintaining the health of their workforce could be beneficial to capital accumulation, something that Hyman has noted when he states that:

> The maintenance of a relatively healthy and well-nourished working class is the essential condition of a productive labour force; hence most employers have come to accept or even welcome the various concessions which have been made to working class pressure. [7]

As welfare legislation was passed it was the worker who largely financed the benefits and as Hyman again has argued 'progressive taxation and state welfare provisions have involved redistribution of income *within* rather than *between* classes.'[8] The labour movement rarely called into question the basis of this economic system and so long as it did not do so it retained a usefulness for that system. Thus for Miliband, drawing on the theory of hegemony posited by Gramsci, such actions made for a 'vigorous but safe controversy and debate, and for the advancement of solutions to problems which obscure and deflect attention from the greatest of all problems, namely that here is a social order governed by the search for private profit.'[9] Therefore the 'functional' role played by the trade unions did deliver some amelioration from the worst excesses of industrial capitalism with various steps being taken to reduce working hours, improve sanitary conditions, lighting, and ventilation, as well as pressing for limited funding for state research on matters of occupational health. Following a steady decline in work-related fatality rates between 1960 and 1981, Nichols has shown that these rates, along with serious injury rates,

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[7] R. Hyman, *Industrial Relations, A Marxist Introduction*, MacMillan press, (London 1978), p.131
[8] *Ibid*, p.131
[9] R. Miliband, *The State in Capitalist Society, The Analysis of the Western Power System*, Quartet, (London 1983), p.233

worsened during the period 1981 to 1984 due to the 'weakening of labour by economic, political and ideological means.'[10] Therefore, the improvements to health and safety that had been implemented whilst the labour movement was acting at its functional best began to be loosened once it had been perceived that they posed a threat to the interests of capitalists. Indeed, where any threat to profit levels arose the measures designed to protect the workforce, as will be discussed below, could be and were ignored by those who controlled the means of production. For those adopting a Marxist approach there is little doubt that ultimately within an industrial capitalist system profit will always be placed above the health and safety of the workforce. For example, Navarro, Nichols, Woolfson and Beck have all utilised Marxist theory in their analyses of occupational health issues and along with the work of others writing from a similar perspective will be referred to.[11]

This Marxist view has not gone unchallenged and for McIvor, in *A History of Work in Britain, 1880-1950,* 'the long-run improvement in occupational mortality belies Marxist prognostications of deterioration, although to some extent new hazards and work-related illnesses replaced old ones.'[12] Two points are worth noting here. First, and as McIvor notes elsewhere, given the fact that many work-related fatal illnesses were not officially included in the compilation of official statistics and that many deaths continued to be misdiagnosed as non-work related (some deliberately to avoid compensation payments) then the first part of this assertion must be qualified and be seen as applying only to the most obvious and irrefutable deaths. Second, we can only speculate as to the levels of mortality found amongst the 'new hazards and work-related illnesses' as they only become 'new' once publicly identified and acknowledged. As will be discussed in detail in Chapters Two and

[10] T. Nichols, 'Death and Injury at Work: A Sociological Approach', pp.86-106 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), p.92.

[11] V. Navarro, *Class Struggle, the State and Medicine, An Historical and Contemporary Analysis of the Medical Sector in Great Britain*, Robertson, (London 1978) V. Navarro, *Crisis, Health, and Medicine, A Social Critique*, Tavistock, (London 1986), V. Navarro, *Dangerous to Your Health, Capitalism in Health Care*, Monthly Review Press, (New York 1993), M. Beck, J. Foster, H. Ryggvik, and C. Woolfson, *Piper Alpha Ten Years After, Safety and Industrial Relations in the British and Norwegian Offshore Oil Industry*, Centre for Regulatory Studies, University of Glasgow, (Glasgow 1998) C. Woolfson, *Deregulation: The Politics of Health and Safety, A Report Prepared for the STUC in Conjunction with the International Centre for Trade Union Rights*, University of Glasgow, (Glasgow 1994), T. Nichols, *The Sociology of Industrial Injury*, Mansell, (London 1997), T. Nichols, and P. Armstrong, *Safety or Profit: Industrial Accidents and the Conventional Wisdom*, Falling Wall Press, (Bristol 1973)

[12] A. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.112

Three both respiratory diseases along with cancers would have devastating effects on an untold number of chemical workers years before these cancers and diseases were officially recognised. Indeed, the effects of exposure to many chemicals remained unknown for years and in some cases have never been revealed as:

> Many of them were first made when manufacturers had no legal requirement to carry out any safety tests, and none has been tested on humans … virtually nothing is known about the long-term effects on human health of these chemicals.[13]

Moreover, many so-called 'new' hazards and illnesses can actually be old. For example, coal miners struggled for years to have pneumoconiosis recognised and as will be shown chemical workers in the dye sector also struggled for years to have bladder cancer recognised as an occupational disease. Therefore, although such occupational diseases existed and would have added to the toll of work-related deaths their impact was only measured once it had been officially recognised and had become 'known'. How is it possible to measure the unknown? As Watterson has argued, 'our ability to assess and predict occupational health risks over the long term is in fact limited.'[14] Based on the above, it is at least possible to argue that it may not be the case that the long-run improvement in occupational mortality in Britain belies Marxist prognostications of deterioration. This issue will be expanded upon throughout.

Other historians of occupational health and safety have argued that Marxist interpretations ignore the positive effects of state intervention on working conditions. For example, Bartrip, Burman, and Fenn have all asserted that state intervention, in the form of compensation and factory legislation ultimately had an ameliorative effect on occupational health and safety. Their 'revisionist' perspective examines the variety of legislative measures that were enacted such as the Factory and Workshop Act (1878), the Employers' Liability Act (1880), the Employers' Liability

[13] J. Reynolds, 'Seriously Hazardous Chemicals in Nearly Every Person Alive', *The Scotsman*, 14 November 2003

[14] A. Watterson, 'Why We Still Have 'Old' Epidemics and 'Endemics' in Occupational Health: Policy and Practice Failures and Some Possible Solutions', pp.107-126 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), p.119

Amendment Bill (1894), the Workmen's Compensation Act (1897), and the subsequent amendments as contained in the Workmen's Compensation Act (1906). The Factory Inspectorate have also been analysed to measure their ratio to British industry as well as the enforcement resources that they had at their disposal. Both Bartrip and Burman have acknowledged that the Employers' Liability Act, which could have penalised employers financially if their negligence was proven, was far from successful. Contracting out was extensively enforced by employers (avoiding investigation of the accident as well as compensation payment) and involved workers signing away their rights to the terms of the Employers' Liability Act.[15] Bartrip has demonstrated that much of the compensatory reform was 'moderate' or 'symbolic' although having some 'practical' significance.[16] In their quantitative analysis of the factory inspectorate both Bartrip and Fenn discovered understaffing and respectively low levels of reporting whilst the low levels of fines at the inspectorates' disposal failed to penalise poor employers effectively.[17] Bartrip and Fenn also question the effectiveness of the Factory Inspector, as they found no close correlation between the rise in the numbers of inspectors after 1892 and reductions in fatal injury rates.[18]

In *Not Only the Dangerous Trades* Harrison explores the relationship between women's work and health between the 1880s and 1914 and persuasively argues that factory legislation proved to be a poor and weak strategy in preventing damage to the health of women exposed to dangerous substances such as lead and phosphorus. Crucially for Harrison, failures existed within the legislative measures in that the elimination of recognised dangerous substances was rejected in favour of their regulation. Aspects of regulation such as protective wear for workers and fines for employers were respectively inadequate and cheap. In any event, legislation and regulation addressed only a few of the problems within a low number of occupations leaving the largest area of women's paid labour, domestic labour, outside its remit.

[15] P. W. J. Bartrip and S. B. Burman, *The Wounded Soldiers of Industry, Industrial Compensation Policy, 1833-1897*, Clarendon Press, (Oxford 1983), pp158-165
[16] P. W. J. Bartrip and S. B. Burman, *The Wounded Soldiers of Industry,* p.188 and P. Bartrip, 'The Rise and Decline of Workmen's Compensation' pp.157-179 in P. Weindling (ed) *The Social History of Occupational Health*, Croom Helm, (London 1985), pp.160-163
[17] P.W. J. Bartrip and P.T. Fenn, 'Factory Fatalities and Regulation in Britain, 1873-1913' pp.60-74 in *Explorations in Economic History*, Volume 25, 1988, p.73
[18] P.W. J. Bartrip and P.T. Fenn, 'Factory Fatalities and Regulation in Britain, 1873-1913', p.71

Consequently, the working environment for women was barely altered and many areas of work remained untouched by legislation.[19]

Recognising certain deficiencies in compensatory legislation, such as its tendency in leading to 'institutionalised conflict' between trade unions and employers' organisations, Bartrip however expresses an optimism towards the legislation in that many who had previously received nothing for accident and injury were now able to claim compensation, especially from 1906 onwards.[20] The Workmen's Compensation Act of 1906 extended the scope of the legislation to a wider field, the rights of the persons covered were enlarged, the amounts payable as compensation were increased for those under 21 years of age, and some provision was made to provide for security of payment. With a few exceptions, all industries and occupations were now covered by this legislation. The 1897 Act had covered around 7 million workers but by 1906 this had more than doubled bringing approximately 15 million workers under its umbrella.[21] One of the most important changes that the legislation now addressed was that automatic financial compensation was paid for those suffering from one of six major industrial diseases. This replaced the previous, and often fruitless, legal route that had been trodden by many workers affected by lead, mercury, phosphorus, arsenic, anthrax, and ankylostomiasis. However, McIvor has argued that these six diseases attained their legal position simply because the connections between the occupation and the disease were 'virtually irrefutable.'[22] The process of identifying dangerous substances was not however one that could be necessarily relied upon. In 1908, Professor Glaister published his *Poisoning by Arseniuretted Hydrogen or Hydrogen Arsenide* that identified the harmful effects of gas found in aniline dye and bleaching powder manufacture that assisted in Workmen's Compensation claims.[23] Unfortunately for chemical workers chrome ulceration, an injury that was repeatedly observed and reported in government enquiries since 1893, had to wait until 1920 for inclusion within the list of recognised

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[19] B. Harrison, *Not Only The Dangerous Trades: Women's Work and Health in Britain, 1880-1914*, Taylor & Francis, (London 1996), p.231
[20] P. Bartrip, 'The Rise and Decline of Workmen's Compensation', p.174
[21] A. Wilson and H. Levy, *Workmen's Compensation*, Oxford University Press, (London 1939), p.102
[22] A. McIvor, *A History of Work in Britain,* p.124
[23] M Anne Crowther and B. White, *On Soul and Conscience, The Medical Expert and Crime*, Aberdeen University Press, (Aberdeen, 1988), p.50

industrial diseases.[24] Even after this inclusion many cases of chrome ulceration remained 'undetected' as will be discussed below.

Bartrip's positive view of compensatory legislation rests on its symbolic and practical importance. Symbolically, workers had been provided with a right that had taken them one step closer to a social, legal and political parity with fellow citizens. Practically, it had established work injury victims as a separate group who were entitled to claim benefits that were denied to others.[25] However, and by way of criticism, compensation did not restore lost limbs or mobility. It did not restore a partner who played a vital part in maintaining the life of others. Health and safety legislation failed to properly address the protection of the worker and concentrated instead on providing limited compensation thereby reinforcing the notion that what was important in life was money rather than health and life itself. More importantly, it is possible to argue that financial compensation and regulation only came into being because it allowed employers and the government to deal with the problem of their responsibility for health in a relatively cheap way rather than spending larger amounts on medical research and properly funded preventative measures.

Between 1970 and 1973, Nichols and Beynon conducted a series of interviews with chemical process workers at a large multi-national chemical plant in the north east of England. In the absence of this knowledge it would be forgivable if the reader dated the interviews to the beginning of the twentieth century. Thus, one operative wearing a mask and goggles which 'don't keep the dust out' and who worked in a large shed which held the materials due for processing reported that:

> You can't see in there. I've been in there and had my gear in forward and tried to look through my windows and with the dust coming down and floating I've had the impression that I am going back and I couldn't understand why. I felt all giddy. It's definitely upsetting. It's not good for you actually. If you went on continually I think you'd get a bad illness after a couple of years.[26]

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[24] A. Wilson and H. Levy, *Workmen's Compensation*, p.134
[25] P. Bartrip, 'The Rise and Decline of Workmen's Compensation', p.163
[26] T. Nichols and H. Beynon, *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.12

Another worker reported that 'sometimes when I come down my ears are tingling – you know buzzing … you only notice when you stop' with another stating 'you say to them (the managers) look its fucking hot in there. I could pass out or something. All they ever say is 'It's your job. It's up to you.'[27] The men employed in this plant worked shifts of eight hours, from 6am to 2pm, 2pm to 10pm and 10pm to 6am but the shifts were not fixed for a week but instead were rotated throughout the week. Thus, the 6am to 2pm shift would be worked on Monday and Tuesday and on Wednesday and Thursday it would move to a 2pm to 10pm shift before being moved again to a 10pm to 6am shift for Friday, Saturday and Sunday. The following Monday and Tuesday were days off. Shift work has always been a part of the chemical industry and has been referred to in government reports since 1893. Discussing shift patterns, Kinnersley, in *The Hazards of Work* noted that much public attention has focused on jet lag but 'jet lag is just a short taste of what its like to be on shifts, but without the dreary surroundings of a factory at night and in circumstances when mistakes can cost only money – not life or limb. Shift lag is an altogether more serious condition.'[28] Diet is affected as are sleeping patterns and the gradual wearing down of stamina must eventually have a deleterious impact on health. Deterioration of health can be much more subtle than loosing a limb or contracting a recognised disease. This study undertaken by Nichols and Beynon appears to be an exception in that much of the literature on the chemical industry fails to make any direct link between the processes and substances discussed and the potential dangers that these posed to the chemical workforce within the British industry. Tweedale, in *Magic Mineral to Killer Dust*, expresses a similar frustration when he comments that, 'at best, workers' deaths and injuries, if they are mentioned at all, are seen as the unintentional results of industrialization – regrettable perhaps, but not really a factor in the onward and upward march of the economy.'[29]

Discussion of deaths and injuries arising out of incidents within the chemical industry tend to be reserved for single and dramatic events, such as explosions or

[27] T. Nichols and H. Beynon, *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.21
[28] P. Kinnersley, *The Hazards of Work*, Pluto Press, (London 1974)
[29] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Tragedy*, Oxford University Press, (Oxford 2003), p.ix

leakages where large numbers of workers have been involved or where the public have been exposed to danger. On the other hand, the toll of injury and death arising from the drip feed effect of exposure to dust, gases and fumes as well as to other dangerous working conditions often occur with little or no comment. The lack of response to industrial injury and death must be viewed in contrast to the amount of political, economic and social effort that has been expended over the years in an attempt to diffuse industrial disputes, which, although resulting in lost days to production and having cost implications, are of a much smaller scale than that lost to industrial accidents. For example, between 1960 and 1970 there were 46.2 million days lost through industrial disputes yet within the same period 241 million days were lost through industrial accidents.[30] Industrial disputes between 1950 and 1975 caused no loss of life amongst those involved but 16,622 workers did lose their lives in work related accidents in the same period.[31] Just five years after the introduction of the Health and Safety at Work Act 1974 (HASAWA, 1974) the Conservative government came to power under a slogan of 'Labour isn't working' and continuously chose to highlight the number of days lost to industry through strikes but never through accidents or injuries. Adopting a policy of anti-trade unionism the Conservative government then presided over a rate of industrial injury that amounted to ten times the number of days lost through strikes.[32] The resultant increase in claims for compensation to the Department of Social Security Industrial Injuries Scheme was met by Conservative cuts to benefit entitlement and by reductions to the levels of compensation available.[33] Clearly for industrial capitalists, owning the means of production is important but to do so also requires having control of that ownership and that strategy can include hiding the truth about the numbers who suffer from its effects.

Offering one sociological interpretation of how industrial deaths or injuries have been made invisible Dwyer posits that professional associations were formed that placed an emphasis on preventing spectacular accidents from coming into public

[30] P. B. Beaumont, *Safety at Work and the Unions*, Croom Helm, (London 1983), p.1
[31] *Ibid*, p.19
[32] T. Nichols, 'Death and Injury at Work: A Sociological Approach', pp.86-106 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), pp.86-87
[33] S. Pickvance, 'Occupational Health Issues and Strategies: A View from Primary Health Care' pp.220-237 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), p.231

view through technical improvement, as occurred in the coal industry, whilst compensation payments were used to reduce the visible destitution caused by accidents.[34] This path, according to Dwyer, meant that industrial death could be produced invisibly and any emerging conflict on the issues could be dealt with institutionally. These structures would leave capitalism and the science that serves it 'triumphant' allowing them to celebrate their victory in such a way that it was visible to all. This theory is persuasive and Dwyer has gone on to argue that the process produced a 'social peace' on issues of occupational health and safety, a pattern that was replicated in the USA, France, Germany and Belgium. 'Weberian bureaucracy replaced Marxian class conflict.'[35] An example of this can be seen when the government updated the rules and regulations attached to chemical work in 1922 (S.R. & O., 1922, No.731). Following this the Association of British Chemical Manufacturers (ABCM) published their *Model Safety Rules* in 1928. This effort had an immediate influence when in 1929 the Annual Report of the Chief Inspector of Factories noted the publication stating that the ABCM were doing 'admirable work.'[36] Republished again in 1938 and in 1952 the Chief Inspector of Factories was sufficiently impressed to write the foreword for the ABCM's rules, commenting that this initiative was 'greatly to be commended.'[37] Alongside this shining example of how the industry took its responsibilities seriously some of the largest and most reputable chemical employers continued to pay compensation to those who died or were dying from exposure to highly suspected or known carcinogenic substances in the dyestuffs industry. The sense of duty and care that the industry was prepared to take had been made visible by its rules and regulations. The workers loss of ability to 'earn a living' had been made invisible by the industry's ability to pay compensation. However, much less visible were the institutional matters such as the accident rates that continued to occur and which, by the 1960s, were three times higher than those found within the American chemical industry (the American industry had clearly made a more intensive effort to maintain their productive labour force). Similarly,

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[34] T. Dwyer, *Life and Death at Work, Industrial Accidents as a Case of Socially Produced Error*, Plenum Press, (London 1991), p.35
[35] T. Dwyer, *Life and Death at Work, Industrial Accidents as a Case of Socially Produced Error*, Plenum Press, (London 1991), pp.33-35
[36] Annual Report of the Chief Inspector of Factories, PP 1929, (Cmd.3633), p.29
[37] Association of British Chemical Manufacturers, Safety Rules for Use in Chemical Works, Part II, Detailed Instructions, (London 1952)

breaches of legislation continued and even as late as 1973 an inspector found men working in chemical dust up to two feet in depth, something for which ICI were later fined just £50.[38] The bureaucratic machine dealt with the practicalities of these infringements whilst at the same time diffusing and diverting any potential antagonism that may have arisen.

But what of the science that serves capitalism? In his Marxist critique of the dominant interpretations of health and medicine Navarro posits that science is far from being objective and basically amounts to what assigned scientists in bourgeois institutions do, thereby leaving the knowledge found outside the scientific circles non-scientific.[39] For example, written in 1939, B. L. Coombes autobiographical account *These Poor Hands* would be considered 'unscientific' evidence of the poor and unsafe working conditions that existed in the coal mining industry. As Navarro has suggested much of this type of evidence was ignored, or ignored until the connections between occupation and disease had become virtually irrefutable. Once the link had become highly visible it then had to be made invisible. Thus, once scientists had 'discovered' the link it was compensation and regulation that were offered more often than prevention or an outright ban. Such was the case with lead, phosphorous, asbestos amongst others. Even with cases that were deemed to be irrefutable science retained a certain usefulness to capital as their compliance could still be used to disguise the truth. For example, the women who toiled to fill shells from 1914 were exposed to the dangers posed by toxic poisoning from TNT, a scientific 'fact' that was established in 1915. However, Ineson and Thom have shown that many women workers continued to be sacrificed for war production as a result of the identity of interests formed between the medical and managerial establishments. Both medical officials and managers were willing to keep production going, along with the help of government censorship, despite clear evidence of toxic poisoning arising from exposure to TNT.[40] In addition, the views expressed by Dwyer and Navarro above are confirmed by Ineson and Thom when they claim that

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[38] T. Nichols and H. Beynon, *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.12
[39] V. Navarro, *Crisis, Health, and Medicine, A Social Critique*, Tavistock, (London 1986), p.163
[40] A. Ineson and D. Thom, 'T.N.T. Poisoning and Employment of Women Workers in the First World War', pp.89-107 in P. Weindling (ed) The Social History of Occupational Health, Croom Helm, (London 1985)

much of the early protection put in place within TNT plants was to prevent explosions and that the TNT workers own experience of ill-health was ignored with the *Lancet* claiming that, 'the history given by a patient is often very misleading.'[41]

Many examples of scientific knowledge being used (or abused) by the interests of capital to hide the effects of occupational disease, death and injury exist within the literature. For example, writing in 1944, Bernal argued that government funded medical researchers were circumscribed. By examining the workings of the Medical Research Council (MRC) Bernal concluded that its scope was 'extremely limited' in that it had to remain a consultative body, had no power to enforce any action in relation to its findings, and could not unilaterally make its findings publicly known.[42] Graebner, in 'Hegemony Through Science' has demonstrated that the lead industries of America had 'engineered the development, dissemination, and perception of knowledge concerning the lead hazard' with one laboratory 'translating the industry's needs into the language of science.'[43] The consequences of this action were that millions of people were exposed to the toxic properties of tetraethyl lead for fifty years. Tweedale has shown that the medical community were sometimes reluctant to upset the asbestos industry given that from the 1950s it had provided 'jobs, research funding, access to data, and university endowments for doctors,' presumably to the right kind of people.[44] Johnston and McIvor's, *Lethal Work* has revealed that research undertaken by the industry-funded Asbestosis Research Council did produce medical knowledge but that the industry helped to limit the dissemination of the knowledge by restricting it to 'a narrow group of specialists.'[45] In 1958, in an article entitled 'Illness and the Job', *The Times* reported that, 'while a manufacturer can still produce a new, perhaps noxious product, without being required to submit it to official analysis, lessons must continue in many cases to be learnt the hard way.'[46] The 'hard way' for many uninformed workers meant

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[41] *Ibid*, p.94 and p.97
[42] J. D. Bernal, *The Social Function of Science*, Routledge, (London 1944), pp.48-49
[43] W. Graebner, 'Hegemony Through Science: Information Engineering and Lead Toxicology, 1925-1965' pp.140-159 in D. Rosner and G. Markowitz (eds) *Dying For Work: Workers' Safety and Health in Twentieth-Century America*, Indiana University Press, (Indianapolis 1989), p.155
[44] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Tragedy*, Oxford University Press, (Oxford 2003), p.68
[45] R. Johnston, and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, (East Lothian 2000), p.218
[46] *The Times*, 'Illness and the Job' June 20, 1958, p.11

experiencing pain, injury and possibly death. The International Agency for Research on Cancer (IARC) posed the question of how accurate the information was on industrial carcinogens because since 1755 (the year the first occupational cancer was identified) only 26 chemicals or industrial processes had been positively linked to occupational cancer over the next 200 years.[47] In some cases a particular process may have been used for a number of years and then withdrawn with a further 20 years elapsing before any of the workers would show signs of cancer that the exposure had caused. Within the chemical industry, chrome compounds were known to have harmful effects on the health of the process workers since 1893 and yet respiratory cancer was not investigated as a possibility until the mid 1950s in Britain even although the German industry had identified a correlation from 1912 and later confirmed this in the 1930s. As referred to earlier, chrome ulceration had become a scheduled disease from 1920 but it would take local knowledge of this illness and not medical expertise to identify the true levels of illness that continued to be found within the industry. Thus, by 1990, the Sheffield Occupational Health Project was able to record more cases of chrome ulceration in one local factory than were officially recorded across the whole of Britain.[48] Where a worker felt ill and had a suspicion that the conditions within his or her workplace may have been the cause of this, there was no guarantee that the local doctor would confirm these suspicions. Writing in 1987, Watkins, a community physician, noted that, 'no doctor has ever been struck off the register for the false certification implicit in telling workers that a process is safe when knowing that it isn't.'[49] With regard to the power that capital can exert through the ownership of medical knowledge the Marxist perspective clearly has some validity.

Perhaps some critics would argue that this is an overly deterministic view and fails to acknowledge that not all scientists behave according to the above interpretation. However, the chemical industry was notoriously secretive, something

[47] A.W. LeServe, C. Vose and C. Wigley, *Chemicals, Work and Cancer*, Workers' Educational Association, Nelson & Sons, (London 1980), p.43

[48] A. Watterson, 'Why We Still Have 'Old' Epidemics and 'Endemics' in Occupational Health: Policy and Practice Failures and Some Possible Solutions', pp.107-126 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), p.112 also *Hazards* 31, 1990, p.40

[49] S. Watkins, *Medicine and Labour, The Politics of a Profession*, Lawrence and Wishart, (London 1987), p.134

Coley explains by the fact that large capital expenditures on new products and process had to be protected to maintain a competitive advantage over rivals.[50] Given the existence of this industrial secrecy the toxic content of many substances remained unclear except amongst those who needed to know (the scientists and engineers).[51] Therefore, following on from the analysis above, the only way this knowledge could be dispersed to a wider audience was for scientists to take an objective and individual stance. Certainly within the chemical industry and in the wider scientific field some dissident voices were heard but they are noteworthy in that they are but a few. The industrial hygienist Arlidge from the 1890s and the medical expert Dr Thomas Oliver attempted to widen interest in occupational health. Publications by Oliver, *Dangerous Trades* (1902) and *The Diseases of Occupations* (1908) covered a variety of trades, with the former volume containing a chapter on the chemical industry written by Laurie, the Principal of Herriot Watt College.[52] Laurie concluded that at the beginning of the twentieth-century the business of chemical manufacturing was one of the unhealthiest industries in Britain.[53] Thomas Legge, a pioneer of industrial health and the first Medical Inspector of Factories, ploughed a sometimes-lonely furrow in exposing dangerous working methods. Legge would later resign his position in 1926 when Britain failed to ratify the Geneva White Lead Convention of 1921 that sought to prohibit the painting of interiors using white lead paint.[54] In 1949, one medical practitioner alleged that ICI had not taken sufficient steps to protect the workforce against ά-naphthylamine (used in the manufacture of dyes and at the time suspected of causing bladder cancer) and was dismissed by ICI when he

[50] N.G. Coley, 'The Shape of the British Chemical Industry', pp.13-41 in C.A. Russell, (ed) *Chemistry, Society and Environment, A New History of the British Chemical Industry*, Royal Society of Chemistry, (Cambridge 2000), p.14

[51] Contained within a 1948 contract of employment ('Agreement') between Mr 'X' and ICI the following had to be agreed to: Section 4 (A) 'The Employee shall keep the secrets of the Company and its subsidiary companies and shall not either during his employment hereunder or at any time after the termination thereof divulge any matters or things relating to the business or interests of the Company or its subsidiary companies to any unauthorised person or utilise any secret or confidential knowledge or information acquired in consequence of the Employee's service hereunder to the detriment or prejudice of the Company or its subsidiary companies.'

[52] A. P. Laurie, 'The Chemical Trades,' pp568-598 in T. Oliver (ed) *Dangerous Trades, The Historical, Social and Legal Aspects of Industrial Occupations as Affecting Health, By a Number of Experts*, John Murray, (London 1902)

[53] A. P. Laurie, 'The Chemical Trades', p.597

[54] P.A.B. Raffle, R.I. McCallum, and R. Murray, (eds) *Hunter's Diseases of Occupations*, Hodder and Stoughton, (Kent 1987), p.173

persisted in his criticisms.[55] Bladder cancer caused by inhalation or skin contact with this chemical was confirmed as an occupational cancer amongst chemical workers in 1954. To some extent these individual examples act as a corrective to the theory posited by Navarro although convincing evidence is available to show that industrial capital has created gaps between scientific knowledge and the dissemination of that knowledge to a wider sphere. Johnston, McIvor, Tweedale, Graebner and others have all demonstrated that capitalist control of scientific knowledge ensured that many workers continued to toil in production processes for years after they were known to be harmful, sometimes fatally so. Although what a small number of dissident scientists had to say was useful in raising awareness of the dangers posed, the hegemonic control that was exerted by capital allowed it to continue exposing workers to risks long after lead, phosphorous, asbestos, chrome, etc, had been revealed as potential killers.

As has been touched upon in the introduction to this work, there were those who did not physically work within a chemical factory but who actively and successfully sought some protection for their health and property from its pollutants. However, unlike the noxious and harmful chemical substances that floated in the air or on water between social boundaries posing some threat to all classes, Watterson has argued that it is mostly those at the lower end of the social scale who have experienced occupational exposure to toxic substances.[56] This exposure resulted in occupational disease amongst chemical workers that included ulceration, dermatitis, poisoning, anaemia, cancers, cyanosis, respiratory disorders, teeth and bone rot, and the partial or complete destruction of the nasal septum. Reforms designed to limit physical damage at the lower end of the social scale, as Jones has argued, have mostly been bound up with reasons of national efficiency, moral outrage or to ward off industrial unrest and the challenges posed by the labour movement.[57] Under such circumstances, health and safety legislation was bound to be piecemeal in nature, (as it was) and would follow a reactive pattern in line with the ebb and flow of the

[55] *The Times*, 'Law Report, High Court of Justice, Trumper v Imperial Chemical Industries Limited and Others' May 3, 1952, p.3
[56] A. Watterson, 'Why We Still Have 'Old' Epidemics and 'Endemics' in Occupational Health: Policy and Practice Failures and Some Possible Solutions', pp.107-126 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), p.108
[57] H. Jones, *Health and Society in Twentieth-Century Britain*, Longman, (Essex 1994), p.17

reasons provided above. An example of this can be seen in the actions of the Health of Munitions Workers Committee. This scientific group, created by the government to tackle the problems of worker fatigue and increased accident rates within a limited number of industries during World War One, had its primary role in helping to increase production levels for the war. However, as Rose notes, finding the limitations of the worker only became a relevant factor for the government when unemployment had become practically non-existent. Once that war had ended unemployment returned and with that 'normality' in place government and business interest diminished until the demands made by the Second World War resurrected their interest again.[58] McIvor, in *A History of Work in Britain, 1880-1950,* holds a similar view to Watterson when he argues that despite the introduction of some ameliorative legislation to deal with issues of occupational health and safety 'working-class, blue-collar and blue-blouse workers were more adversely affected than middle-class professionals and office workers.'[59]

Work-related poisonings have not been as vigorously pursued as homicidal poisonings although as Crowther and White have noted in *On Soul and Conscience*, poisoning was more numerous and 'more likely' to be found as a result of exposure to toxic materials within industry.[60] Those who investigate murders generally seek out a motivational factor to explain any malice or intent involved. Perhaps it is thought that there is a lack of malice or intent in industrial poisoning cases? If so, perhaps there is a case for industrial manslaughter? The failure of employers to fully implement the rules and regulations that were passed by successive governments and the consequences suffered by workers has been the subject of investigation for some time. For example, from the end of the nineteenth century Sherard, in *The White Slaves Of England* and Hardie in his 'White Slaves' series of pamphlets published by *The Labour* Leader exposed the disregard that employers had for their chemical process workers.[61] Factory Inspectors Reports such as that provided by Thomas Legge, a pioneer of industrial health and the first Medical Inspector of Factories,

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[58] M. Rose, *Industrial Behaviour, Theoretical Development Since Taylor*, Penguin, (Middlesex 1975), pp.98-100
[59] A. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.147
[60] M Anne Crowther and B. White, *On Soul and Conscience, The Medical Expert and Crime*, Aberdeen University Press, (Aberdeen, 1988), p.19
[61] R. H. Sherard, *The White Slaves of England*, Fifield, (London 1897) and *The Labour Leader*, The 'White Slaves' Series of pamphlets, (Glasgow 1899)

confirmed the ill health identified by these writers as well as providing evidence that many employers continued to evade the legislation.[62] More recently, Tweedale's *Magic Mineral to Killer Dust* and Johnston and McIvor's *Lethal Work* have revealed how employers and government regulators failed to properly protect workers from asbestos dust even after 1931 when medical knowledge had clearly identified the implications of exposure to asbestos. Both of these studies also reveal that despite being provided with full medical knowledge and legal opinion asbestos employers continued to oppose regulation, misinform workers of the dangers, failed to maintain extraction and safety equipment, and continued to expose their workforces to this potential killer. Providing an explanation (or motive perhaps?) for this 'strikingly irresponsible' behaviour Tweedale, Johnston and McIvor all take the view that, 'profit was, quite clearly, being placed before workers' health and well being.'[63]

Within the international chemical industry perhaps the most notorious and well-known incident is that which occurred in 1984 in Bhopal, India. Described by Lapierre and Moro as the worst industrial disaster in history the explosion at the Union Carbide fertilizer plant produced a massive toxic cloud that killed an estimated 16,000 to 30,000 people with more than 500,000 sustaining injuries to their eyes, lungs, brain, muscles, bone joints, liver, kidneys, as well as to their reproductive, nervous and immune systems.[64] The exact death and injury tolls remain unknown as, in order to limit compensation claims, the authorities stopped counting. Union Carbide never disclosed the exact content of the chemicals involved thereby restricting the range of effective treatments and no court, neither Indian nor American, ever passed judgement on Union Carbide which took all possible steps to avoid responsibility.[65] The main source of this 'accident' was the inadequate and poor state of the safety systems, a preventable situation except for the fact that the safety budget for the plant had been cut in order to save money. Having a safety system in place means that the firm had calculated the risks associated with the

[62] Annual Report of the Chief Inspector of Factories and Workshops for 1899, HMSO, PP 1900, (Cd. 223), p.336

[63] R. Johnston and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, (East Linton 2000), pp.213-216, G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), pp.279-280

[64] D. Lapierre and J. Moro, *Five Past Midnight in Bhopal*, Scribner, (London 2003), pp.371-372 According to the Indian Medical Research Council, 521,262 people suffered from the toxic effects.

[65] T. Nichols, 'Death and Injury at Work', pp86-106 in N. Daykin and L.Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), p.93

process. Therefore, by diluting this safety system the risk factor for securing a safe environment had been increased.

In *Paying for the Piper*, Woolfson, Foster, and Beck have identified the human cost amongst oil workers that resulted from the employers' failure to implement good health and safety practices so that production would not be inhibited. Public investigations following the *Piper Alpha* and *Ocean Odyssey* explosions of 1988 revealed that the employers had shown a 'flagrant disregard for the safety and welfare of the offshore workforce.'[66] A later study by Beck, Foster, Ryggvik and Woolfson concluded that despite the criticisms made of the industry the lessons of the *Piper Alpha* disaster had still not been learned.[67] Perhaps the most well known example of placing profit before human life was that of the Ford Pinto case. In 1977, company documents belonging to the Ford Motor Company proved that Ford knew of weaknesses in the fuel tank of the Ford Pinto prior to its launch on the market. However, a cost-benefit analysis conducted by the firm indicated that it would be cheaper for Ford to pay compensation for burn deaths and injuries (identified as a 'benefit') following 'accidents' rather than modify the fuel tank to prevent the fires in the first place (a 'cost').[68] Ford's actuaries calculated that there would be 180 burn deaths and 180 severe burn injuries per year. All of the above-cited cases demonstrate that employers may not have intended to kill or injure but they do show quite emphatically that they had the knowledge to prevent this happening. Amongst the industrial capitalists above, calculations had been made to see how much it would cost to prevent death or injury before deciding to choose profit over life. Of course defining 'accident' can be fraught with interpretation although the common interpretation would be that it is an unforeseen event, something that occurs unintentionally or by chance. Writing on such issues Campbell, in *Philosophy of the Accident,* has argued that if situations are controlled successfully then what happens

[66] C. Woolfson, J. Foster and M. Beck, *Paying for the Piper, Capital and Labour in Britain's Offshore Oil Industry*, Mansell, (London 1997), p.413
[67] M. Beck, J. Foster, H. Ryggvik and C. Woolfson, *Piper Alpha Ten Years After, Safety and Industrial Relations in the British and Norwegian Offshore Oil Industry*, Centre for Regulatory Studies, University of Glasgow, (Glasgow 1998), p.49
[68] D. Eva, and R. Oswald, *Health and Safety at Work*, Pan, (London 1981), pp.47-49

is non-accidental: the accidental appears where there is imperfect control or no control at all.[69]

It is at least possible to argue that the economic rationalities of industrialised society forces people at all levels to choose between health and productivity and to seek an 'acceptable' balance between the two. One South Wales industrialist and Member of Parliament, H.H. Vivian, stated at the end of the nineteenth century, 'You cannot have manufactures carried on without suffering: half or two thirds of your incomes is derived … from manufacturing industry, and you must take the rough with the smooth.'[70] This demonstrates quite clearly the relationship that exists between capital and labour. Firstly, within a capitalist system most workers derive their income from industry by selling their labour power to those who own the means of production. Secondly, by doing so, there is the potential to suffer. Thirdly, there appears to be little choice, as 'you must' take the rough with the smooth. The pronouncement did take the potential for ill health into account but for those who own industry, being ill (or taking the rough) usually means having access to, and the financial backing for, care, rest, medical attention, and even recuperation. A developed welfare system can assist those who find themselves out of work but for those who sell their labour power both the wage and the working conditions can determine the living standards, social well being, and health for themselves as well as for their dependants. Being physically able to sell ones labour power is crucial for most as it literally means being able to earn a living. Amongst the theories espoused by the adherents of capitalism, the contract of employment has always been presented as something that the sellers of labour power have entered into freely. Whilst the theory of being 'free' to enter into a contract may be true in that workers are not marched at gunpoint to a place of work, the theory can also be viewed as disingenuous as it implies that the decision is reached without restriction or constraint.[71] Yet restrictions and constraints do exist that heavily influence the potential workers' decision. Financial and state support for those with no wage improved as the twentieth century progressed, however, at the beginning of the

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[69] R. Campbell. 'Philosophy of the Accident', pp17-33 in R. Cooter and B. Luckin (eds) *Accidents in History: Injuries, Fatalities and Social Relations*, Rodopi, (Amsterdam 1997), p.26
[70] E. Ashby and M. Anderson, *The Politics of Clean Air*, Oxford University Press, (Oxford 1981), pp.81-82
[71] R. Hyman, *Industrial Relations, A Marxist Introduction*, MacMillan press, (London 1978), p.23

period under examination these provisions were negligible and consequently the threat and fear of unemployment haunted many. Job mobility for the working classes was also limited to some extent by their inability to save from low wages as well as by their lack of educational opportunities. When the overwhelming alternative to accepting long hours of risky and dangerous work on the employers' terms is unemployment, debt or poverty, the meaning of being 'free' to enter the contract has clearly been redefined. Thus, even in the 1970s one chemical process worker could state that, 'You're trapped in this job. Every man in this plant now is trapped here, believe it or not. You've got to stay whether you like it or not.'[72]

In his Marxist critique of the labour process and health, Navarro posits that the extraction of absolute surplus value is usually found where low technology, low specialisation of labour, and elementary organisation of labour form the major part of the labour process.[73] On offer to the majority of workers who 'freely' entered into a contract of employment with the chemical manufacturers in 1914 were, basic technology, long hours of work, no proper meal breaks, relatively low wages, and a labour intensive and dangerous working environment. Again Navarro claims that such working conditions would have had negative consequences for the health of the workers resulting as they did in, fatigue, stress, and exposure to risks from injury and toxic materials.[74] As touched upon elsewhere in this chapter conditions did improve to some extent over time, however the NEDC could still report in 1967 that within the British chemical industry, toilet and changing facilities varied considerably, that many first aid and medical facilities were under funded, safety training and auditing was under developed, and that strong and effective safety policies and practices needed to be put in place.[75]

Hyman has argued that the 'imbalance' of the employment contract can only be lessened for the worker when labour markets are tight, the skills that are required by employers are scarce, or when workers band together such as in a trade union.[76] Of the three factors that might lessen this 'imbalance' there is little evidence to suggest

[72] T. Nichols and H. Beynon, *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.28
[73] V. Navarro, *Crisis, Health, and Medicine, A Social Critique*, Tavistock, (London 1986), p.115
[74] V. Navarro, *Crisis, Health and Medicine*, p.115
[75] National Economic Development Council, Manpower in the Chemical Industry, HMSO, (London 1967)
[76] R. Hyman, *Industrial Relations, A Marxist Introduction*, p.23

that chemical workers would have experienced much ameliorative impact. Firstly, Gill *et al* have argued that chemical employers had little concern with the labour market for chemical workers a market that usually contained 'ample numbers.'[77] Secondly, even up to the 1970s about 50 per cent of the waged labour in the chemical industry had no recognised trade skill with diligence and brute force being the main requirements in demand.[78] Thirdly, the trade unions that attempted to represent chemical workers from 1914 were relatively weak and poorly organised and failed to make more than a limited impact upon the chemical masters. The embryonic chemical trade unions had faced a formidable task in developing or sustaining collective organisation. They were confronted by organised employers in the shape of the United Alkali Company and also by the range of paternalist strategies in place at Brunner Mond. The absence of chemical trade unions during this period is evident for example in *A History of Trade Unionism* (1894) where the Webbs only make a passing reference to them in their publication. More than one hundred years later, Fraser, in *A History of British Trade Unionism* (1999) only refers to the skilled few chemical workers that had joined craft unions. Clegg, Fox and Thompson, in *A History of British Trade Unions Since 1889*, note the existence of the National Labour Federation who competed with the Tyneside and National Labour Union for members along with the Workers' Union also attempted to gain members.[79] Pelling offers no information on chemical trade unions within his *History of British Trade Unionism* (1992).

Lerner, in *Breakaway Unions and the Small Trade Union*, provides a case study of the Chemical Workers' Union (CWU) that was assisted and influenced in its development by the Independent Labour Party (ILP) from the late 1890s. According to Lerner, the CWU were unfairly accused of poaching members in 1923 and by 1924 had been disaffiliated from the Trades Union Congress (TUC). Therefore, general unions, whose main interests and membership lay outside the chemical

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[77] C.Gill, R. Morris and J. Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.139

[78] T. Nichols, and H. Beynon, *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.12

[79] H. A. Clegg, A. Fox, and A. F. Thompson, *A History of British Trade Unions Since 1889, Volume 1, 1889-1910*, Oxford University Press, (Oxford 1964), p.65-66, p.79 and H. A. Clegg, *A History of British Trade Unions Since 1889, Volume II, 1911-1933*, Oxford University Press, (Oxford 1985), p.58

industry would represent the chemical workers with those being the Transport and General Workers Union (T&GWU) from 1922 and the National Union of General and Municipal Workers (NUGMW) from 1924. By 1927, ICI had set up Works Councils to establish labour-management co-operation but the CWU, who represented a challenge from below, regarded the setting up of these councils as, 'a form of company unionism established to prevent effective union organization.'[80] This assessment appears to have been correct although, to some extent, other factors did play a part. Between 1927 and 1950, trade union membership in ICI plummeted from approximately 60 per cent to around 20 per cent of the workforce despite a general increase in trade union membership in other firms from 1935 and into the war years.[81] Sir Alfred Mond, in charge of all labour issues at ICI, was determined from the outset that the employees should be loyal to the firm and not to the trade unions and in echoing the sentiments of the deeply anti-trade union organisation, the Economic League, Mond stated that, 'the best answer to socialism is to make every man a capitalist.'[82] On this evidence it could be argued that the trade union movement within the chemical industry had been throttled at birth. The lack of agency within the industry unlike the coal miners or engineers has resulted in few historical documents being created and has led to what Haber has described as 'a lack of continuity in the original source material.'[83]

Some historians, although acknowledging that the trade unions did campaign for improved health and safety legislation, have argued that they could have done more. For example, Weindling and Bartrip, have forwarded such a view.[84] It is certainly difficult to agree with this assertion for the chemical industry but in analysing this claim at a wider level it must mean that these writers feel that either a) the trade unions should have been more revolutionary or b) that trade unions had an equal power within the social structures and had equal access to the policy process yet

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[80] S. Lerner, *Breakaway Unions and the Small Trade Union*, George Allen & Unwin, (London 1961), p.23
[81] A. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.99
[82] W. J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.60
[83] L. F. Haber, *The Chemical Industry During the Nineteenth Century, A Study of the Economic Aspect in Applied Chemistry in Europe and North America*, Oxford University Press, (Oxford 1958), p.231
[84] P. Weindling, (ed) *The Social History of Occupational Health*, Croom Helm, (London 1985), p.10 and P.W.J. Bartrip, *The Home Office and the Dangerous Trades, Regulating Occupational Disease in Victorian and Edwardian Britain*, Rodopi, (Amsterdam 2002), p.276

failed to utilise this power. In examining these points it can be stated that trade unions were never a revolutionary force and had accepted the capitalist mode of production, arguing from within, in order to lessen the worst affects of industrial capitalism. Laybourn has suggested exactly this when he notes that from the mid 1920s the TUC were intent on uniting the trade union movement and with regard to the General Strike he notes that:

> It was never the revolutionary strike which some ardent Communists hoped it would be but it had a cathartic effect upon government and employers, and permitted the trade unions to protect and improve the standard of living of their members.'[85]

This was only possible because the hegemonic structures allowed trade unions to play this functional role and therefore it can be argued that point b) can be viewed as adopting a fallacy of pluralism.

Following a short post-war economic boom, rising unemployment led to a haemorrhaging of trade union membership during the depression that began in the early 1920s. Trade union membership declined from 8,348,000 in 1920 to 4,392,000 by 1933 with union density reduced from 45.2 per cent to 22.6 per respectively.[86] This slashed income from membership dues, increased outgoings for unemployment benefit, reduced numerical strength and created a large reserve army of labour desperate for work. By 1926, following the General Strike, the trade union movement could have been eliminated but instead the Conservative government introduced the Trade Disputes and Trade Unions Act (1927). Historians differ over the severity of the measures contained within this legislation but general or national strikes were made unlawful and the system of political levy to the Labour Party was changed from contracting-out to contracting-in amongst other restrictive measures. According to Hain, in *Political Strikes*, this Act 'boosted moderate trade unionism by attacking workers' rights to engage in strikes and political action and drove unions

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[85] K. Laybourn, *A History of British Trade Unionism, 1770-1990*, Sutton Publishing, (Gloucestershire 1997), pp. 152-153.
[86] C. Wrigley, 'The Trade Unions Between the Wars', pp.71-128 in C. Wrigley (ed) *A History of British Industrial Relations, Volume II, 1914-1939*, Harvester Press, (Sussex 1987), p.71 and W, H, Fraser, *A History of British Trade Unionism, 1700-1998*, MacMillan, (London 1999), p.152

towards an accommodation with government' which lay the foundations for joint government, industry and union cooperation 'within a system of corporate bias.'[87] The Mond-Turner talks of 1928 and 1929 were a symbolic example of the new industrial atmosphere. Therefore in response to a number of unofficial strikes and defeats, against a background of employer organisation and national lock-outs the new moderate leadership of the Trades Union Congress (TUC) shifted the official union strategy from offensive action to reasoned argument in defence of pay and conditions. This strategy continued, and from the 1940s, whether it was a Conservative, Labour or even a Coalition government, they all worked together with trade unions until the late 1960s when governments began to impose collective agreements on the unions in answer to economic problems such as the rise in foreign competition. Therefore, it was economic problems for the capitalist class that caused this shift in cooperation as their profit levels were being challenged and were now upsetting the balance that they had created. Again, as Laybourn notes, and has been suggested elsewhere in this chapter, the increased number of strikes in this period:

> promoted the idea that Britain was strike-prone, but strikes generally formed a small proportion of the days lost at work and may deflect attention from other factors which might be more appropriate as explanations of Britain's relative industrial decline.[88]

From the 1970s onwards the trade union movement were forced into a defensive position although some analysts have spoken of the power that the trade unions had that 'brought down the Heath government' and ultimately led to the 'winter of discontent' in 1979. However, being on strike is a sign of weakness, not power. If the trade union members had power they would have been able to improve occupational health as well as other conditions and there would have been no need to battle with the variety of governmental, medical, and other institutional bodies to achieve what little they did. To suggest that the trade unions could have done more is to suggest

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[87] P. Hain, *Political Strikes, The State and Trade Unionism in Britain*, Penguin, (Middlesex 1986), p.84

[88] K. Laybourn, *A History of British Trade Unionism, 1770-1990*, Sutton Publishing, (Gloucestershire 1997), p.187

that pluralism is what it says it is, an equal distribution of political power. Where in their history have the trade unions had equality in accessing the policy process? Whilst political and ideological competition does exist, this competition is unequal. The politics and values that uphold the capitalist system have an overwhelming advantage over ideas and values that challenge it within a system that operates behind the illusion of free speech, open competition and political pluralism.[89]

The worker's health plays little or no part in most of the literature on the chemical industry although the accounts that are available remain useful in providing information on the technological and scientific advances that have been made throughout the period in question. This information can be used to analyse what production methods and chemical substances were being introduced as well as providing information on the mechanisation of processes that took the worker away from direct contact with hazardous and toxic substances. For example, Haber's two volumes contain useful chapters on comparative international working conditions although most of the remaining content relates specifically to the scientific, technological, economic, and environmental factors that played their part in the industry's growth.[90] Hardie and Pratt's extensively researched *History of the Modern British Chemical Industry* provides the reader with a cornucopia of information with regard to the development of the industry although these writers fail to provide one single account of the conditions of work experienced by the chemical labour force.[91] In reviewing Hardie and Pratt's work, Musson accurately describes this type of analysis as a 'techno-historical study.'[92] Reader's history of Imperial Chemical Industries traces the development of the largest chemical concern in Britain. Having had access to ICI records this volume provides an exhaustive account of business transactions and the development of plant and processes yet it fails to deliver any substantial information about occupational health and safety issues. Indeed, although it is made clear that the book only covers the period up to 1952 the health dangers

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[89] A. Heywood, *Politics*, MacMillan, (London 1997), p.190
[90] L.F. Haber, *The Chemical Industry During the Nineteenth Century*, Oxford University Press, (Oxford 1958) and *The Chemical Industry, 1900-1930, International Growth and Technological Change*, Oxford University Press, (Oxford 1971)
[91] D.W. F. Hardie, and J.D. Pratt, *A History of the Modern British Chemical Industry*, Pergamon Press, (London 1966)
[92] A.E. Musson, Book Reviews, *Business History*, Volume XI, No.1, January 1969, Liverpool University Press, p.49

that had been identified with the dyestuffs and rubber sectors are strangely absent from Reader's detailed account.[93] Fox, a former ICI chemist, provides an extensively researched analysis of the development of the dyestuffs sector and yet provides only limited information on the working conditions in this part of the industry. Unlike Reader however, Fox does include some basic information about the 'discovery' that bladder cancer was linked with the manufacture of dyestuffs.[94] This deadly danger will be dealt with in detail in Chapter Three of the thesis. William's account, *The Chemical Industry,* essentially deals with the organisational development that took place across the British industry whilst Miall's study, *The History of the British Chemical Industry,* makes but a few (and outdated) points about the health of the workforce who toiled to produce TNT, a matter dealt with above. Harrison's *Not Only the Dangerous Trades* is helpful in understanding the gender inequalities that existed within occupational health and safety. Whilst it is true that Harrison's work explores the relationship between women's work and health between the 1880s and 1914, and therefore puts it outside the period under examination, it remains a persuasive account of factory legislation that proved to be a poor and weak strategy in preventing damage to the health of women exposed to dangerous substances such as lead and phosphorus. For Harrison, failures existed within the legislative measures in that the elimination of recognised dangerous substances was rejected in favour of their regulation.[95] The relevance this study has is that a similar pattern of regulation continued into the twentieth century. Aspects of regulation such as protective wear for workers and fines for employers remained respectively inadequate and cheap. In any event, legislation and regulation addressed only a few of the problems within a limited number of occupations leaving many areas of paid labour outside of the legal or state systems.

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[93] W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975)
[94] M.R. Fox, *Dye-Makers of Great Britain, A History of Chemists, Companies, Products and Changes, 1856-1976*, Imperial Chemical Industries PLC, (Manchester 1987)
[95] B. Harrison, *Not Only The Dangerous Trades: Women's Work and Health in Britain, 1880-1914*, Taylor & Francis, (London 1996), p.231

Chapter Two

Assessing the Damage I: Fatigue and Trauma

> *Oh, it improved as the years went on but the things that improved a lot were the minor things. The major things…if it cost the company a lot of money, there was very little change, they weren't interested, they just ignored our comments on likes of noise and ambient temperature and stuff like that…they weren't bothered.*[1]

Introduction and Context

Male labour power was the principal choice for British chemical employers throughout the period under examination although, as was the case in other parts of British industry, many women were employed during both world wars (1914-18 and 1939-45). The chemical plants in which they worked ranged in size and complexity and between 1914 and 1974 many changes took place in the way that the chemical plants were designed, in the type of process technology that was used, and the number and variety of chemicals that were produced. This dynamism was not evident at the beginning of the period under examination when only eleven per cent of global chemical output was British whilst German manufacturers accounted for more than twice that level at twenty-four per cent (USA levels were thirty-four per cent).[2] Unlike their European counterparts the British chemical masters concentrated on producing a narrow range of products and by 1915 it was clear to the government that the industry would be unable to meet the material demands of the First World War. Indeed, the realisation of just how limited a range was on offer forced the government to intervene during the early years of the war and ensure that new chemical plants were built and essential processes developed. In a *History of the Modern British Chemical Industry* Hardie and Pratt have argued that the government intervention proved to be the catalyst that helped transform the industry.[3] In the aftermath of war competition with both the American and German chemical giants resulted in the rationalisation of large sections of the British chemical industry and

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[1] Interview D. Walker with KG (SOHC) 25 November 2005, p.10

[2] E.J. Hobsbawm, *Industry and Empire*, Penguin, (London 1990), p.180

[3] This was evidenced in three main ways, a) an increase in the scale of common chemicals production b) changes to existing processes and the addition of new ones and c) the government became directly involved in chemical production. D.W. F. Hardie, and J.D. Pratt, *A History of the Modern British Chemical Industry*, Pergamon Press, (London 1966), p.98

this process was evidenced most graphically in 1926 by the formation of the largest chemical company in Britain, Imperial Chemical Industries (ICI).

From the mid 1920s a larger range and quantity of products came to be manufactured by firms such as ICI, Albright and Wilson, Courtaulds etc. and the overall expansion of the chemical manufacturing sector led to more workers becoming employed within the industry. Indeed, the Chemical Workers' Union noted that whilst other sections of British industry had been 'plagued by unemployment' between the years 1925 to 1935 the chemical sector had increased its employees by 25,000.[4] Many of those workers would witness the changes that occurred in the use of process technology and scale of production although the modernisation of the industry was neither wholesale nor smooth. For example, Reader notes that even by the early 1940s the conditions of work in the newly built government chemical factories highlighted to the directorate of ICI just how little regard they had given to their own workers welfare in their more established plants.[5] According to Waldron, the situation for those working in the older plants were exacerbated by wartime working conditions with long hours being worked in poorly lit, badly ventilated and badly maintained plant.[6] Inevitably, under such circumstances, increased numbers of workers contracted industrial diseases and this was especially so amongst those in the munitions sector.

The post-war era witnessed more changes in the way that chemical plants were designed and constructed although it was not until the 1960s that one industrial medical officer could comment on the fact that chemical engineers were now being consulted at the design stage and that consequently 'methods of reducing the frequency of operations that involved risk' were being considered.[7] Yet, it remained the case that the chemical process itself was the main determining factor in the choice of materials and design of the plant. For example, Brian Watson, a former ICI manager, recalled visiting one ammonia soda process site in the 1970s where wood

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[4] B. Edwards, *Chemicals, Servant or Master? Life or Death?* National Labour Press, (London 1945), p.33

[5] W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), pp.300-301

[6] H.A. Waldron, 'Occupational Health During the Second World War: Hope Deferred or Hope Abandoned?' pp.197-212 in *Medical History*, (41) 1997, p.202

[7] E.E. Lieber, *Occupational Health, Guide to Safeguards Against Employee Sickness and Accident*, Business Publications, (London 1964), p.45

and copper were used as construction materials because, 'the environment was so corrosive that they couldn't make the plant out of steel girders.'[8] Regardless, the process man was still expected to toil within this corrosive environment and as one worker recalled 'its not just the fumes, you can get burns you see, terrible burns from ammonia and ammonia nitrate.'[9]

Huge capital investment was made in the research and development of complex new products and it became increasingly essential that any new plant be built to more exacting specifications. Many large-scale building programmes were embarked upon during the 1960s such as those in the north east of England where ICI built new plants at Billingham and Wilton. These formed the largest petrochemicals and general chemicals complex outside of the United States of America whilst the polythene plants were the largest in Europe and the third largest in the world. Interestingly, a study of the ICI Billingham plant noted that between 1946 and 1959 the 'output doubled in value but the labour force was reduced from 15,000 to 14,800 during the same period.'[10] The use of automated process technology was responsible for this trend, a trend that was accompanied by large capital investments. Between 1958 and 1970 the annual capital expenditure in the British chemical industry rose by 70 per cent in real terms.[11] As noted above, although some of the labour intensive methods were being replaced this investment in the industry initially led to higher numbers being employed with the total numbers employed rising from 444,000 in 1958 to 462,000 by 1970. Investment in the new processes and products also meant that over the same period the net output per person employed rose from £1,656 to £4,184.[12] By 1972, the chemical industry was able to reduce the numbers employed to 439,000 whilst at the same time the net output per person employed continued to rise, reaching a total £5,251.[13]

With advances being made in the fields of science and technology a much larger range of products came to be manufactured and these found ready markets in

[8] Interview D. Walker with B.J. Watson, 08 October 2005, p.10
[9] Interview D. Walker with D. May, 06 September 2005, Tape 1, p.11
[10] J.W. House, *Recent Economic Growth in North-East England, The Role of Four National Growth Industries, Chemicals, Electrical Goods and Machinery, Vehicles, Paper and Board*, Department of Geography, Research Series No.4 (University of Newcastle Upon Tyne 1964), pp.34-35
[11] W. Grant, W. Paterson, and C. Whitson, *Government and the Chemical Industry, A Comparative Study of Britain and West Germany*, Clarendon Press, (Oxford 1988), p.40
[12] Annual Abstract of Statistics, Number 111, 1974, p.164
[13] Annual Abstract of Statistics, Number 111, 1974, p.164

other industries. For example, synthetic dyestuffs and chemical fertilisers were produced in large quantities from the 1920s, synthetic resins and plastics from the 1930s and 1940s and, having barely existed at all before 1945, the petro-chemical industry would become a very large sector of the industry in the post war period. Changes in the type of chemicals being produced necessitated the use of the new process technology and some chemicals would be produced on a continuous basis within a totally enclosed system. These processes were primarily introduced to meet the needs of production but enclosed process systems and automated handling would remove some of the more obvious risks associated with the industry. Nonetheless, new chemicals and processes brought with them new risks and dangers. From the 1930s some of the dangers were being strongly suspected by chemical process workers and occupational health experts but these suspicions did not impede production. Only from the late 1940s and early 1950s, in response to the data presented in a series of official epidemiological studies would safety procedures for certain processes become strengthened and the production of clearly defined substances be banned altogether. Nonetheless, by the 1970s the former ICI director of research calculated that 'only 6000 of the 30,000 chemicals in regular use in British industry have been tested for their ability to cause cancer' and that 1000 of the 6000 tested were proven to be able to cause cancer.[14] By the end of the twentieth century around 100,000 chemical substances were registered in the USA for commercial use and each year that total increased by 800 to 1,000. This occurred 'with no, or only minimal testing' and there was 'little or no basic toxicity information in the public record for 75 per cent of the 3,000 chemical substances produced in the highest volume in the United States.'[15]

In *A History of Work in Britain* McIvor has argued that there were three main ways in which work could directly affects a worker's health. Long hours and the pace of work could induce fatigue, workers could be injured or killed by industrial accidents, and working in close proximity to substances could lead to poisoning and occupational disease.[16] Within the majority of chemical works in Britain in 1914,

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[14] D. Eva, and R. Oswald, *Health and Safety at Work*, Pan, (London 1981), p.114

[15] C.F. Cranor, 'How Should Society Approach the Real and Potential Risks Posed by New Technologies?' pp.3-9 in *Plant Physiology* (133) September 2003 http://www.plantphysiol.org/cgi/content/full/133/1/3

[16] A.J McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.113

long hours of work were common, the provision of suitable washing and sanitary facilities was the exception, the supply of protective wear was patchy, and food was usually consumed where the work was done leaving open the possibility that workers might ingest toxic substances.[17] Moreover, much of the chemical production in Britain was generated within a crude and chaotic working environment. For example, Russell notes that in 1915 one manufacturer instructed his employees to sit on top of safety valves in order to maintain a high pressure in process vessels.[18] This insight might have a darkly comic value to it and perhaps be dismissed as a 'thing of the past' yet Brian Watson recalled that in the 1970s:

> There was a process, I think it was a titanium process somewhere over Billingham way, where the process was dissolving the vessels in which it took place or at least dissolving the lids of the vessels away. And there were people who wore asbestos suits who walked on the top of these hot retorts welding up gaps in the lids as they appeared and it struck me as being a particularly dangerous job.[19]

Again, at the beginning of the period under examination, most chemical workers came into close contact with the materials they produced and much of the work was labour intensive. For example, commenting on the alkali trade Campbell noted that the men were 'mixing, heating, dissolving and crystallising' and in carrying out these 'arduous' tasks were 'exposed to great heat and acid fumes.'[20] Doug May, a former chemical process worker, worked in the ammonia nitrate fertiliser section of an ICI works in Avonmouth, Bristol. Various chemicals were used depending on the specific type of fertiliser required and these would include ammonia, nitric acid, phosphoric acid, sulphuric acid, potash and limestone. Discussing the job, Doug May recalled that in 1969:

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[17] D. Walker, *An Inconvenience of the Trade, Occupational Health and Safety in the British Chemical Industry, 1870-1914*, M.Phil Dissertation, University of Strathclyde, 2003. Unpublished

[18] C.A. Russell, (ed) *Chemistry, Society and Environment, A New History of the British Chemical Industry*, Royal Society of Chemistry, (Cambridge 2000), p.236

[19] Interview: D. Walker with B. J. Watson, 08 October 2005, p.11

[20] W.A. Campbell, 'The Alkali Industry' pp.75-106 in C.A. Russell, (ed) *Chemistry, Society and Environment, A New History of the British Chemical Industry*, Royal Society of Chemistry, (Cambridge 2000), p.84

> All of these things were produced on the site but actually came together in my plant which was the granulation plant and that was where they were all mixed up together in various…in what we called NPK [N=Nitrogen, P=Phosphorus and K= Potassium]. If you had a high ammonium nitrate content fertiliser with low other ones they used to produce different problems on the plant. Sometimes things would clog up, other times you would get particularly dusty conditions, if you were producing high ammonium nitrate ones you would get white dust flowing around all over the place. It was a hard plant, it was a physical plant, it was the sort of plant where you could work your guts out and, blow me, five minutes later the whole damn plant was in a mess again and you had to start all over again…It was physically demanding.[21]

As the above testimony has indicated, the idea that the chemical industry evolved from being a mainly dangerous and labour intensive business into a fully safe and automated one can be misleading. Drawing on a variety of source material this chapter will examine what impact the changing workplace had on the health of those who sold their labour power within the British chemical industry during the sixty-year period that began in 1914. The framework for this chapter will draw on the first two of the areas identified by McIvor above and will be presented in two parts.

[21] Interview: D. Walker with Doug May, 06 September 2005, Tape 1, p.7

Part One: Hours and Pace of Work

The firm of Brunner Mond was an early pioneer amongst chemical employers in reducing working hours. This was evidenced by their decision to introduce a three-shift system in place of the normal two-shift system from as early as 1889. By doing so, shift hours were reduced from 12 to 8 per day and a 56-hour working week was created. To achieve this the firm employed a third shift of men and to help finance this change Brunner Mond reduced the existing men's pay by 10 per cent per shift to cover some of the additional costs.[22] Brunner Mond provided an explanation to the Chemical Works Inquiry of 1893 as to why shorter working hours were conducive within their business. Firstly, they claimed that sickness levels had been lowered and secondly that when combined with increased productivity the wages paid per ton of alkali were no different than they had been four years previously. Brunner Mond thus assured the Committee that all of this had been made possible due to 'improvements in the apparatus used [the Solvay system in place of the LeBlanc system] …and partly to the increased efficiency of the men due to their better health and spirits.'[23] The implementation of shorter working hours at Brunner Mond was accompanied by the introduction of holidays with pay, share-ownership schemes, company housing, and recreation clubs, all of which formed part of the welfarist programme that Brunner Mond would import into ICI in 1926. As will be discussed in *Chapter Four*, in return for this welfarist package both the management of Brunner Mond and ICI expected, and generally got, loyalty to the firm rather than to a trade union. Indeed, both Fitzgerald and Melling have argued persuasively elsewhere that welfarist schemes were generally designed as part of a wider strategy that aimed to instil a sense of loyalty to the firm thereby diluting and confusing any potential unified labour disquiet over the conditions of work.[24]

During the late 1890s and early 1900s some other chemical employers followed the Brunner Mond lead on hours and shifts such as at Castner-Kellner,

[22] The 50th Anniversary, Brunner Mond & Co, 1873-1923, Bemrose & Sons, (Derby 1923), p.69
[23] Report on the Conditions of Labour in Chemical Works, The Dangers to Life and Health of the Workpeople Employed Therein and the Proposed Remedies, Chemical Works Committee of Inquiry, PP 1893, (C.7235), p.5
[24] J. Melling, 'Employers, Industrial Welfare, and the Struggle for Work-place Control in British Industry, 1880-1920, pp.55-81 in H.F. Gospel and G.R. Littler (eds) *Managerial Strategies and Industrial Relations*, Gower Publishing, (Hampshire 1983), p.64 and R. Fitzgerald, *British Labour Management & Industrial Welfare, 1846-1939*, Croom Helm, (Kent 1988), p.204

Chance Brothers, Gaskell Deacons, Peter Spence, and Crosfield's, but these firms were exceptions rather than the rule. For most workers the conditions at the beginning of the twentieth century worsened as the pace of shovelling and the strength of the chemicals increased directly as a result of the intense competition that the industry experienced from the USA and Europe.[25] Haber has also noted that in the period following the Great War most shiftmen who toiled in British chemical works continued to work twelve-hour shifts although these hours were reduced by the mid to late 1920s so that a typical working week for shiftmen consisted of 7 shifts of 8 hours each.[26] The hours worked in ICI remained at the Brunner Mond level until 1935 when they were reduced to 48 hours and two years later the Factory Act of 1937 made legal the 48-hour working week and limited the amount of overtime to be worked to a maximum of 6 hours. This was a relatively short-lived gain and as demand increased during the war years from 1940 onwards the contractual hours were raised to 56 hours. Indeed, McIvor has noted that across British industry in this period there was a 'repeat of the 1915 scenario' whereby work was speeded up and the hours of work were lengthened up to 70 or 75 per week.[27] Indeed, the records of the TGWU show that in the chemical sector in 1944 the wages were 'too low' and that 'a man could not live on his earnings unless he worked for 12 hours a day.'[28] Following the war ICI reduced the contractual hours to 48 and by 1948 had reduced this further to 44 hours per week.[29] The level of hours remained at this level until 1960 when they were lowered to 42 hours and in 1965 they were reduced still further to 40 hours where they remained at that level up to and beyond 1974.[30]

The trend towards the introduction of the shorter working week may be viewed as a positive one for the health of the worker. Less time spent in the workplace facilitated recovery time for the workers as well as reducing the amount of

[25] A.P. Laurie, 'The Chemical Trades', pp.568-598 in Dr T. Oliver (ed) *Dangerous Trades*, John Murray, (London 1902), p.575
[26] L.F. Haber, *The Chemical Industry, 1900-1930, International Growth and Technological Change*, Oxford University Press, (Oxford 1971), p.383
[27] A.J. McIvor, 'Manual Work, Technology, and Industrial Health, 1918-1939' pp.160-189 in *Medical History*, (31) 1987, p.182
[28] MSS.126/TG/449/E (Minutes & Reports of the Chemical and Allied Trades National Committee of the Transport & General Workers Union), MIN 36, October 1944
[29] *Alkali News,* 75th Anniversary Edition, 1873-1948, November 1948 (Northwich)
[30] Pay of General Workers and Craftsmen in Imperial Chemical Industries Ltd. PP 1969 (Cmnd 3941) HMSO London, p.2

time they were exposed to potential hazards. Whilst these could all be positive aspects of a shorter working week Kinnersley has argued that as the working week was reduced many employers introduced methods to intensify production levels. Certainly, across British industry as a whole, productivity levels did increase by 20 per cent between 1957 and 1968 and from 1960 more than a third of British workers regularly worked eight hours of overtime each week.[31] From Table 1 it can be seen that production in the chemical sector overtook the production of all other manufacturing in Britain from the 1960s. As has been touched upon above an investment in technology helped to increase production levels but many chemical firms also increased their productivity by harnessing the available labour power to this technology so that little or no interruption of production would occur. The use of shift systems was also an essential element in this process whilst overtime and wage incentive schemes were widely utilised.

Table 1: Growth of the British chemical industry, 1913-1968

(Production in 1958 = 100)

Year	Chemical and allied trades	All manufacturing industry
1913	23	37
1920	26	38
1929	29	46
1937	38	62
1950	69	82
1960	123	115
1961	125	115
1962	129	115
1963	139	120
1964	152	129
1965	159	134
1966	165	136
1967	171	134
1968	185	143

Source: G.C. Allen, *British Industries and Their Organization*, Fifth Edition, Longman, (London 1970), p.219

[31] P. Kinnersley, *The Hazards of Work*, Pluto Press, (London 1974), p.19

By the 1970s more than a third of all industrial workers employed across British industry worked shifts. Throughout the period 1914 to 1974 shift work, especially rotating shifts, was a common feature for those selling their labour power in the chemical industry, a method of working often associated with health problems. For example, dietary and sleep patterns were disrupted causing digestive problems, increased fatigue, and increased stress levels. By the early 1970s one physiological research study revealed that those who endured rotating shift patterns were more prone to physical, mental and social problems.[32] Navarro has also argued that shift work 'in addition to physical and psychological wear, destroys all possibilities for the workers to enjoy normal daily life relations.'[33] Having started work with ICI in 1964 one former shift worker recalled that he had actually liked shift work and especially when each shift consisted of twelve hours because, 'the working week was condensed, that's whit I liked aboot it, but you could have twelve hard hours, twelve hard hours, o'er four days, it was a hard week.'[34] Nonetheless, demonstrating that his liking for shiftwork was atypical the same respondent also revealed that 'at that time there was about twenty [others] started but after two years there was three [because they] jist didnae like it, didnae like shift work.'[35] That is, eight-five per cent of the men who started shift work at that plant subsequently resigned within a period of two years for no reason other than the fact that shift work was an essential part of the job. This decision was taken in spite of the fact that for an unskilled or semi-skilled worker 'the money at that time was probably the best in the area.'[36] As will be argued below, very few workers liked shift work but the money and security offered by a large firm such as ICI could act as a magnet especially to those young unskilled or semi-skilled men who were starting to have families.

Reasons that explain why shift work was not liked are revealed in an examination of a chemical labour force employed in a large Teeside chemical works. The study, conducted in the early 1970s by Nichols and Beynon, found that many of

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[32] R. Wilkinson, 'Hours Of Work and the Twenty-Four Hour Cycle of Rest and Activity,' pp.31-54 in P.B. Warr, (ed) *Psychology at Work*, Penguin, (Middlesex 1971), pp.53-54
[33] V. Navarro, *Crisis, Health, and Medicine, A Social Critique*, Tavistock, (London 1986), p.129
[34] Interview: D. Walker with KG, November 2005, p.19
[35] Interview: D. Walker with KG, November 2005, p.6
[36] Interview: D. Walker with KG, November 2005, p.3

the process workers viewed shift work as having a detrimental effect on their social and physical wellbeing. For example, on returning from a night shift many men became irritable when they were forced to deal with the noise levels of traffic or other family members and neighbours who were going about their 'normal' daily routines. Echoing Navarro's assertion above, it was also found that the men had trouble arranging to meet others for a social occasion as 'free times' would have to be calculated well in advance and take account of the rotating shift pattern. The continental shift system was especially disliked and one of the respondents outlined how it affected his diet and sleep pattern:

> This Continental (6am-2pm, 2pm-10pm and 10pm-6am) really messes my system about: on the day shift I'll eat like a pig, y'know about five meals a day like. I have a breakfast before I go to work, then I have a big breakfast at work and then I have a few pints before my dinner, then tea, a few pints and chips for supper. Now on 'two to tens' I just sleep. I have a big meal before I go to work and some supper but mostly I just sleep. But on nights. Jesus Christ! On nights I don't sleep or eat. Then it's days off to recover and back eating like a pig again.[37]

Looking back at his career in ICI Peter Dodds recalled the rotating shift pattern that he worked throughout the 1960s and 1970s and commented on how this had affected his daily life.

> Yeah, well if I was the early shift I was home at three o'clock but you felt tired. If you were on back shift the kids were at school and you were there in bed and on night shift, your first night shift was okay because ye saw the kids and that before they went to school, yer second night shift ye were in bed when they went tae school and ye saw them when they came home but ye were shattered…I thought the continental shifts were horrific, absolutely horrific.[38]

[37] T. Nichols, and H. Beynon, *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.25
[38] Interview: D. Walker with Peter Dodds, November 2005, p.26

Whilst the shift system interfered with the social pattern of his and his family's daily life, Peter Dodds had resigned himself to the fact that accepting shiftwork was the price that had to be paid in the labour market for gaining improved job security.

> I was just married and I wanted the security. The ICI gave you a pension and I thought this was terrific because at the buses you got nothing. So I went there for security at the time. I'd never worked inside a factory in my life before and I thought when I first started, 'och, I'll never stick this' and as I say I was there for thirty-five years. I basically went there for the pension. When I first started I actually dropped fifteen pounds a week which was a lot of money in these days. I went from twenty-five pound a week tae ten pound so I didn't go there for money. Eventually that came after about six months, I got the same rate, but the thing I went there for was security for ma wife and kids.[39]

The production of alkali dominated the early years of the industry, a process that was both labour intensive and required men to attend to the process round the clock (paternalistic legislation prohibited night work for women and juveniles and so excluded them from the shift jobs available in the chemical works).[40] Physical exhaustion was therefore experienced not only by the long hours of work they were expected to undertake but also by the heat and the heavy nature of the work. For example, Campbell notes that large wrought iron tools measuring 12 to 15 feet long had to be manipulated into place using hooks and chains. Whilst being exposed to acids and fumes throughout their shift the men would use these large and heavy tools to stir batches for production.[41] The same heavy manual labour was required for black ash production, a process that was also undertaken on a piecework basis. Both

[39] Interview: D. Walker with Peter Dodds, November 2005, p.3
[40] L.F. Haber, *The Chemical Industry, 1900-1930, International Growth and Technological Change*, Oxford University Press, (Oxford 1971), p.378
[41] W.A. Campbell, 'The Alkali Industry' pp.75-106 in C.A. Russell, (ed) *Chemistry, Society and Environment, A New History of the British Chemical Industry*, Royal Society of Chemistry, (Cambridge 2000), p.84

jobs required the worker to use his own judgement to determine when the mixture was ready. With the wage being determined by the quantity produced an additional level of pressure was laid on the shoulders of the chemical process worker to get this judgement right. The heat associated with many of the tasks also drained the men of energy. Wohl notes in *Endangered Lives* that temperatures of 130ºF were experienced by Victorian bleach makers but by the 1950s temperatures in the workplace had risen dramatically, such as in the manufacture of carbide, where electric furnaces reached temperatures of 4000ºC.[42] One former ICI process worker noted that in his work area during the 1970s, 'it was a hundred plus Fahrenheit, that's draining during a twelve hour shift, it's no(t) very healthy.'[43] Working in this heat he had been issued with nylon overalls for protection but according to this respondent, 'it was just a normal nylon and it did melt if ye touched the stenter oven door.'[44] Asked if a heat protection suit or overall was available the respondent claimed that, 'there was one heat protection suit which was one size fits all and it was stinking, it was never cleaned, so are you going tae put that on?'[45]

Few historical records of the chemical industry contain the workers voice but one government inquiry undertaken in the last decade of the nineteenth century provides evidence of the arduous nature of the work. Although this documentary evidence is taken from the 1890s the content remains relevant to the period under investigation as little or no change in this process took place up to the First World War. On being questioned by the Royal Commission about his working day one black ash worker described his working conditions at Bramwell and Sons' Chemical Works. From this evidence it can be seen that long hours of heavy manual labour were undertaken in great heat. Thus:

> I have to strip to my singlet. Having raised the furnace door I have to buckle to with a slicer, a large heavy iron bar fourteen feet long, weighing over half a hundredweight, it's as much as I can lift with

[42] A.S. Wohl, *Endangered Lives, Public Health in Victorian Britain*, Methuen, (London 1983), p.276 and P. Pagnamenta and R. Overy, *All Our Working Lives*, British Broadcasting Corporation, (London 1984), p.15
[43] Interview D. Walker with KG, 25 November 2005, p.25
[44] Interview D. Walker with KG, 25 November 2005, p.25
[45] Interview D. Walker with KG, 25 November 2005, p.25

> both hands. With this bar I have to shift the material from one over to another. The ball includes 3 cwt [hundredweight] of salt cake, 1½ cwt of slack, 2¼ cwt. of stone, and 3cwt of mud lime. That is the lightest scale but we are generally on what is known as double muck and that brings in as much as 16 cwt of lime. While at it I am working as hard as a man can work for the full twelve hours. We have no fixed meal hours. I have sometimes to take my meals by instalments sometimes rising from them four or five times. There is no time allowed for meals. We must make it out as best we can.[46]

Long hours of heavy manual work remained a common feature for most people employed in 1914 and the Health of Munitions Workers Committee (HMWC) noted that this was due mainly to the view held by most employers that long hours of work produced larger outputs. Nonetheless, recognising that neither the health of the worker nor industrial efficiency were benefiting from long hours of work the HMWC recommended in 1916 that the average working day should not exceed 13 or 14 hours and that regular breaks should be incorporated into the working day. By the end of the war the HMWC acknowledged that their earlier recommendations on working hours were 'too long' and they therefore proposed that the hours could be reduced further 'without loss of output.'[47] In their final report, published in 1918, the HMWC reported that the reason why so many accidents had occurred in the workplace could be explained by the speed of working and worker fatigue and that this was exacerbated by poor diet, inadequate illumination, lack of ventilation and a lack of safety provision.[48]

Long hours of work and shift patterns could have a negative effect on the well being of a worker and this could be exacerbated by methods of work designed to maximise production levels and profits. By 1911, American firms such as DuPont had taken an early lead in forming Labour Efficiency Departments but the workforce

[46] Royal Commission on Labour, Minutes of Evidence, Group 'C' Volume II, Textile, Clothing, Chemical, Building, and Miscellaneous Trades, Appendix XXXVIII, PP 1892, (C. 6795) p.470. One hundredweight (cwt) is an imperial measure of weight and is equivalent to 50.8Kg

[47] Health of Munitions Workers Committee, Final Report, Industrial Health and Efficiency, PP 1918, (Cd. 9065), p.122

[48] Health of Munitions Workers Committee, Final Report, Industrial Health and Efficiency, PP 1918, (Cd. 9065)

in Britain were generally managed on an informal basis with managerial prerogatives being maintained. Haber has noted that amongst the British chemical employers managerial attitudes were mostly 'autocratic, harked back to Smilesian precepts of self-help, and occasionally were sympathetically paternalistic.'[49] Nonetheless, a range of strategies including piecework, close supervision, and the speeding-up of the process were all utilised across British industry. Most incentive payment schemes, such as piecework, were designed to give the impression that a 'fair system' was in operation with the financial rewards being directly related to output. However, as Parker *et al* have argued, all such schemes involved some form of 'subjective estimating' and from a health point of view could also lead to increased worker anxiety associated with the 'instability of earnings' and a fear that the rate would be cut if the bonus earnings reached too high a level.[50] According to Cronin and Littler approximately 250 British firms had implemented the Bedaux 'scientific management' system by 1939. This neo-Taylorist system introduced incentive payment schemes in conjunction with time and motion studies that were aimed not only at increasing production but also exerting more managerial control over the labour process.[51] From amongst the 250 firms that adopted the Bedaux system 11 per cent were in the chemical sector with ICI being the best known amongst them. With the chemical process itself often dictating the speed of production limited opportunities were available to chemical employers to intensify workloads. Nonetheless, the Bedaux system was implemented to measure, control and intensify workloads in the filling, packing and storing of the finished chemical products. According to Gill *et al* the Bedaux system was introduced to ICI employees in 1935 and at a point when pay structures were changing from one that had been negotiated at district levels to one of a single, uniform company rate paid throughout all ICI

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[49] L.F. Haber, *The Chemical Industry, 1900-1930, International Growth and Technological Change*, Oxford University Press, (Oxford 1971), p.377
The 'Smilesian precepts' were outlined in a book published in 1859 by a former parliamentary reformer called Samuel Smiles called 'Self-Help.' The book extolled the virtues of industry, thrift and self-improvement.
[50] S.R. Parker, R.K. Brown, J. Child, and M.A. Smith, *The Sociology of Industry*, George Allen and Unwin, (London 1981), p.105
[51] J.E. Cronin, *Labour and Society in Britain, 1918-1979*, Batsford, (London 1984), p.61 and C. Littler, *The Development of the Labour Process in Capitalist Societies, A Comparative Study of the Transformation of Work Organization in Britain, Japan and the USA*, Heinemann, (London 1982) p.107

plants.[52] Maintaining the managerial prerogative, the scheme was overseen by the ICI Central Labour Department who appointed an assessor at each site who in turn evaluated the work and awarded points under specific headings according to their own personal judgement.[53]

By 1945, the secretary of the Chemical Workers Union (CWU) commented that between the wars 'the hours of labour were dangerously long for such an unhealthy industry' and that 'rationalisation and the Bedaux system were used to press workers to utmost limits of physical endurance.'[54] Zelma Logue worked in the ICI Ardeer munitions plant during the war and remembered working under the Bedaux system. She recalled, 'they gave you a quota and anything you done over that you got a percentage but we never had a great wage.'[55] The low bonus experienced by this worker was perhaps a result of the way in which the workload had been assessed and how the points for tasks were allotted. The system could be manipulated in the firms favour and this is made clear in the testimony provided by former Wolsey workers. For example, at Wolsey the time and motion men had picked younger and fitter workers to do the jobs that were to be measured for the scheme. By doing so the higher bonus levels became virtually unattainable and for some the bonus was ridiculously low. One former Wolsey worker recalled her experience of this wage system thus:

> It floored everybody, I mean it... they just didn't know what to do, you know, to try and better themselves, I mean after all you could only, you could only keep working. They hadn't done enough research, they didn't realise the implications of what it could do to a human being. One girl can adapt, another girl can't. I saw them go hysterical, I saw them cry, I saw one girl faint. And I don't think that any system

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[52] C. Gill, R. Morris, and J. Eaton *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.103
[53] *Ibid*, p.106
[54] B. Edwards, *Chemicals, Servant or Master? Life or Death?* National Labour Press, (London 1945), p.85
[55] SOHCA/015/02, Interview P. Williams with Z. Logue, August 1998, p.59

should be allowed to do that to a person, I think it should have been gone into a lot more before it was introduced.[56]

Isabella Henderson worked at the ICI munition plant in Ardeer and also disliked the Bedaux system commenting that 'nobody liked it ken, it really was a horrible thing.' Isabella recalled that in other sections of the workplace a piecework system was in use and this delivered a better return for effort as 'you made your own wages…the more cartridges you made the more money you got.'[57] The influence of the Bedaux scientific management system continued at ICI and in 1951 payment by results systems linked to work study continued to be implemented.[58] Indeed, by 1965, when discussing the British chemical industry Manning claimed that incentive schemes based on work study were 'fairly common' and that these were often coupled with 'plant efficiencies and other factors to provide an overall incentive to greater output, better quality and greater efficiency.'[59] Increased outputs were of course also achieved by improved methods of manufacture but only where 'higher effort' was measured did incentive bonus schemes reward the workers.[60]

Having examined the methods used in a large chemical fertiliser plant during the early 1970s Nichols and Armstrong noted the pressure on the operatives to manhandle the sacks of product and to keep pace with the speed of the feeders and conveyors. These men were 'cheaper than a completely automated system' and seventy-five per cent of them were engaged in 'unremitting physical work of an unskilled kind.'[61] Nichols and Armstrong also noted that these men now worked within a newly designed and 'elaborate productivity deal' that removed the former complicated bonus systems. Within the new system of work the employees were encouraged to become more 'involved' in their work, to 'self actualise' and to see that their own and the Company's needs were interdependent. The new productivity

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[56] East Midlands Oral History Archive, www.le.ac.uk/emoha/community/resources/hosiery/effect-**bedaux**.html, November 2006
[57] SOHCA/015/01, Interview P. Williams with I. Henderson, August 1998, p.52
[58] Pay of General Workers and Craftsmen in Imperial Chemical Industries Ltd. PP 1969 (Cmnd 3941) HMSO London, p.2
[59] J. Manning, *An Introduction to Chemical Industry*, Pergamon Press, (Oxford 1965), p.222
[60] Pay of General Workers and Craftsmen in Imperial Chemical Industries Ltd. PP 1969 (Cmnd 3941) HMSO London, p.6
[61] T. Nichols, and P. Armstrong, *Workers Divided: A Study of Shopfloor Politics*, Fontana, (London 1976), pp.24-25

deal, it was claimed, would provide 'more chemicals, more wages and more profit – for everyone.'[62] With the bonus rates removed and a structure of guaranteed fixed wage rates put in their place the non-negotiable wage took no cognisance of increased workloads. Exposing the workforce to a series of training films, talks about wastage, the costs of production etc, the new productivity targets were then identified by plant managers and the team of workers were encouraged to meet them. As Nichols and Armstrong have noted, 'the period which followed the introduction of the Agreement saw an increasing pressure for production being placed upon fewer and fewer men.'[63] One former ICI worker recalled his experiences of a similar system of working that had been introduced at his plant thus:

> Aboot yins [once] a month we were subjected to a brain washing session. They ca'd [called] it a communication session and it was supposed to be a two way thing…you know…coming and going frae baith sides. Our concerns were put forward and allegedly forwarded tae the management. All the times that I was at these meetings I've never known anybody tae get a response back frae any of our queries. All they were interested in doing was telling us facts or whit they wanted tae dae and whit they were going tae be dae'n [doing] they didnae give a toss aboot whit we were wantin' whether it wis safety…anything, they jist didnae care but this was supposed tae be a communication a two way communication…a complete waste o' time… propaganda that's a' it was, but again, it looked good when they said there was communications.[64]

Within such a system this ICI employee had no feeling of being 'involved' or of being 'self-actualised' as he toiled each week within his 12 hour rotating shift pattern amidst the excessively high noise levels that were slowly impairing his senses.

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[62] T. Nichols and H. Beynon, *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.112
[63] *Ibid*, p.133
[64] Interview D. Walker with KG, 25 November 2005, p.36

It has been explained above that long hours of work were a common feature during the early years of the industry however this was not a universal trend. For some, working long hours would have been impossible due to the very nature of the atmosphere in which they toiled. Two notable examples of the type of work that fell into this category were bleaching powder packing and lime dressing. Those employed on this work did so for shorter hours than any other job in the chemical industry because of the heavily polluted conditions that existed in the 'chamber' where they worked.[65] Prior to starting their work the 'packers' and 'dressers' first had to wrap numerous layers of cloth around their mouths, a protective barrier sometimes referred to as a 'muzzle.' From an inquiry of 1892 one worker stated that

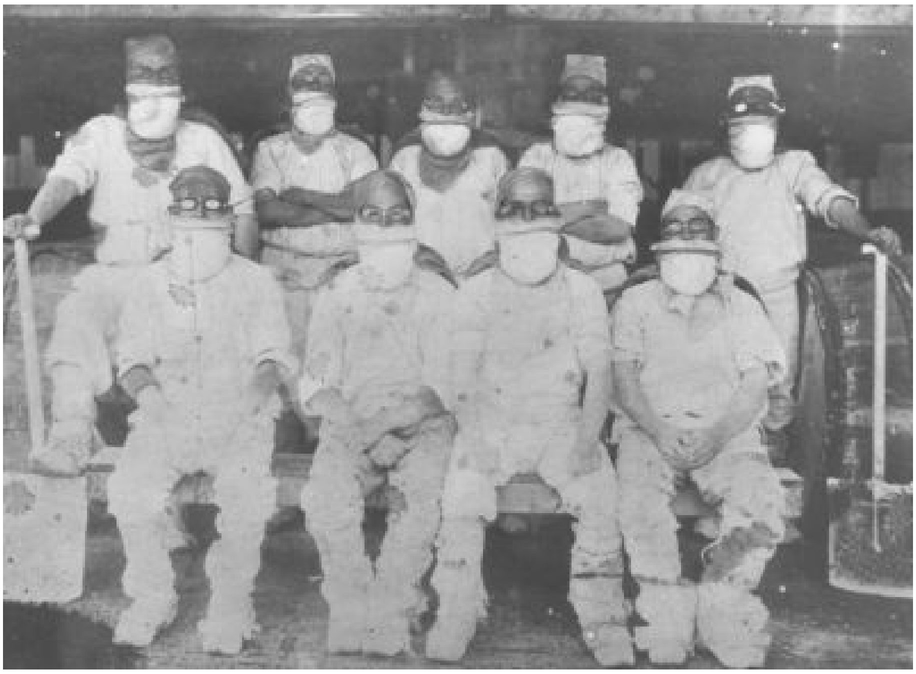

Illustration 2: Bleaching powder packers wearing muzzles, c.1917.

Source: http://www.northwichuk.com/pics/albums/oldnorthwich/thumb_1917_bleach_packers.jpg

it was vitally important to breathe through the mouthpiece of the muzzle and the consequences if this was not done. Thus:

[65] A typical chamber was made from lead and was usually 30 to 50 feet long, by 20 to 30 feet wide and about 5 to 6 feet high.

> If they inhale through their nostrils at all it has a very bad effect, they become gassed and sometimes they have to lie up for two or three days. The sensation they complain of is in the throat - a choking sensation as if they were asphyxiated.[66]

Moreover, breathing through such a large improvised respirator was physically demanding with the exertion required for breathing being intensified once the actual work started. This was physical work with the lime dresser wheeling in barrows of lime into the chamber and then spreading the lime using a large rake. The doors of the chamber were then closed and chlorine gas would be piped into the chamber through the roof. About halfway through the process the lime dressers would have to re-enter the chamber and rake the lime once again to ensure that the gas was saturating all of the lime. Once the process had been completed, barrels were rolled into the chamber and the bleaching powder was then shovelled into the containers. Neither of these types of workers could withstand the physical strain of breathing through the respirators nor raking or shovelling for more than an hour at a time. Working in such conditions a working day of five or six hours was considered to be a 'big day.'[67]

The government enquiry of 1893 noted that both these types of workers quickly became exhausted and that this was noticeable by their 'red and puffed state' as well as by their 'profuse perspiration.'[68] The picture overleaf shows that packing bleaching powder into large barrels continued as a job at the ICI Castner Kellner Works in Runcorn through to the late 1940s. From the photograph it can be seen that the packer was now able to utilise machinery for a part of this task. This machine was used to deliver a standard measure of powder to the barrel. The 'barrel filler,' as it was known, was positioned directly below the various openings in the ceiling. This allowed the bleaching powder to be shovelled from the floor above (where the

[66] Royal Commission on Labour, Minutes of Evidence, Group 'C' Volume II, Textile, Clothing, Chemical, Building, and Miscellaneous Trades, PP 1892, (C. 6795) p.386

[67] Report on the Conditions of Labour in Chemical Works, The Dangers to Life and Health of the Workpeople Employed Therein and the Proposed Remedies, Chemical Works Committee of Inquiry, PP 1893, (C.7235), Appendix, Examination of Witnesses, p.2 (Q.43)

[68] Report on the Conditions of Labour in Chemical Works, The Dangers to Life and Health of the Workpeople Employed Therein and the Proposed Remedies, Chemical Works Committee of Inquiry, PP 1893, (C.7235), p.4

process had taken place) via a chute and into the open barrel. The introduction of this equipment would not have reduced the physical nature of the job or the dust levels

Illustration 3: ICI Castner Kellner bleaching powder packing, Runcorn, 1946/1947
Source: www.catalyst.org.uk/visit/visibase.htm

but was used to help meet the requirement for accuracy of weight in packing. Once filled, the barrel had to be manually manoeuvred into position for storage and shipment. The large wooden mallet in his hand would have been used to hammer the lid of the barrel into position. What is also remarkable about this picture is that it shows that from the 1890s to the 1940s the packer had remained reliant on a cloth 'muzzle' to protect his respiratory system. As can be seen in the photograph overleaf, by the 1960s, a small gauze mask had replaced the muzzle and the operator was now equipped with a pair of lightweight goggles. As before, breathing in through the exposed nostrils had to be avoided. However, the requirement for heavy labour had been reduced with the powder now being delivered to the metal barrel by the pull of a lever. A canvas cloth was attached to the feeder nozzle and this fitted over the top of the container thereby reducing the dust levels. Nonetheless, as can be seen from the photograph below, despite the improvements that had been implemented, dust continued to be transmitted into the air and accumulations of this are clearly visible around a wide part of the work area.

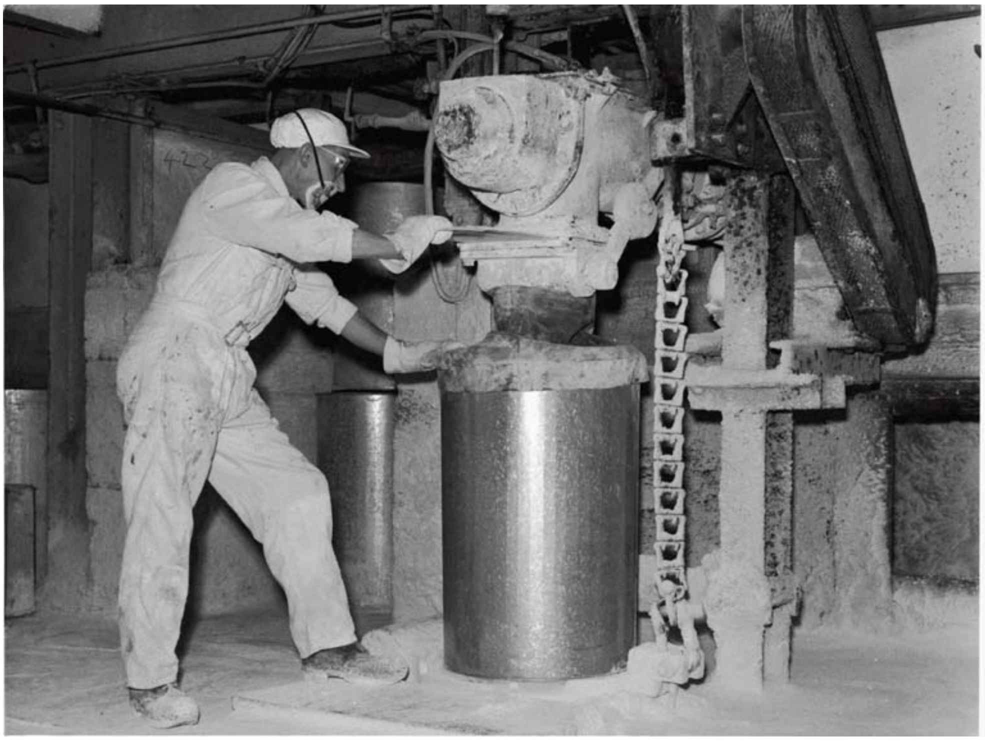

Illustration 4: Filling bleaching powder containers, Castner Kellner Works, Runcorn, 1960
Source: Catalyst Museum, Widnes, Cheshire

Heavy loading and unloading of raw ores and finished chemical materials were part and parcel of the daily toil for many chemical workers throughout the period under examination. The shovel was used extensively for filling barrels and sacks. These containers, once filled, were then manually heaved into storage areas ready for dispatch. Large bottles or 'carboys' filled with corrosive liquids were also manhandled throughout the workplace and these were both heavy to lift and liable to spillage or breakage. Usually stored within a metal cage and using straw as cushioning, some of the glass carboys contained up to 10 gallons of liquid and required two labourers to lift them. One former worker at Holliday Dyes and Chemicals Works in Huddersfield recalled that:

> I was helping to lift a carboy of nitric acid up the stairs to 59 & 60 pans when the carboy broke and splashed down my trousers, a quick

dash to the nearest tap and a drenching with water saved me from serious injury.[69]

In 1960, the Chief Inspector of Factories noted that in some of the new chemical plants corrosive liquids were now being pumped and piped from delivery to storage or to use and that this system had reduced the necessity for repeated hazardous operations that involved the handling of carboys and drums.[70] However, the use of this safer system was slow to reach the factory floors of British industry and the CIF could only comment that 'the system of lifting carboys by a pulley block to the reaction vessel is still prevalent…it cannot be emphasised too strongly that this is a most dangerous practice.'[71] Discussing the reluctance of industry to modernise Dintenfass has argued in the *Decline of Industrial Britain* that by comparing productivity growth figures for Britain with other industrial economies it suggests that the chemical industry along with coal, construction, and the electrical goods industry were 'all part of a larger pattern of technological backwardness and not isolated exceptions to a more progressive tendency.'[72] Pagnamenta and Overy have claimed that in 1914 the chemical industry remained "unsophisticated" with wooden poles being used to stir vats and with chemicals being decanted haphazardly.[73] A few employers did invest in new technologies but they remained few in number and by 1920 *The Chemical News* could only report on experiments that were being conducted with labour saving devices that could potentially be installed in chemical works.[74]

Technological advances such as conveyor belt machinery were developed primarily to increase production levels although indirectly they may have delivered some improvement in the working conditions by reducing the loads that had to be manually transported. Areas considered appropriate for mechanisation in the

[69] www.colorantshistory.org/Holliday**Dye**.html
[70] Annual Report of the Chief Inspector of Factories for the Year 1960, PP 1961 (Cmnd. 1479) HMSO, London, p.53
[71] Annual Report of the Chief Inspector of Factories for the Year 1960, PP 1961 (Cmnd. 1479) HMSO, London, p.53
[72] M. Dintenfass, *The Decline of Industrial Britain, 1870-1980*, Historical Connections Series, Routledge, (London 1992), p.15
[73] P. Pagnamenta and R. Overy, *All Our Working Lives*, British Broadcasting Corporation, (London 1984), p151
[74] *The Chemical News*, May 7, 1920, p.225

chemical industry in the 1920s were the pneumatic conveying of coal and granular substances as well as the automation of machines that handled liquids.[75] However, as with any transmission equipment a potential threat to the worker existed if it was not properly maintained or guarded. Warnings about this specific danger had repeatedly been made by the Chief Inspectors of Factories and despite successive claims that this issue was being addressed the CIF still felt it necessary to reiterate the warnings in 1925 when they stated that 'the harmless looking rotating shaft, once it gets a grip of a worker's clothing can speedily cause death or grave mutilation.'[76] Therefore, although the introduction of conveyors and automated equipment would relieve the strain associated with moving heavy loads of ore and coal this type of equipment, if improperly installed and maintained, had its own potential health and safety dangers.

Haber has argued that by the 1920s 'the shovel was on the way out' although this general statement could not be applied across the whole of the industry.[77] One process operator recalled that even in the 1970s he continued to use a shovel:

> We started using limestone as a filler within fertiliser. I didn't like using the stuff I think it was bloody awful. It's very heavy. I mean, if you have a shovel full of limestone it's like lifting up a block of concrete and it was introduced into the system instead of using sulphuric acid because it was cheaper.[78]

Indeed, adopting technical or mechanical labour saving devices seems to have occurred more readily in Germany and the USA than in British chemical concerns where conveyors were not installed widely until well after the First World War. In the smaller batch system of production Richard Fitzpatrick, a chromate process worker, recalled that from the early to mid 1940s the raw materials that he required were brought to his workplace on wheelbarrows. Thus:

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[75] *The Chemical News*, May 7, 1920, p.225
[76] Annual Report of the Chief Inspector of Factories and Workshops for 1925, Cmd2714, as quoted in E. Crooks, *The Factory Inspectors, A Legacy of Industrial Revolution*, Tempus, (Gloucestershire 2005), p.97
[77] L.F. Haber, *The Chemical Industry, 1900-1930, International Growth and Technological Change*, Oxford University Press, (Oxford 1971), p.382
[78] Interview D. Walker with D. May, 06 September 2005, Tape 2, p.12

> I was wheeling a one wheel big barra (barrow) that maybe held aboot four hundred weight o' dross (coal) and I had to feed the furnaces (with a shovel) plus a had about a hundredweight bag of soda I had to put at certain furnaces.[79]

The chromate manufacturing industry was a more labour than capital intensive one but by the early 1950s the large-scale manufacture of soda ash did utilise mechanical packing equipment. That is, the finished product was delivered to the sack by mechanical means, usually by conveyor. Thereafter the sacks were manually handled with men loading the sacks onto wagons or barges for storage and transportation. The volume of labour required to handle the output can be gauged from a 1948 ICI magazine that claimed that 85 per cent of the Winnington and Wallerscote exported products were transported by barges and other small craft to the main ports at Merseyside for shipping.[80] This meant that many thousands of sacks had to be manipulated onto these craft and that much of this heavy manual labour was undertaken in an atmosphere thick with dust. One ICI report from 1954 stated that despite the existence of the ventilation system in the plant 'dust is inevitably produced at the packing points' where up to 23,000 bags were handled daily.[81] Five years later in 1959 ICI could still report on the physical demands being made on the packers and loaders and that the dust exposure was 'both heavy and prolonged.'[82] The British Economic Development Committee viewed high levels of manual labour as being inefficient and in the 1960s noted that the scale of operations in American chemical firms allowed them to utilise the latest bulk handling techniques, including automatic bagging and loading facilities.[83] By comparison, the wife of a former ICI soda ash worker recalled the heavy manual labour that her husband did in a Cheshire chemical plant during the 1960s:

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[79] Interview D. Walker with R. Fitzpatrick, 13 August 2004, p.7
[80] *Alkali News,* 75th Anniversary Edition, 1873-1948, November 1948 (Northwich), p.23
[81] R.McL Archibald, 'Perforation of the Nasal Septum Due to Soda Ash' pp.31-37 in *British Journal of Industrial Medicine*, (11) 1954, p.32
[82] C.P. Chivers, 'Respiratory Function and Disease Among Workers in Alkaline Dusts' pp.51-60 in *British Journal of Industrial Medicine*, (16) 1959, p.52
[83] Economic Development Committee for the Chemical Industry, *Manpower in the Chemical Industry, A Comparison of British and American Practices*, HMSO, (London 1967), p.6

> It was very hard work 'cos they [sacks] used to come down a chute and of course, taking them off the machines they used to rub all their wrists and all their wrists would be bleeding.[84]

According to Hilda Langley her husband had to stop this particular job after he sustained an occupational injury. This testimony indicates that there were high physical demands being made on those employed to load sacks of finished product. Ten years later Nichols and Beynon found much the same situation at a large fertiliser plant where it was observed that hundredweight bags of fertiliser were delivered by conveyor to the men at the 'band end' where they 'thudded' into the shoulders of the loaders. Having caught the bags, they turned and dropped a bag into a lorry every six seconds.[85] When loading bags onto railway wagons the area for loading was restricted and would only allow room for one man. Taking it in turns the men caught the hundredweight bags and dropped them into position every three seconds, 'warm bags that burn your shoulder; leaving it red raw.'[86] Hilda Langley recalled the work her husband had to do and the speed that the bags were delivered to him, something that ultimately damaged his body.

> They came down the chute…they come at such a speed …down the chutes like … and he used to have to load them into boats. He was one of the loaders that used to load the barges and he hurt his back with the loading a boat so he had to go on light work duty then, he was on a green card, he hurt his back.[87]

As a 'green card' holder Mr Langley was now officially designated as a disabled worker. He retained his job at ICI but his status as a seller of labour power had now been altered and as a 'disabled' worker was now liable to be discriminated against. To reduce the levels of discrimination against disabled workers the government set

[84] Interview D. Walker with H. Langley, 21 March 2005, p.2
[85] T. Nichols, and H. Beynon, *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.14
[86] Nichols, T. and Beynon, H. *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.14
[87] Interview D. Walker with H. Langley, 21 March 2005, p.4

employment quotas for employers under the rules of the Disabled Persons (Employment) Act 1944 and 1958. If a 'green card' holder was employed they would be counted against the quota set for that firm. Although this legislation was well intentioned one former chemical worker recalled his ICI medical examination in 1964 and how he was pressured to help meet the firms 'disabled' quota:

> Aye, it was a bit of a joke. I mean they wanted me to go in as disabled because I'd had a broken leg in a motorbike accident and I said 'no, I'm no going disabled' cos they were obviously trying to make their figures look good…they've got to employ so many disabled guys and I said 'no' I says 'if I dinnae stick this job' I says 'I can get a disabled sticker easy' I says 'but I canane get rid o' it easy' I says 'so I'm no willing tae go' and he said 'well' the usual ICI tactic 'we might no be able to employ you' I said 'well, that's up tae you but I'm no going disabled.'[88]

ICI were in need of shift workers at this factory during the mid 1960s and the man secured the job without succumbing to the threat that he would only be employed if he agreed to be a green card holder.

Film archive of sodium cyanide production in the 1930s shows a workshop with rows of pots emitting explosions followed by sheets of flame. The men in this ICI film wear (pristine) heavy aprons, hoods, gloves, and goggles, in order to carry out their workload, much of which is manual in nature. Using large metal tools they tighten or loosen nuts and levers, they push large containers and bogies alongside the process, and empty the sodium bricks from their moulds before piling them onto the passing trolley. The narrator of the ICI film intones 'heavy clothing was needed to protect them from caustic splashes and the great heat generated in the cells.'[89] As the men finish their shift they remove their heavy protective clothing wiping away the sweat that has gathered beneath the thick layers. The narrator informs the viewer that this plant is closing and a new one will open at Billingham which is 'modern, better

[88] Interview D. Walker with KG, November 2005, p.5
[89] ICI Film Archive, 'Sodium Cyanide Production, The End of a Process'. www.bbc.co.uk/nationonfilm/topics/chemical-industry

equipped, and more efficient' and will produce one and a half times the amount of sodium under better conditions. He adds 'not all of the men will be going.'[90]

The reduction in the number of men required for each process was being matched by investments in new technology and new processes. This trend of replacing men with technology continued and by the mid 1960s technical 'innovations' were changing the demands made on the labour force. One example of this is seen in the change that occurred in a process man's job where he was expected to provide manual labour looking after one reactor. Following the installation of the new technology it meant that he had to attend to five reactors.[91] This would indicate that the introduction of this particular piece of technology had been introduced to boost productivity and profit levels. With more reactors to look after the process operator now had to rely on the equipment to perform satisfactorily. Brian Watson, a former manager at ICI, commented on the tendency to move from a manual workforce to a less manual one where possible. Thus:

> The explosives industry in particular tended to be heavily manual because mechanisation tends to mean friction and you want to keep friction to a minimum in anything involving explosives so there tended to be a lot of manual involvement in the explosives industry.[92]

One respondent who had worked at an explosives factory recalled the heavy manual workload during the war, a job that led to her wrists being strapped for about six or eight weeks due to strain. For the reasons stated above by Brian Watson, the manner in which the work was carried out changed very little with the passage of years.

> You had to put the gun cotton from the steaming house into this pumper which …it was like a huge bath it wasn't a bath but it looked like that. One (worker) was at one end and you were at this end or whatever and you had sticks with flat pieces on it that you had to keep

[90] ICI Film Archive, 'Sodium Cyanide Production, The End of a Process'. www.bbc.co.uk/nationonfilm/topics/chemical-industry
[91] D. Wedderburn, and R. Crompton, *Workers' Attitudes and Technology*, Cambridge University Press, (London 1972), p.114
[92] Interview: D. Walker with B.J. Watson, 08 October 2005, p.11

> pushing the popper, pushing the gun cotton and if it wasn't running smoothly you had difficulty in getting it away again, very much so. It had to run smoothly.[93]

The manufacturing of less volatile products allowed for the introduction of mechanisation and automation and Mr Watson discussed some of the reasons as to why these would have been implemented.

> It tended to move from manual to less manual. Various pressures on that, safety for one thing, the less extent to which people are exposed to chemicals the safer they are likely to be and it's cheaper to buy electricity than it is to buy labour. So you want to keep your manning to a minimum and automate as much as you can.[94]

The above testimony indicates that many variables were in play when determining which methods were best suited for the needs of production but protecting the process and reducing costs would have been paramount considerations for any capitalist firm. In the above statement the safety of the operatives also appears to feature in the consideration process. Indeed, within the *Sociology of Industrial Injury* Nichols has identified this feature of capitalist production and has argued that improving safety standards can be conducive with profit accumulation when, for example, it reduces the threat of explosions or other disruptions to production.[95] The drive to increase production could also bring changes to the design of manufacturing equipment and inadvertently minimise or eliminate dangerous procedures. For example, one former shift supervisor recalled that for years men were regularly injured by the knives that they used to cut the plastic film they produced. This hazard was ultimately removed but only because 'the units got bigger and bigger' and the film became 'too wide to cut manually so they had tae design a machine tae cut it.'[96] Therefore, whilst the introduction of new process

[93] Interview: D. Walker with MP, p.7
[94] Interview: D. Walker with B.J. Watson, 08 October 2005, p.12
[95] T. Nichols, *The Sociology of Industrial Injury*, Mansell, (London 1997), p.104
[96] Interview D. Walker with KG, 25 November 2005, p.10

technology and improved plant design could reduce the numbers of operatives being injured the motivation behind some of these improvements was to enhance production and profit levels rather than to save or protect lives *per se*. As will be discussed below, even where injury or death was shown to be occurring as a direct result of exposure to certain processes a positive preventative response was not always forthcoming from the industry.

Part Two: Accidents

In 1918, the HMWC noted that 'only accidents of a certain degree of severity' were notifiable to the Chief Inspector of Factories and that 'vast numbers' of accidents remained unaccounted for.[97] Consequently, the 150,000 accidents reported annually during this period are merely an indication of how dangerous the workplace was for those who left their home each day in order to earn a living.[98] Over the following decades various legislative measures were introduced aimed at reducing the numbers of workers who fell victim to an occupational injury, disease, or premature death. Nonetheless, by 1972 the levels of death and injury caused by accidents at work remained under serious discussion and following a two-year investigation a Royal Commission, led by the former Chairman of the Coal Board, Lord Robens, stated that:

> Every year something like 1,000 people are killed at their work in this country. Every year about half a million suffer injuries in varying degrees of severity. 23 million working days are lost annually on account of industrial injury and disease.[99]

These statistics refer to British industry as whole and it is therefore important to analyse the record of health and safety within the chemical industry to see what sort of levels of injury and death were found in this sector. Statistics by themselves have a tendency to dehumanise occupational accidents and perhaps at the outset of this section a detailed example of one fatal accident may bring such incidents into sharper focus. This particular accident occurred in the mid 1960s within a modern ICI fertiliser plant in Bristol. Doug May, a sub-contracted maintenance fitter at the time, recalled what happened:

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[97] Health of Munitions Workers Committee, Final Report, Industrial Health and Efficiency, PP 1918, (Cd. 9065), p.65
[98] Health of Munitions Workers Committee, Final Report, Industrial Health and Efficiency, PP 1918, (Cd. 9065), p.65
[99] T. Nichols, and P. Armstrong, *Safety or Profit: Industrial Accidents and the Conventional Wisdom*, Falling Wall Press, (Bristol 1973), p.1

> There was a Polish worker who was actually working on the top of one of the elevators. I mean the elevators are huge, huge elevators, they run …they ran in those days from the bottom of the plant up two or three floors to the top. He was actually working on the top of the elevator and he was repairing some of the linkage on the top of the product screen elevator and he had actually put his head, or his body, inside the top of the elevator to see where the chain was actually on the cog and unbeknown to him the chain was actually balanced on one of the teeth and he put his head in there, put a light on …(sighs). As you can well imagine the chain actually clicked down into its position and his head happened to be in the wrong place at the wrong time. They dragged him out of the elevator, the whole of the top of his head was split open according to the senior operator at the time who told me…you could actually see his brain, where his …obviously the weight of the chain just smashed down onto his skull and just cracked (snapping of fingers) it like an egg. Terrible, terrible thing to happen but that was … that was obviously something that was avoidable but he should never have put his body or his head in there anyway but I mean people do…people just do something on the spur of the moment and that was enough, you know. Unfortunately the poor fellow died and that was that.[100]

It is interesting to note that the respondent, a fellow worker, is blaming the 'poor fellow' himself for this accident because 'on the spur of the moment' he had placed his own body in this potentially dangerous situation. However, with no guarding or warning system to prevent him from doing this it is possible to argue that this is exactly what he had been expected to do in order to repair the machine. Following this 'accident' Doug May noted that the firm installed guarding at the top of the elevator and that:

[100] Interview D. Walker with D. May, 06 September 2005, Tape Two, p.1

> You could clean things, you could clean the top of an elevator after that but you could not actually get into the chain system. They pushed a series of chutes in there I remember and also grills and gratings so it was not possible to happen again. So they did learn their lesson from it but I mean…at what a cost.[101]

No longer would anyone be able to spontaneously put their head or body in this part of the machinery but it took a human life to achieve this level of safety. Whether this was technically an accident is highly debatable. For decades the Factory Inspectorate had been vociferous on the need for guarding on machinery. At the design stage it would not have been difficult to predict that this elevator, which included major moving parts, would require regular maintenance. Therefore, hindsight was not required to determine that such a piece of equipment would have needed guarding to ensure its safe operation. The remedial work carried out after the 'accident' had no disproportionate financial costs nor did it pose any technical difficulties. If this had been done earlier then the tragedy that took place could have been averted. Moreover, sub-contracted maintenance fitters were increasingly used by the industry but by definition were not chemical sector employees.[102] They were therefore not included in the fatal accident statistics for the chemical industry.

Situated on the Lancashire coast, the Fleetwood Ammonia Soda Works witnessed 251 accidents between the years 1918 to 1920.[103] The accident records for the years 1920 to 1924 were missing from the archive but in the same works between January 1924 and August 1927 a further 504 accidents occurred.[104] Therefore, within a single chemical plant over a period of seven years there had been a total of 755 accidents. This equates to an average of one reported accident every three days. The official government statistics also reveal that between 1914 and 1924 around 845 chemical workers were killed in industrial accidents across the entire British chemical industry.[105] Another way of looking at this is that for the first ten years of

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[101] Interview D. Walker with D. May, 06 September 2005, Tape Two, p.2
[102] T. Nichols, and P. Armstrong, *Workers Divided: A Study of Shopfloor Politics*, Fontana, (London 1976), p.35
[103] DIC/UA16/18/1 Accident Report Book No.1 Fleetwood Ammonia Soda, 1918-1920
[104] DIC/UA16/18/2 Accident Report Book No.3 Fleetwood Ammonia Soda, 1924-1927
[105] Eighteenth Abstract of Labour Statistics of the United Kingdom, PP1926 (Cmd.2740), pp.156-157

the period under examination one chemical worker lost his life every fourth day and consequently a significant other lost their husband, their father, their brother, their son, or indeed, a wage earner.

Some of the injuries sustained in the chemical industry were not specifically process related and included those where workers had fallen through poorly maintained roofing or weak scaffolding. Some workers were electrocuted where cranes or heavy lifting gear had struck overhead cables. Railways and boats transported bulk ores and chemicals to and from the chemical plants and as a result some workers were crushed to death or run over by railway wagons whilst others drowned after falling between boats and the dockside as they loaded barges. Other reported accidents were process related and had similar outcomes to accidents recorded in other industries. These included injuries to the eyes, head, and back, septic wounds, loss of limbs, burns to either the face, arms, hands or feet, fractures and crushed limbs.

The discovery of a neglected archival source belonging to the United Alkali Company (UAC) provides a unique opportunity to see just how some of the injuries came to be sustained within this large chemical undertaking. The UAC was one of the four largest chemical manufacturers in Britain prior to it becoming part of ICI in 1926. What the archives of this firm show are that between October 1914 and June 1928, around 7,254 of its workers sustained an occupational injury and that 67 of their workers died. This represents an average of 544 serious accidents and 5 deaths per year.[106] The total workforce is not known and therefore the percentage being injured or killed is also unknown. Nonetheless, a selection of cases are cited in order to provide an overview of the type of injuries sustained as well as providing, where possible, the reasons that were given for them happening. They include brief accounts of each reported incident from the 39 works that were operated and owned by the UAC.[107] Due to constraints of space only a limited number of reports will be

[106] DIC/UA8/5/11-22. Accident Books of United Alkali Company Limited 1914-1928. The average has been corrected for the months that are unaccounted for between Aug 1917 to May 1918

[107] The factories included: Allhusen, Atlas, Baxter, Bold Venture, Central Stores, Clyde Wharf, Eglinton, Fleetwood Alkali, Fleetwood Salt, Friar's Goose, Gaskell Deacon, Gerards Bridge, Globe, Golding Davis, Greenbank, Hall & Shaw, Hardshaw Brook, Henderson, Hutchison, Kurtz, Kurtz Brick, Lancashire Metal, Liver, Mathieson, Marsh, McKechnie, Mort Liddell, Muspratt Flint, Muspratt Widnes, Netham, Pilkington, Runcorn Alkali, St.Rollox, Sullivan, Tennant, Tennant Salt, Weston, Widnes Alkali, and Wigg.

referred to but what is suggested by the content of these reports is that a poor standard of maintenance and preventative safety provision was responsible for the frequency and repetitive nature of many of the accidents. The books were compiled as a reference for insurance and court cases and this becomes clearer when in 1924 a new column was added headed ‘name and address of any person other than the Company on whom there may be a legal liability?’[108]

Many of the reported cases contain handwritten footnotes such as ‘settled in County Court’ with various sums of money being identified for legal costs. Most of the victims received reduced wages whilst recovering from their injuries although this was not an automatic or universal provision. The decision to pay reduced wages was based on the employee making a claim and having this claim approved by his manager at the relevant UAC plant. Many of the accident reports state that ‘no claim was made’ but for those claiming successfully the UAC appear to have thought that half the normal weekly wage was sufficient to keep the worker and any dependants alive. Compensation for fatalities was dealt with on a case-by-case basis. Some cases were settled in the County Courts, some were settled on a paternalistic basis and some were completely ignored. The examples set out below demonstrate the glaring social inequalities and reveal how much the employer felt a human life was worth.

Each quote is taken directly from the accident reports and therefore it is the manager of each chemical works that is describing what happened. Although all of the reported cases provide short descriptions of each accident many of the reports also contained the footnote ‘no claim made’ and ‘did not return to work.’ On some occasions it can be seen that very similar accidents are recorded and therefore it must be assumed that few, if any, steps were taken following an accident to prevent it happening again. This of course calls into question the extent to which many of these incidents were in fact accidents. Fatalities were dealt with as court cases or, if no claim was made, simply logged. The 67 fatalities are those that happened as a result of accidents and therefore do not include those who died from the effects of long-term exposure to toxic fumes, gases and dusts. On the matter of gases the Chief

[108] DIC/UA8/5/20. Accident Book of United Alkali Company Limited, February 1924- April 1925

Inspector of Factories himself admitted in 1937 that the system used for reporting cases of gassing was inadequate and therefore 'no true picture' could be furnished.[109]

In May 1915, Joseph Lagan, a 28 year-old furnace worker employed at the UAC Tennant's Works was killed. He had been employed for 4 weeks when according to the report 'he stumbled against the guard of No.2 pot which gave way and he fell into the pot which contained hot hyposulphite liquor. He died immediately on 7 May 1915 from scalded body, legs and arms.' The sum of £253.15.9 was 'paid into court on 9/6/1915 to settle.'[110] Guarding or fencing around the pots, or rather the lack of them was apparent again that year when Thomas Jones, a 19 year-old labourer, died at the Pilkington-Sullivan Works. Employed for just nine weeks he 'evidently walked into a pot containing about fifteen inches of hot sulphur.'[111] This case was also 'settled' but for the much lesser sum of £15.19.2. Neither of the reports provided any concrete reason as to why someone would be able walk into a pot of hot sulphur or why the guards would have broken or given way so easily. The Chemical Works Inquiry of 1893 offers some explanation. Having received evidence of the lack of guarding around pots and inefficient lighting the Chemical Works Inquiry recommended that areas around the rims of pots be kept clear, that 'secure' fencing be erected, and that all dangerous places be well lit.[112] The 1893 legislation was in force and unaltered in 1915 and as the guarding had given way in the first case and had not been erected at all in the second this strongly suggests that the UAC had failed to comply with the legislation. Further, a lack of sufficient lighting is evidenced in the report of a man who had rushed to sound the alarm following an escape of gas at the UAC Allhusen Works. The man had fallen and 'lacerated his leg and was off work for just under six weeks'. Why this man had

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[109] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1937, PP 1938 (Cmd.5802) HMSO London, p.59

[110] DIC/UA8/5/11. Accident Book of United Alkali Company Limited, October 1914-July 1915

[111] DIC/UA8/5/11. Accident Book of United Alkali Company Limited, October 1914-July 1915

[112] 'In future every uncovered pot, pan, or other structure, containing liquid of a dangerous character, shall be so constructed as to be at least 3 feet in height above the ground or platform. Those already in existence which are less than 3 feet in height, or in cases where it is proved to the satisfaction of an inspector that a height of 3 feet is impracticable, shall be securely fenced. There shall be a clear space round such pots, pans, or other structures, or where any junction exists a barrier shall be so placed as to prevent passage. The lighting of all dangerous places shall be made thoroughly efficient.' Report on the Conditions of Labour in Chemical Works, The Dangers to Life and Health of the Workpeople Employed Therein and the Proposed Remedies, Chemical Works Committee of Inquiry, PP 1893, (C.7235), 'Special Rules,' pp. 7-8

fallen was that he couldn't see where he was going because 'it was dark at the time.'[113] How this man actually felt as he fled an escape of gas in the dark was not recorded but the testimony provided by one former chemical worker gives some insight into the feelings of panic and fear that were experienced when fleeing an escape of dangerous chemicals more than 50 years later. Thus, according to Doug May:

> I was showing another operator how to vent a system, a liquefied ammonia system, a cooling system, and unbeknown to me one of the valves had been passing and liquefied ammonia had got into a hundred foot stack which was used for venting-off. I didn't realise that there was pressure in the system and the pressure blew up, blew up the vent, which normally would have been safe if it had just been pressure… and there was this eight-foot of liquefied ammonia which vented over me and my colleague. He ran one way…fortunately he stayed in the open air (but) he did suffer some burns to his chest and his shoulders. I actually ran the other way, ran along a road into an electricians shop, slammed the door behind me and at that stage I started venting off like nobody's business because I was covered in white em … you know white liquefied …and eh… I couldn't breathe, couldn't even get out the room because the door had jammed and that frightened me to death because I was quickly loosing common sense. I saw a dartboard which had been grouted into a wall and I just put my foot up against the wall and my hands on the dartboard and I wrenched it out of the wall and smashed it through a window which was about head height, a small window, and dived straight through the window after it, cutting my arm and my leg. I managed somehow or other to hurl myself out the window and I'm not kidding you would do things like that …if you can't breathe you would do daft things and eh …I ran up the road, well it seemed like a run, probably a stumble I would imagine, and went into the front of the plant and it was a big

[113] DIC/UA8/5/13. Accident Book of United Alkali Company Limited, March 1916- January 1917

> plant. Managed to get to the control area telling everybody to shut the systems down because I thought there had been a major fume release and I was grabbed by two or three of my colleagues who stripped all of the clothes off of me and it was then that I noticed that everybody was not gasping for air like myself. One of my colleagues Dennis Armitage put a ten minute breather set on me and within seconds I was okay because there was air coming into me but they got me off to a hospital and my colleague as well and I think really if I hadn't got out of that room I don't know if I would be here today to be honest. It was that dangerous, it was awful stuff, terrible. But that's liquefied ammonia…it's terrible stuff, it really is awful when it vents-off, it just grabs your lungs and you can't breathe…it really is horrible stuff you know…I shit myself to be perfectly honest and I didn't realise I had, not until I got to the hospital and sat there in my overalls and I thought 'my goodness me.' [114]

In this account Doug May reveals the panic, the anxiety, and the fear that accompanied his desperate attempts to avoid what he thought were his last moments of life. This incident took place in daylight hours but if the attempt to flee the release of ammonia had occurred in the dark he may not have survived. Doug May was lucky to avoid serious injury and this is evident from a report conducted in 1973 that examined the long-term health effects amongst seven workers who were exposed to separate accidental escapes of ammonia. Showing a remarkable similarity with the type of accident experienced by Doug May all of the workers involved sustained burns to the eyes, throat and mouth. In addition all of them suffered respiratory damage for several years with 'persistent abnormalities' being experienced thereafter. One of the workers died following the extensive damage to his respiratory system.[115]

With the rush to produce armaments from 1915 the numbers of employees in the chemical industry doubled with the labouring power of women also being

[114] Interview: D. Walker with Doug May, Tape 1, 06 September 2005, pp.9-10
[115] M. Walton, 'Industrial Ammonia Gassing' pp.78-86 in *British Journal of Industrial Medicine*, (30) 1973, p.85

utilised. Output of high explosives increased from one ton per day to six hundred tons a day and at the end of the war 600,000 tons of high explosives had been produced.[116] The UAC Pilkington-Sulliven Works in Widnes was part of this effort and accidents here reveal the lack of preventative care afforded to the women who toiled here. Having been employed for six months, 28 year-old Ellen Connor had her hand crushed when 'the rag she was using as protection caught on the rim of a drum of sulphide sodium.'[117] The implication being made here was that this was her own fault when in fact it clearly indicates that proper safety gloves had not been issued by the employer for this task. Ellen Webster, a 24 year-old with only four weeks experience did not return to the works after her feet had been badly burned with nitric acid that had spilled from a carboy. Her 22 year-old colleague May Smith, who had just one months experience suffered a similar fate although this woman did return to the works after sixteen weeks of convalescence on half pay.[118] Catherine Fox and Anne Cosgrove, both 19 year-olds with six months experience were injured. Fox was 'gassed whilst plugging shells' and Cosgrove was burned by nitric acid 'whilst unloading carboys.'[119] Neither made a claim. Eleanor Morley and Florence James were both employed at the Allhusen Works as shell fillers in 1917. Eleanor had had four months experience at her job but 'whilst filling shells some liquor got into her rubber gloves and burnt her hands.' She was absent for two weeks and received half pay. Florence suffered from a similar accident but made no claim and did not return to the works.[120] Whilst burning the fingers may not appear at the outset to be too debilitating there is another case that highlights the potential dangers. A male shell-filling colleague also burnt his fingers but continued working. It was reported that 'his fingers got gradually worse and although under medical supervision his fingers were amputated on November 1st 1916.' He did not return to the Allhusen Works and he made no claim on the firm.[121]

Annie Hamilton, a 25 year-old labourer worked at the Mort Liddell Works in Widnes for five months when she received burns to her legs and feet. This happened

[116] P. Pagnamenta, and R. Overy, *All Our Working Lives*, British Broadcasting Corporation, (London 1984), p.153
[117] DIC/UA8/5/13. Accident Book of United Alkali Company Limited, March 1916- January 1917
[118] DIC/UA8/5/13. Accident Book of United Alkali Company Limited, March 1916- January 1917
[119] DIC/UA8/5/14. Accident Book of United Alkali Company Limited, January 1917- August 1917
[120] DIC/UA8/5/14. Accident Book of United Alkali Company Limited, January 1917- August 1917
[121] DIC/UA8/5/13. Accident Book of United Alkali Company Limited, March 1916- January 1917

after 'passing through the finishing shed when the No.12 caustic pot foamed over and she walked through the hot liquor on the floor.'[122] She returned to her work after three months of half pay. The accidents books contain many reports of accidents that were caused by splashes or spillages of caustic but these reports do not relay the impact that the injuries had on the worker or his dependents. Hilda Langley recalled her father talking about his experience in the caustic works during the late 1940s:

> There was one man, I remember me Dad telling me once, that he fell and when he fell he landed with his arm in the caustic and they pulled him straight out but it had burnt his arm straight off it were that bad.[123]

Hilda's brother-in-law recalled this incident vividly.

> I can remember the accident, he had a bungalow built at Sandiway and I was electrician and we wired the bungalow and I can remember him being there with his arm and I asked him what happened and he said, he told me himself that he slipped on the gantry thing that he walked across and his arm went through the thing and when he pulled it out it had gone.[124]

Was this accident the fault of the worker? From the evidence it can be seen that the guarding did not prevent the worker's limb from entering a highly dangerous container. Obviously a finer mesh would have prevented this happening and therefore this was not really an accident at all but a foreseeable incident caused by the fitting of a poorly designed and inefficient guarding system. The flooring around the vat may also have been uneven or manufactured from unsuitable materials to cause the man to slip. Nonetheless, from the records it can be seen that being splashed by caustic was a much more common occurrence than falling into a

[122] DIC/UA8/5/14. Accident Book of United Alkali Company Limited, January 1917- August 1917
[123] Interview: D. Walker with H. Langley, 21 March 2005, p.7
[124] Interview: D. Walker with D. Rogerson, 21 March 2005, pp.7-8

container of caustic. Gladys Rogerson recalled her own father being brought home after being badly splashed by caustic in the 1940s:

> I remember him coming home, well, being brought home in the ambulance when he'd had nasty burns through the caustic. His legs were badly marked down the front and his arms…well at the time it was, it was horrendous to me as a child because to see somebody with their skin burnt off their legs and their arms …it was a horrible sight.[125]

Following this accident Gladys remembered her mother stating to her father 'I suppose this will be the death of you one day.' Gladys recalled her reaction to this adult discussion:

> I used to think to myself 'Oh, heck, I don't think me Dad will get killed working there', but you don't know (emphasis) what happens in these situations. Being a small child you weren't really …I don't think the imagination was fired like it is today with the television, to see things is common place…these horrendous things that go on…but you couldn't visualise it in my day.[126]

In effect, this child had been left with the fear of the unknown and as her father went to work each day she was left thinking that he might not return. Gladys's husband Derek visited the plant as a maintenance worker and noted that condensation water sometimes dropped into the caustic vats and that this caused caustic splashes to occur. As the working environment around caustic production was very hot the men wore little underneath their cotton overalls and therefore the splashes 'went through their overalls and onto their skin.' Gladys Rogerson recalled the damage done to her father:

[125] Interview: D. Walker with G. Rogerson, 21 March 2005, p.6
[126] Interview D. Walker with G. Rogerson, 21 March 2005, p.7

> The front of both legs were very badly burnt and his arms… from his elbows down, they were just like white lines down where the caustic had burnt him… it heals but it leaves the white, a white scarring you never seem to see the pink of the flesh, you know.[127]

Asked if any friends or neighbours had been injured Hilda Langley recalled that:

> A lot of it was eyes, 'cos they got caustic in their eyes, they used to flush them out with water and run 'em straight to the surgery that was the most injuries they got I think really wasn't it? It was from the caustic to their eyes.[128]

At the Muspratt Works in Widnes, Patrick Simmott, a 37 year-old man with seven years experience, was killed in April 1917. The circumstances surrounding his death were that 'after a revolving furnace had drawn a charge of black ash he was found burnt to death in one of the black ash bogie wagons into which the charge had been drawn.'[129] As was often the case, no claim was made. The fact that no claim was made could be explained by an absence of relatives or dependents or perhaps because the living relatives and dependents had no idea that it was possible to make a claim or indeed had no funds to pursue one. Workmen's compensation legislation had been originally enacted in 1897 but even after being strengthened in 1906 the burden of claiming lay with the workers or their dependents. Where they were well organised trade unions helped to pursue accident claims across British industries. However, as will be discussed in Chapter Five, trade unions were poorly organised in the chemical industry and only began to realise their potential membership after the 1939-45 war. With little protection on offer the accidents books are filled with many cases of a similar nature and reveal a gloomy and tragic list of human suffering. What is also striking is that in some of the cases the men being asked to undertake the work were quite old when injured. For example, in 1924 Bernard Johnston was employed as a foreman bricklayer in the St.Rollox Chemical Works in Glasgow.

[127] Interview D. Walker with G. Rogerson, 21 March 2005, p.27
[128] Interview D.Walker with H. Langley, 21 March 2005, p.25
[129] DIC/UA8/5/14. Accident Book of United Alkali Company Limited, January 1917- August 1917

Supervising the cleaning of a private drain on the Caledonian Railway line he was struck by a 'light engine' and suffered a 'fractured elbow, scalp wound and shock.'[130] This man was 73 years old and had an average wage of 102/6d per week. He died as a result of his injuries and his widow was granted a one-off payment of £10 by the firm as well as an allowance of 10/- per week. The year before that death a 74 year old was reported to have 'strained [his] abdominal muscles' as he attempted to separate carboy baskets. The man, Henry Collins, had already worked for 62 years of his life and it must be assumed that his accident caused more damage than was known at the time. He died four weeks later. No claim was made and no costs were made for his funeral or other expenses.[131]

The first book of the UAC accident books had a total of 368 recorded accidents whilst the next eleven books had room to record 626 accidents each.

Table 2: Reported accidents, United Alkali Company Ltd, 1914-1928

Period covered by book	Total number of months	Total number of accidents	Average number of accidents per month	Fatalities
October 1914 - July 1915	10	368	36.8	6
July 1915 - March 1916	9	626	69.5	6
March 1916 - January 1917	11	626	56.9	6
January 1917 - August 1917	8	626	78.2	8
May 1918 - March 1919	11	626	56.9	7
March 1919 - December 1919	10	626	62.6	3
December 1919-October 1920	11	626	56.9	4
October 1920 - August 1922	23	626	27.2	7
August 1922 - February 1924	19	626	32.9	5
February 1924 - April 1925	14	626	44.7	4
May 1925 - February 1927	22	626	28.4	5
February 1927 - June 1928	16	626	39.1	6
Total		**7254**		**67**

Source: DIC/UA8/5/11-22. Accident Books of United Alkali Company Limited 1914-1928

[130] DIC/UA8/5/19. Accident Book of United Alkali Company Limited, August 1922- February 1924
[131] DIC/UA8/5/19. Accident Book of United Alkali Company Limited, August 1922- February 1924

Therefore, the rate at which these books could be filled provides a rough indication of the overall rate that accidents were occurring. The Allhusen, and Pilkington/Sullivan works feature prominently in the accident books and although the actual number of employees for each works is not known their prominence may have something to do with them being the largest works with the highest number of employees. Both works were involved in munitions manufacturing and in this particular area of manufacture the pressure to increase productivity was intense. As can be seen from the table, between January and August of 1917 the average number of accidents per month had more than doubled since July 1915. It should be noted that the period August 1917 to May 1918, a period of nine months, is missing completely from the records and it can only be assumed that many accidents would have occurred during this period as this was the height of wartime production. Accident rates decline slightly after this period but a steady number of accidents continued to be recorded through to October 1920 before slowing down. The economic boom years and high levels of productivity during the wartime and immediate post war era may account for the relatively high rate of accidents experienced during those periods. However, although the average amount of accidents per month were never as high as those experienced at the height of war it can be seen that by 1928 the average number of accidents being reported was higher than had been recorded in July 1915. From this evidence it would appear that few if any steps had been taken in the intervening years to seriously address the causes of accidents in this firm.

An increased awareness of the causes and consequences of industrial accidents led to factory legislation and some improvements in health and safety statistics. At first glance, the official data appears not to show any dramatic changes in the actual numbers of accidents or fatalities. As can be seen in the tables below, between 1924 and 1974, a total of 2,017 chemical workers were officially reported as having been killed in industrial accidents and between 1959 and 1974 more than 130,000 workers who sold their labour power within the industry were injured in accidents.[132] One important point that has to be applied when viewing the fatality figures is that over the period 1924 to 1974 the total numbers employed in the

[132] Annual Reports of the Chief Inspector of Factories and Workshops 1960-1975

Table 3: Fatal industrial accidents in the British chemical industry, 1924-1974

1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
66	56	39	56	69	59	78	54	36	49	52	53	52
1937	**1938**	**1939**	**1940**	**1941**	**1942**	**1943**	**1944**	**1945**	**1946**	**1947**	**1948**	**1949**
38	43	N R	N R	89	86	58	65	44	34	40	41	43
1950	**1951**	**1952**	**1953**	**1954**	**1955**	**1956**	**1957**	**1958**	**1959**	**1960**	**1961**	**1962**
34	40	27	42	45	51	26	34	35	38	48	37	26
1963	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**	**Total**
36	23	25	41	31	31	30	19	22	14	19	46	**2,017**

Sources: Chief Inspector of Factories Reports, Annual Abstract of Statistics No.88 1938-1950, p.48 and Annual Abstract of Statistics No.96, 1959, p.45

NR denotes that in these years figures were not recorded

industry increased substantially. Therefore, by factoring that variable into the equation it is logical to assume that the chances of being killed in an industrial accident within the British chemical industry had decreased over this period. As will be discussed below this apparent record of improvement in the rates may not be wholly accurate. The data for non-fatal accidents is also unclear. As can be seen in Table 4 the years 1963 through to 1969 witnessed a year on year increase in the number of reported non-fatal accidents. This increased accident level was mirrored over the same period across the whole of British industry. Subjecting the industry-

Table 4 Non-fatal accidents in the chemical industries sector, 1959-1974

1959	1960	1961	1962	1963	1964	1965	1966
10,036	9,909	9,947	9,542	8,074	9,943	10,465	10,907
1967	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**
11,377	11,534	12,214	10,232	9,330	9,169	9,994	9,825

Source: Chief Inspector of Factories Reports

wide accident data to quantitative analysis it has been asserted that neither the unemployment nor engagement rates were significant variables but that the high levels of overtime being worked during ‘a continuing upswing in the business cycle’ offered one explanation for this increase.[133] Were high levels of overtime worked in the chemical sector during this period and would this explain the increased accident rate?

One government inquiry of 1969 stated that productivity in ICI had been increasing at a rate of 10 per cent annually and that this would have been ‘impossible without a direct contribution from the workers.’[134] Did this contribution include overtime? Peter Dodds, a former ICI process worker in Scotland recalled that during the 1960s:

> There was a lot of overtime, well everybody did it at that time…ye had yer mortgage, ye had yer family growing up so you wanted as much money as you could so ye’d maybe do an extra shift or an extra two shifts on yer day and a half off so ye were working fourteen days on a trot and ye were absolutely shattered.[135]

With a workforce that was ‘shattered’ accidents were bound to happen but Peter recalled that in the 1960s ‘the money was rolling in’ and ICI were less concerned about accident levels at that stage. It was only when international competition became intense and profits dropped that more strenuous efforts were made to reduce accident levels and their associated costs. Thus, according to Peter Dodds:

> I think people weren’t so aware that accidents cost money and that that affected the business. They [ICI] were concerned that you as a person got a cut but that was as far as it went I think. They didn’t think ‘how can we stop the accident happening where as that changed later on in years.[136]

[133] P.B. Beaumont, *Safety at Work and the Unions*, Croom Helm, (London 1983), pp.20-21
[134] Pay of General Workers and Craftsmen in Imperial Chemical Industries Ltd. PP 1969 (Cmnd 3941) HMSO London, p.9
[135] Interview: D. Walker with Peter Dodds, 25 November, 2005, p.25
[136] Interview: D. Walker with Peter Dodds, 25 November, 2005, p.13

Based in Cheshire, Hilda Langley, the wife of a former ICI soda ash process worker recalled that during the 1960s her late husband worked more than his contractual hours and she stated that:

> It was hard work, very hard work. He used to do a lot (emphasis) of overtime because the more overtime he did the more money they got in their pension fund … and with being late going to ICI he wanted to get as much in his pension fund as he could.[137]

In communities where chemical work was the main option for those selling their labour power the conditions of work were known and talked about beyond the factory walls. In 1964 Ron Angel, a local songwriter in the chemical area of Middlesborough, wrote the words for the 'Chemical Worker's Song' or, as it is became known, 'The ICI Song':

> Go, boy, go
> They time your every breath
> Every day you're in this place
> You're two days nearer death
> But you go
>
> A process man am I, I'm telling you no lie
> I work and breathe among the fumes that trail across the sky
> There's thunder all around me, poison in the air
> A lousy smell that smacks of hell, dust all in my hair
>
> I've worked among the spinners, breathed in the oily smoke
> Shovelled at the gypsum that nigh on makes you choke
> I've stood knee-deep in cyanide, got sick with the caustic burn
> Been working rough, seen enough to make your stomach turn
>
> There's overtime and bonus, opportunities galore
> Young men like the money, they all come back for more
> But soon you're knocking on, looking older than you should
> Every bob made on this job is earned with sweat and blood. [138]

The song relays a negative message about the working conditions that existed in the chemical industry and the fact that overtime is actually cited in the final verse

[137] Interview: D. Walker with H. Langley, 21 March 2005, p.3
[138] www.my**song**book.de/msb/**song**s/c/**chemical**.html

indicates that this had been a regular feature during the mid 1960s. Taking the above evidence together it is possible to argue that working overtime was a regular experience for those employed in the industry during the 1960s and that this could explain the year on year increase in the accident rates for the chemical sector during that period. Table 5 is interesting in that it shows a decline in the *number* of reported accidents in the late 1960s compared to the early to mid 1970s but that the *rate* of accidents had actually increased slightly over the same period.

Table 5: Incidence of accidents per thousand employees, 1967-1974

Year	Reported Accidents	Incidence per 1000 employees
1967	11,377	31.6
1968	11,534	33.3
1970	10,232	35.6
1971	9,330	33.4
1972	9,169	34.3
1973	9,994	35.8
1974	9,825	34.6

Source: Annual Reports of the Chief Inspector of Factories and Workshops
(Incidence rates prior to 1967 were not found).

In respect of the risk of bodily damage caused by accidents Table 6 shows that by the mid 1970s most of the old staple industries in Britain retained their unenviable position of having a higher incidence of accidents than the chemical sector. In other words, according to the official data, there was less chance of having an accident in the chemical industry than in the coal, metal manufacturing, or shipbuilding industries. This positive view should be tempered by three facts. Firstly, official figures rely on accidents being reported. This would include those where a worker had died at their place of work or had been injured and then went on to receive treatment for that industrial injury. Crucially, those not included are the many workers who would later suffer from a disabling or lethal illness due to ‘accidental’ exposures to toxic substances. The total numbers affected in this manner are self evidently unknown as they were not included in the accident or fatality data associated with the chemical industry.

Table 6: Inter-industry variation in accident rates reported under the provisions of the Factories Act at the SIC Order Level for Britain, 1972-74 (Average) (Incidence rate per 100,000 at risk of total reported accidents)

Coal and Petroleum	7290
Metal Manufacture	7270
Shipbuilding and Marine Engineering	6850
Mechanical Engineering	4020
Chemicals and allied industries	3730
Textiles	2920
Electrical Engineering	2400

Source: P.B. Beaumont, *Safety at Work and the Unions*, Croom Helm, (London 1983), p.22

This, as Sellers has noted, is the 'epistemological dilemma' in that 'connections between workplace causes and their bodily effects often remained frustratingly obscure, remote, and difficult to establish.'[139] Some measurement was made of poisoning by recording some of those affected by the limited number of 'recognised' occupational diseases. However, as will be discussed in detail below all that can be stated is that many thousands of chemical workers would have died or would have become incapacitated by industry related diseases many years before the diseases became recognised, many from diseases that were never recognised, and many who left the industry and whose illness was never attributed to the chemical industry at all. Secondly, chemical firms had been concerned throughout their history by adverse public opinion, usually associated with pollution and environmental damage. In response, the industry sought to give the impression of being safe and this included artificially lowering the numbers of employees recorded as being absent from work from accidents. The issue of accidents not being reported was one raised by the TGWU in the mid 1950s, as they were concerned that if this was not done at the time of the accident then claims for injury benefit may not be met at a later date if the symptoms persisted.[140] The TGWU then made a request to ICI that all works

[139] C.C. Sellers, *Hazards of the Job, From Industrial Disease to Environmental Health Science*, University of North Carolina Press, (London 1997), p.4
[140] MSS.126/TG/449/E (Minutes & Reports of the Chemical and Allied Trades National Committee of the Transport & General Workers Union), MIN 406, October 1956

accidents should be notified to the shop steward immediately but this was refused and ICI claimed that the methods they used for notifying accidents were 'satisfactory.'[141] Nonetheless, there is evidence that some chemical manufacturers deliberately massaged accident data by paying workers to attend the workplace even although they were not fit enough to carry out the work for which they were employed. For example, Davidson notes that in various American chemical plants trade unions and attorneys, such as Ralph Nader, produced evidence to show that firms would transport injured workers into the plant so as to show that they had no lost time and therefore had a good safety record.[142] This practice was not exclusive to the USA. One respondent who had worked with ICI in Britain revealed that it was also operated at his and other ICI plants throughout the United Kingdom. Thus:

> If someone got hurt in ICI and it was say a broken bone or severe bruising they were practically carried oot back tae work on a stretcher 'cos they didnae want their lost time accident figures tae go up. This happened in a' the plants I was ever involved wi, anybody that got hurt at a' wi an accident wis…they were threatened tae get their arse back tae work and they were picked up wi' taxis and God knows what a' just tae get them in so it widnae gang doon against (be set against) the record.[143]

Thirdly, in 1973 the National Economic Development Council claimed that both the French and Dutch chemical industry had fewer accidents than the British industry. The German industry did have a higher number than the British but their figures included accidents that occurred on journeys to and from work and minor accidents of a nature not recorded in Britain. The German figures were further skewed because they employed many workers in the industry who were of a lower health standard due to the labour shortages and it was also reported that safety requirements had been difficult to communicate to the many immigrant workers who had little knowledge of

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[141] MSS.126/TG/449/E (Minutes & Reports of the Chemical and Allied Trades National Committee of the Transport & General Workers Union), MIN479, July 1957

[142] R. Davidson, *Peril on the Job, A Study of Hazards in the Chemical Industries,* Public Affairs Press, (Washington 1970), pp.151-171

[143] Interview: David Walker with KG, 25 November 2005, p.35

the language.[144] Taking all of the above issues into consideration the claim that the British chemical industry was a less dangerous place to work in than say shipbuilding or metal manufacture seems less robust.

There was one danger associated with the chemical industry, which, unlike most of the others, did receive wide public interest. This was the danger of explosion. McIvor has argued that in the coal mining industry attention concentrated on explosions rather than the weekly death toll, as these were dramatic incidents that had an immediate adverse impact on the surrounding social and economic community.[145] A similar pattern evolved for the chemical industry. In 1913, it was reported that an explosion at the Nobel Explosives Works at Ardeer on the Ayrshire coast of Scotland had killed seven men with nine others being seriously injured.[146] Eleven months later another explosion at the same works killed eight workers and injured one.[147] Nobel's responded with the observation that, "human imperfection can never be entirely eliminated."[148] It is not clear by this if Nobel's were admitting that they too were imperfect but it is more likely that the blame was being directed at the worker. Why this might be is explained by Dwyer who has argued that:

> From the moment the human factor is considered to be the cause of accidents, everything the worker does and omits to do can be blamed. In this way a definition can be arrived at in which nearly all accidents are attributed to the worker.[149]

By 1915, another six workers had lost their lives at Ardeer in two separate explosions.[150] In 1917, a huge explosion occurred at the Brunner Mond Silvertown TNT plant in London killing 73 people, seriously injuring 400 others, and destroying

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[144] National Economic Development Office, *Chemicals Manpower in Europe, Report of a Comparative Study of Industrial Relations and Manpower Productivity in the UK, France, Germany and Holland*, HMSO, (London 1973), pp.20-21

[145] McIvor has argued that mining explosions were well publicised but that it was the daily occurrence of accidents that accounted for most of the 'major disability and death.' A.J. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.138

[146] *The Times*, March 11, 1913, p.6

[147] *The Times*, May 29, 1914, p.18

[148] *The Times*, May 29, 1914, p.18

[149] T. Dwyer, *Life and Death at Work, Industrial Accidents as a Case of Socially Produced Error*, Plenum Press, (New York 1991), p.148

[150] *The Times*, June 1, 1916, p.14

900 homes in the immediate vicinity.[151] The cause of the accident was investigated and a report published in 1917 (the public were not allowed to see this report until the 1950s). The investigation into this explosion would not have been undertaken simply because of the numbers of workers that had been killed or injured, after all, British workers had been dying from occupational accidents at a rate of at least two every hour for many decades prior to 1917.[152] The more likely scenario was that this had been undertaken in response to the destruction of lives and property of those who were not directly employed in the chemical industry. This was a highly public incident and one of the major criticisms made in the inquiry was that the Silvertown plant had been positioned in a built-up urban conurbation.

An explosion placed a fear in those living in close proximity to a chemical works and who, through the media, generally sought assurances from the firms that their families and property would be protected from future explosions. For the owners of the production process an explosion represented the destruction of a large capital investment and one that had to be repaired or replaced. Therefore, a positive consequence for the survivors of an explosion was that employers tended to take relatively swift preventative action to protect their investments, even when the precise cause of the explosion was unknown. For example, in 1930 at a chemical plant in Scotland the exact cause of the ignition causing the explosion could not be ascertained yet the firm immediately fitted 'explosion panels' and 'hanging screens' to reduce the risk of explosion and fire.[153] In the same year following an explosion at a synthetic chemical plant in Middlesborough 'the plant was re-designed with the elimination of all tanks and gas spaces so reducing further risk of explosion to a minimum.'[154] A leak of rainwater entering a sodium storage tank resulted in a chemical reaction and explosion. Following this accident the tanks were placed under

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[151] http://www.portcities.org.uk/london/server/show/ConNarrative60/chapterId/1183/londons-biggest-explosion.html

[152] Between 1880 and 1914 around 150,000 workers were officially recorded as having been killed by injuries sustained whilst at their work. This equates to 2 workers dying each hour. A.J. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p116

[153] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1930, PP 1931 (Cmd.3927) HMSO London, p.34

[154] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1930, PP 1931 (Cmd.3927) HMSO London, p.35

weather proof cover and large explosion vents of sheet rubber were fitted.[155] Whilst these responses were laudable a swift preventative response to risk was less forthcoming where the assessed risk did not pose a threat to a large capital investment. Evidence of this can be seen in the multitude of Factory Inspector's reports that had to repeatedly make the same points over many years about ensuring that guards were fitted to machinery or that dust extraction and ventilation systems be maintained and operated efficiently.

Despite the efforts taken to prevent them happening explosions continued to occur and between 1936 and 1958, across British industry as a whole, 587 people were killed in industrial explosions.[156] In the post-war era the chemical industry itself experienced various explosions but one, more than any other, stood out. In June 1974, an explosion occurred at the Royal Dutch Shell Nypro (UK) plant in Flixborough, North Lincolnshire. This single explosion killed 28 chemical workers and injured 36 others. A further 53 people were reported as casualties and hundreds of people not associated with the plant suffered minor injuries. Around 1,821 homes and 167 shops in the area sustained some damage. Noting the damage the Chief Inspector of Factories commented on the fact that the Flixborough 'disaster' had no parallel in the UK chemical industry since 1945.[157] The Chief Inspector could only have been referring to the size of the explosion and the widespread injury and damage caused, because the total death toll at Flixborough differed only marginally from that which was posted every single year for the chemical industry between 1924 and 1974.[158]

As with previous explosions elsewhere in the industry the deaths of the operatives and the total destruction of the operating records meant that the cause of the accident was not immediately known. How the public viewed this most visible of death tolls can be seen in the words of one contemporary BBC team that visited the site:

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[155] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1930, PP 1931 (Cmd.3927) HMSO London, p.35

[156] E. Crooks, *The Factory Inspectors, A Legacy of Industrial Revolution*, Tempus, (Gloucestershire 2005), p.155

[157] Annual Report of H.M. Chief Inspector of Factories for the Year 1974, PP1975, (Cmnd. 6322) HMSO, London, p.15

[158] See Table 3, p.90

> Just a few miles from here in the Yorkshire coalfields they've grown used to the idea of death and disaster as the price men have to pay for coal. Even the fish that comes into Hull, across the Humber, over there, is bought at the cost of the trawlers that never return. Now Flixborough has joined this unhappy band of communities that pay for other people's progress with human life.[159]

The reporter turned to look at the sheets of flame and the enormous clouds of thick black smoke that spewed from the tangled wreckage of the Nypro pant. He indicated towards the scene of devastation and stated slowly and deliberately, 'this is the price of nylon.'

A government inquiry team were quickly established who discovered that in March 1974 a crack had been found in one of the reactors and that this had resulted in a leak of cyclohexane, a highly flammable substance used as an intermediate in the production of nylon. At that juncture the company had shut down the plant for investigation and a decision was taken to remove the faulty reactor and install a bypass assembly to connect the other reactors 'so that the plant could continue production.'[160] Kletz has argued that at this point:

> There was no professional mechanical engineer on site at the time as the works engineer had left and his replacement had not arrived. The men who were asked to design and install the temporary pipe had great practical experience and drive; they had the plant back on line in a few days. However, they did not realize that designing large pipes (20 inch bore) to operate at high temperatures (150°C) and pressure (10 bar) was a job for experts. Their only drawing was a full-size sketch in chalk on the workshop floor; the only support was scaffolding on which the pipe rested.[161]

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[159] BBC Creative Archive, ca_bbc_1193.flixborough
[160] Health and Safety Executive, 'Flixborough (Nypro) Explosion 1st June 1974' http://www.hse.gov.uk/comah/sragtech/caseflixboroug74.htm
[161] T. Kletz, 'Flixborough: 20 Years After', Second Biennial Canadian Conference on Process Safety and Loss Prevention, www.dyadem.com/company/techpapers/flixboro.htm

Unsurprisingly the disaster inquiry discovered that this course of action had been seriously flawed and that the modification to the plant had been installed 'without a full assessment of the potential consequences. Only limited calculations were undertaken on the integrity of the bypass line.'[162] Therefore, senior management at this plant had sanctioned the remedial work and thereby had effectively prioritised the restoration of production capacity and profits over the health and safety of the operatives. Brian Watson, a former ICI plant manager, recalled the accident and commented that:

> That was a piece of impromptu design that went wrong. I suppose under the Health and Safety at Work Act it would not have been a safe system of work. It went to not being a safe place of work or a safe method of work and the whole thing had not been thought through properly.[163]

The administration block was completely destroyed in the explosion and it was only because the accident occurred at the weekend that the lives of the 50 women who worked there were spared. Of the workers killed, 18 had been working in the control room when the explosion blasted through the glass windows. The inquiry commented that more attention should have been paid to the safety of the workers and that the control room should have been designed with the potential for explosion in mind. As described above, explosions had been associated with the industry throughout its entire history and it is therefore remarkable that by the 1970s the firm needed any reminding of this risk and to include its potential in the plan for the building. Moreover, the manufacture of nylon specifically included the use of highly flammable substances and again should have heightened any risk awareness at the design, planning, building or building approval stages. No record could be found to explain why Royal Dutch Shell Nypro had sanctioned the design of the control room without taking the possibility of explosion into account.

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[162] Health and Safety Executive, 'Flixborough (Nypro) Explosion 1st June 1974' http://www.hse.gov.uk/comah/sragtech/caseflixboroug74.htm

[163] Interview D. Walker with B.J. Watson, 08 October 2005, p.8

Conclusion

Following the analysis of the hours and pace of work it has been argued that despite the reductions in hours made by a few welfarist employers most workers in the first two decades of the twentieth century experienced a long arduous day within the haphazardly constructed chemical works of Britain. A typical working week lasted around 60 to 70 hours with many workers having to undertake their duties on a rotating shift pattern of work. Such long hours of work were filled by bouts of intense and heavy labouring and this was made worse by the fact that much of the work was carried out within a hot, dusty, and fume filled atmosphere. None of these working conditions were conducive for the health of the worker. Indeed, physical exhaustion resulting from the long hours of intensive work was just one of the issues identified by the HMWC during World War One as having a detrimental impact on productivity. In response, recommendations were made by this government appointed body (and their successors) to reduce the hours and pace of work. From the mid 1920s the contractual hours of work began to be reduced and although the period 1939 to 1945 saw them increase once again the trend thereafter meant that by 1974 they had been lowered to an average of around 40 hours per week. Although much of the work remained heavy and dangerous the lowering of the contractual hours meant that workers now had the potential to enjoy longer periods of 'free' time in which to physically and mentally recover from the strains of their work. This, combined with a wider introduction of holidays with pay from the mid 1940s meant that less time was spent in the workplace and along with the reduced hours of work the chances of coming into contact with toxic substances or of being burned, scalded, gassed, or blown to pieces were reduced.

However, over the same period in which the working week was gradually being reduced the chemical industry expanded both its range and level of production. To some extent increased productivity was achieved by the use of improved scientific and technological developments but what is evident is that three other factors involving the chemical workforce helped achieve this objective. First, the workforce had to respond to the labour process that had been altered and linked to a variety of wage payment schemes. Second, the workforce remained harnessed to the production process by means of the rotating shift system of work. Third, although ostensibly a voluntary scheme, many workers were drawn into a regular pattern of working overtime. What has been argued is that all of these methods of work had an adverse impact on the social, physical, and mental well being of many chemical workers. For example, someone on a rotating shift pattern could never have benefited from reduced working hours in the same the way that someone on constant day shift would. Whilst some of the health issues associated with working shifts or keeping pace with wage payment schemes are subjective in nature it has been argued that a direct correlation does exist between the increased amount of overtime being worked during the 1960s and the increased accident rates recorded over the same period. Based on the evidence presented it is at least possible to argue that the full benefits that should have been delivered by reducing the contractual hours of work were diluted by the demands made by the chemical industry for increased productivity and the consequent methods of work that were deployed to achieve this.

Official data reveals that between 1914 and 1974 thousands of chemical workers lost their lives and that many hundreds of thousands were injured. This toll was generated entirely as a result of accidents in the workplace. Evidence taken from the accident books of the UAC, the Factory Inspectors reports, and from oral testimony all demonstrate that a certain amount of knowledge did exist with regard to the causes of many of these accidents. Nonetheless, many types of accidents reported at the beginning of the period continued to be reported decades later. Therefore, the overwhelming evidence is that many of the reported ‘accidents’ were foreseeable and therefore potentially avoidable if the knowledge of the causes had been acted upon much sooner. For example, proper guarding, overalls, gloves, goggles, respirators, and regular maintenance would all have helped reduce the frequency and number of accidents that occurred. In this respect it has been found that the chemical industry was no different from many other areas of British industry where tens of thousands of workers were killed or injured in accidents that were easy to predict and technically preventable.

The large increases in the numbers employed across the chemical industry do not appear to be matched by large increases in the numbers of reported accidents and therefore it appears that the chemical industry had a comparatively good safety record. Undoubtedly, the introduction of new process technology and enclosed systems of production would to some extent have reduced the need for workers to physically manipulate heavy loads around open vats of boiling liquid and this would have helped reduce the numbers of accidents. Improved plant design, better lighting and company supplies of protective clothing would also have made a positive impact on accident rates. Greater steps were also taken to protect the plant from explosion or fire risk and this too would have resulted in a safer working environment for the operatives. However, notwithstanding such efforts to improve the health and safety aspects of the working environment this research has raised some doubt about the validity of the accident data for the chemical industry.

As with all statistical evidence if it is to show a true picture then the data that is entered has to be accurate. However, the underreporting of occupational accidents has historically been shown to be a likely occurrence. Whilst this is true for all sectors of British industry the chemical industry had its own some specific features that led to the underreporting of accidents. Missing data for war years is a relatively common feature across British industry and this is seen in the UAC archive. This archive has also shown that for an accident to be recorded the works manager had to write a report and that this was done for compensation insurance purposes. However, it has been demonstrated that many of these reports simply stated that the victim 'did not return to the works' or that 'no claim was made.' It is therefore highly unlikely that any of these accidents would have officially appeared in any government statistics. Moreover, a comparatively low level of trade union representation existed throughout the period in question and therefore fewer workers than in other industries, such as coal mining or shipbuilding, would have received support in reporting an accident or in pursuing a claim for compensation. Further, in circumstances where little worker unity existed injured workers would have been cautious of claiming against the firm and this too would have kept the accident figures artificially low. Any of the many sub-contracted workers who were injured or killed would not have been set against the chemical industry data and evidence has also been presented to show that the industry took steps to present an impression of being a safe employer by 'transporting' injured employees into the workplace and thereby creating low and false accidents records.

Chapter Three

Assessing the Damage II: Poisoning and Occupational Diseases

> *Despite the 200 years that have passed since observing the first occupational cancer [scrotal skin cancer in chimney sweeps}, a positive, definite association between industrial exposure and the occurrence of cancer in humans has only been established for 26 chemicals (or industrial processes).*[1]

Watterson has argued that unlike infectious diseases that float between social boundaries posing a threat to all social classes, occupational diseases are specifically related to those who are exposed to the materials and processes at the point of production. Historically therefore occupational diseases have overwhelmingly impacted on the lower socio-economic groups and perhaps this explains why occupational diseases, which are rarely contagious, have been given less importance and are often left unchecked for centuries.[2] Occupational diseases are also sometimes difficult to recognise due to the fact that the symptoms experienced by the worker may be common to other non-occupational diseases such as coughs, fatigue, loss of appetite, indigestion or, simply, pain. Further, many years can elapse between exposure to a substance and an occupational disease developing. Indeed, a process may have been worked for a number of years and may have ceased altogether many years before any of the workers develop an illness. The delay between exposure and disease is known as the latency period and diseases contracted over long periods of time are known as chronic diseases. This differs from an acute reaction whereby the symptoms and the reactions occur within very short periods of time. British chemical workers experienced both chronic and acute occupational diseases and the cause and effect of these will be discussed below.

At the beginning of the twentieth century the atmosphere that existed within many of Britain's chemical works was described as, 'one of unpleasant fumes and

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[1] A.W. LeServe, C. Vose, and C. Wigley, *Chemicals, Work and Cancer*, Workers' Educational Association, Nelson & Sons, (London 1980), p.43

[2] A. Watterson, 'Why We Still Have 'Old' Epidemics and 'Endemics' in Occupational Health: Policy and Practice Failures and Some Possible Solutions', p.107-126 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives, MacMillan, (Hampshire 1999), p.108*

stinks, either acrid, stifling or nauseating.'[3] Whilst this may not have been an especially conducive environment in which to work it was the toxic properties of the chemicals rather than their smell that posed a health risk to the workers. By the early 1900s some established chemicals had been recognised as posing a danger to the health of chemical workers but it was untypical to see risk awareness accompanying the production of a new substance. For example, the fumes of aniline, carbon bisulphide, nitric acid or benzene had a negative impact on the health of chemical workers but these effects were not officially discussed in 1913 the reason being that none of these 'new' products had been included in the official definitions of a gas.[4] Therefore, although workers exposed to the fumes of aniline suffered from headaches, fatigue, dizziness, respiratory damage and heart failure no official efforts were being made to halt this. Carbon bisulphide fumes were killing some and damaging others with liver, kidney or central nervous system damage being the most common symptoms. Benzene would be later identified as a carcinogenic substance but even short-term exposure to the fumes caused nausea, vomiting, narcosis, a reduction in blood pressure, dermatitis, skin and respiratory damage whilst exposure to the fumes of nitric acid could result in serious respiratory damage or even death.[5]

Although chemical process workers were faced with a variety of potentially health damaging substances Russell has noted that up to 1914 protective clothing and equipment was 'rarely provided' leaving most workers little option but to improvise their own protection from the processes and products.[6] Depending on the work being undertaken strips of muslin cloth (the muzzle) would be wrapped around the worker's mouth to prevent fumes or dust being inhaled, paper was stuffed in and around shoes or clogs to guard against spillages and old sacking material was used as temporary overalls or wrapped around the hands as a form of glove. Unsurprisingly, only limited success was achieved by these improvised means. Filters placed over the mouth for example may have stopped larger particles of dust but they were less efficient in preventing tiny particles of dust or fumes and gases from entering the

[3] M.R. Fox, *Dye-Makers of Great Britain, A History of Chemists, Companies, Products and Changes, 1856-1976, Imperial Chemical Industries PLC*, (Manchester 1987), p.40
[4] Annual Report of the Chief Inspector of Factories and Workshops, PP1914, Cd. 7491, p.141
[5] Physical and Theoretical Chemistry Laboratory, Oxford University, www. physchem.ox.ac.uk/msds/
[6] C.A. Russell, 'The Organic Chemicals Industry to the First World War', pp.197-238 in C.A. Russell, (ed) *Chemistry, Society and Environment, A New History of the British Chemical Industry*, Royal Society of Chemistry, (Cambridge 2000), p.236

body. Indeed, when the German army first used chlorine and phosgene gas as weapons of war in 1915 no respirator existed in Britain to provide protection from their effects.[7] Self evidently therefore no process worker associated with the manufacture of these gases would have had protection. With little or no attention being paid towards the workers health the men had no alternative in responding to leaks of poisonous gas other than by 'stuffing a wet handkerchief in their mouths, clenching their teeth on it, and shutting off the valves.'[8] With an abundant supply of available labour scant regard was paid to developing a suitable and efficient respirator. In fact, it was not until gassing incidents on the Western Front began to threaten British military plans that experiments to find an effective respirator were begun.[9] Therefore, it was the need to keep soldiers alive and fighting in the trenches that brought about the development of the military respirator and from this emerged the industrial respirator.

On the eve of the Second World War the Senior Medical Inspector could still report on the high number of occupational gassing incidents that were occurring. This he hoped, would be corrected by the 'international situation' a matter that would make the workers more 'gas minded' and 'respirator minded.'[10] Indeed, despite the presence of potentially dangerous dusts, gases, and fumes in the workplace there is evidence to suggest that some workers so exposed did not always wear respirators or masks. Various reasons can be cited to explain why this was so such as the fact that a daily exposure to the fumes could render the operator oblivious to the smell. For example, on being questioned if there were any noticeable fumes within his plant Peter Dodds stated that there was a slight smell at first but that this had soon disappeared. His wife immediately interrupted the interview to contradict this statement recalling that, 'the smell never disappeared…every time you [Mr Dodds] came home from work I could smell the plastics…it seemed to cling to your hair and your skin.' Mr Dodds recalled 'it was the fumes of the polymer…after two or three weeks you couldn't smell it.'[11] Derek Rogerson recalled visiting a chemical plant to

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[7] N.T. Freeman, *Protective Clothing and Devices*, United Trade Press, (London 1962), p.50
[8] N.T. Freeman, *Protective Clothing and Devices*, United Trade Press, (London 1962), p.50
[9] *Ibid*, p.50
[10] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1938, PP 1939 (Cmd.6081) HMSO London, p.62
[11] Interview: D. Walker with P. Dodds, 25 November, 2005, p.5

do some maintenance work and where the men joked about the fumes to which they were exposed:

> This stuff used to come off this pipe, used to come through it like, God, you know, the tears would be running down your face you know and the blokes used to say to me (laughs) 'Oh you'll never have a cold while your working here mate.'[12]

There was also the possibility that the conditions of work made wearing protection extremely uncomfortable or that the respirators that were available were of such a poor design and quality they were ignored.[13] For example, one former chromate process worker could still recall that in the period 1939 to 1945 he and his colleagues all wore 'muzzles' made from muslin cloth to protect themselves from the fumes and dusts in their factory.[14] This muzzle was not worn in place of a properly fitted respirator it was because this cheap material was what the firm had supplied. As will be discussed below this level of protection was hopelessly inefficient and occupational respiratory damage, including chronic bronchitis and lung cancer, would be experienced by many of these chromate workers. However, where the danger posed by the fumes was immediate a different response was needed. Doug May recalled:

> You could go up on the saturator section, what we called the saturator section, and sometimes up there you would get a whiff of ammonia, it might be a small leak or something of that nature, and by golly you know, you'd get the hell out of there quickly, you'd grab a mouthful of air (inhales deeply) and that would do you 'cos you were on the run, you know. Get the hell out of this, you know, or in the end, you would…I would always take a breather set with me if I was working in a certain area, I would carry a ten-minute breather set with me just

[12] Interview D. Walker with D. Rogerson, 21 March 2005, p.23
[13] Similar problems with badly designed respirators were encountered in the asbestos industry. See G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), p.28
[14] Interview: D. Walker with R. Fitzpatrick, 13 August 2004, p.2

in case. Because if you're caught in it you'll never forget it, you got to get out quick.[15]

At an ICI soda ash plant in 1953 it was found that the workers were being 'constantly exposed to a heavy concentration of ash dust' and that following initial bouts of uncontrollable sneezing and nasal irritation many workers suffered from perforation and loss of the nasal septum.[16] It was acknowledged by the ICI research

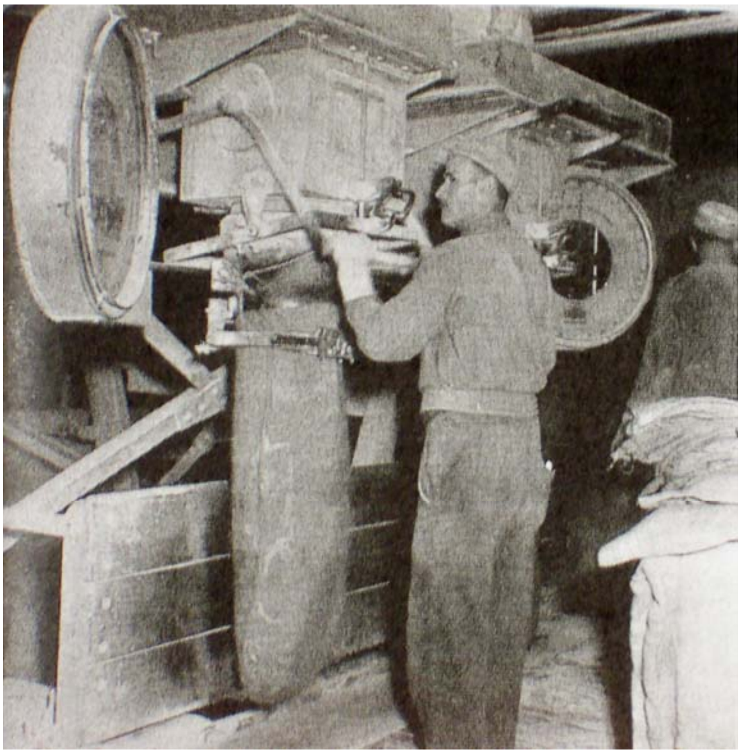

Illustration 5: Packing soda ash, 1953.

Source: R. McL. Archibald, 'Perforation of the Nasal Septum Due to Soda Ash' pp.31-37 in *British Journal of Industrial Medicine*, (11) 1954, p.33

team that the septum had both a physiological and anatomical importance and that changes to the structure could be harmful.[17] An efficient, well-fitted, and comfortable mask would have reduced this risk but the report stated that packing soda ash was 'a hot job' and that the packers 'did not like protective masks or mutton

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[15] Interview D. Walker with D. May, 06 September 2005, p.12

[16] R.McL Archibald, 'Perforation of the Nasal Septum Due to Soda Ash' pp.31-37 in *British Journal of Industrial Medicine*, (11) 1954, pp.33-34

[17] R.McL Archibald, 'Perforation of the Nasal Septum Due to Soda Ash' pp.31-37 in *British Journal of Industrial Medicine*, (11) 1954, p37

cloth.' The report had noted that the temperature of the ash at the packing point varied from 120º to 130º F.[18] ICI decided not to share their research findings with the workers nor did they think it appropriate to carry out pre and post employment examinations. The reason given for this decision was that it was thought that it might lead to 'neurosis' amongst the workforce.[19] The recommendations made in the report did not call for the design and provision of a more suitable mask but instead set the long-term goal of reducing or eliminating dust levels. Whilst this aim was admirable it was not met. Six years after the initial research had been conducted a second survey in 1959 revealed that dust exposure at the ICI soda ash plant was 'both heavy and prolonged.'[20]

Meeting the material needs of the First World War created excessively high demands on British chemical workers. Concerned about flagging output, some government officials began to speculate in 1915 that if health and safety measures were improved this might also improve industrial efficiency and therefore productivity would increase. As has been stated above, the group charged with turning this logic into practicality was the Health of Munitions Workers Committee (HMWC). By 1916, the HMWC had noted that 'the manufacture and manipulation of toxic chemical substances…have brought many special dangers to the lives and health of munitions workers.'[21] Of the many dangers identified, attention was brought to those engaged with tetrachlorethane, trinitrotoluene, and other nitro or amido derivatives of benzine which were resulting in cases of toxic jaundice and which were now to be notified to the Chief Inspector of Factories.[22] The manufacture of nitric acid, a toxin associated with the manufacture of explosives, could also be a risky occupation and as the demand for explosives increased then so too did the risks of exposure to nitrous fumes. For those unfortunate enough to be working in areas where, as the HMWC described it, 'accidental escapes of nitrous fumes' occurred,

[18] R.McL Archibald, 'Perforation of the Nasal Septum Due to Soda Ash' pp.31-37 in *British Journal of Industrial Medicine*, (11) 1954, p32
[19] R.McL Archibald, 'Perforation of the Nasal Septum Due to Soda Ash' pp.31-37 in *British Journal of Industrial Medicine*, (11) 1954, p37
[20] C.P. Chivers, 'Respiratory Function and Disease Among Workers in Alkaline Dusts' pp.51-60 in *British Journal of Industrial Medicine*, (16) 1959, p.52
[21] 'Special Industrial Diseases' Health of Munitions Workers Committee, Final Report, Industrial Health and Efficiency, PP 1918, (Cd. 9065), p.75
[22] *Ibid*, p.75

the initial symptoms experienced by the workers were an irritation to the eyes and a bad cough.[23] As these were of a relatively minor nature many workers simply carried on working and therefore the exposure continued. Indeed, having a cough was virtually ubiquitous in working class communities. However, with a higher level of exposure the worker was likely to collapse, usually within a period of up to three hours. An increased discharge of mucus would then occur along with bouts of vomiting and thereafter congestion of the respiratory system rapidly developed. Within 30 hours the victim would be dead having remained conscious 'until near the end.' In response to the increasing numbers of cases of poisoning by nitrous fumes the HMWC recommended that 'emergency helmets' with a supply of 'fresh air' should be placed near the workplace and that notices should be posted in factories warning workers not to remain in an area where an accidental escape had taken place.[24]

It is difficult to measure the success of this prevention policy as the only way to do so is to analyse the numbers of officially reported cases of gassing. Nitrous fume poisoning figures for 1915 and 1916 are unavailable but for the years 1914, 1917, 1918 and 1919 the figures show that 9(2), 62(5), 27(7) and 5(2) workers were gassed or killed.[25] Given the fact that tens of thousands of workers were employed in the munitions sector this shows that a surprisingly low percentage suffered from this particular form of poisoning and that the numbers suffering decreased substantially by the end of the war period. Clearly a lower demand for munitions offers one logical explanation for the reduced figures in 1919. However, doubt must exist over the accuracy of this data. Indeed, Ineson and Thom have demonstrated that despite clear evidence of toxic poisoning amongst female munitions workers statistical data was manipulated and falsified in relation to the numbers of women suffering so that the war effort would not be hampered.[26] Moreover, other reasons exist that question

[23] *Ibid* , p.82
[24] Health of Munitions Workers Committee, Final Report, Industrial Health and Efficiency, PP 1918, (Cd. 9065), pp.82-83
[25] E. Crooks, *The Factory Inspectors, A Legacy of Industrial Revolution*, Tempus, (Gloucestershire 2005), p.178 (Figures in brackets denote fatalities).
[26] A. Ineson, and D. Thom, 'T.N.T. Poisoning and the Employment of Women Workers in the First World War,' pp.89-107 in P. Weindling (ed) *The Social History of Occupational Health*, Croom Helm, (Kent 1985), p.89

the veracity of the data, for example, discussing the 905 reported cases of gassing that had occurred between 1932 and 1937 the Chief Inspector of Factories noted:

> The [above] table gives no true picture of the actual number of cases of workmen affected by gas either slightly or even to the extent of being rendered unconscious. Unless the after-affects are such as to keep the workman away from work for three days the Department does not necessarily hear of the case.[27]

Yet, where workers had been absent for more than three days this would not necessarily mean that they would be included in the tables for the Department's attention. For example, at the United Alkali Company (UAC), a large supplier of munitions, many of the workers who were absent for more than three days were simply logged in the company's accident book as 'gassed' and 'did not return to works.'[28]

The UAC accidents books again provide some insight into the conditions of work, specifically in relation to those exposed to gases and fumes. In 1917 two UAC employees at the Pilkington-Sullivan Works in Widnes, Thomas Daniels and Ralph Phillips, were both 'gassed by fumes' that had escaped from a 'damaged earthenware pipe.'[29] Daniels returned to the works some three weeks later but Phillips did not and no claim against the firm was made. The report did not state which type of gas had escaped. A similar vagueness surrounded the chemical involved in an incident a few months later when a 37 year-old labourer died 'due to the absorption of some toxic substance.'[30] The most probable reason that explains why the causative agents in these and other cases remained undefined is that in most chemical works different substances were produced under the one roof. Without a proper investigation it would have been difficult to determine which specific toxic substance delivered the final blow. Finding the precise substance may only have been required if a court case

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[27] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1937, PP 1938 (Cmd.5802) HMSO London, p.59
[28] DIC/UA8/5/11-22. Accident Books of United Alkali Company Limited 1914-1928
[29] DIC/UA8/5/13. Accident Book of United Alkali Company Limited, March 1916- January 1917
[30] DIC/UA8/5/14. Accident Book of United Alkali Company Limited, January 1917- August 1917

was to be held or insurance monies paid out but where neither the workers nor their families made a claim there was no need to determine the precise substance involved.

Over a period of a few weeks in 1918 five workers were 'gassed' in separate incidents at the Allhusen Works in Gateshead. The first incident happened on the 14th May and the fifth on the 4th June. The four men and one woman were all described as having suffered from 'inhalation of gas in the atmosphere of the building.'[31] Following their exposure the true consequences for the health of these workers can only be surmised, as once again the gas itself was not specified and none of the victims made a claim. It is not known whether a loss of health or fright kept these workers away all that is known is that none of the five victims who had been gassed returned to the Allhusen Works. Again, the true damage done to the health of a 49 year-old pyrite breaker (a task reserved for those who were no longer fit enough to do other work) is also unspecified after he had 'inhaled gas that was floating about.'[32] The man never made a claim or returned to the works. A clue to one type of gas inhaled by the Allhusen workers can be found in the case of a 72 year-old labourer named William Irwin, who had worked in the Allhusen Works for 14 years. In the accident report for this man it is stated that he 'inhaled chlorine gas whilst sweeping up the gangway at the mechanical Saltcake Furnace. The gas escaped through pipes that had been cracked by frost.'[33] Inhaling chlorine gas causes coughing, nausea, vomiting, headache, dizziness and difficulties in breathing. It can also result in pulmonary oedema (a build-up of fluid in the lungs). As yet another victim of poor plant maintenance Irwin's earnings dropped substantially from his usual 65/- per week to a compensatory level of 25/- per week. This situation continued for a period of twenty-eight weeks until the Company granted him an unspecified pension due to his 'old age.'[34]

At the Widnes Works ten men were gassed in March 1921with four of the ten dying immediately. The four men killed were aged between 19 and 27 years old and had an average of ten weeks experience in the works. Their cases were settled in the County Court for the sum of £300 each whilst the other six victims, who had all been

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[31] DIC/UA8/5/15. Accident Book of United Alkali Company Limited, May 1918- March 1919
[32] DIC/UA8/5/16. Accident Book of United Alkali Company Limited, March 1919-December 1919
[33] DIC/UA8/5/15. Accident Book of United Alkali Company Limited, May 1918-March 1919
[34] The amount of pension was unspecified.

involved in the attempted rescue effort for the deceased men made no claim on the UAC and never returned to the works.[35] In 1927, Patrick Mulroy, a 38 year old man with five months experience in the Pilkington-Sulliven Works, died from 'congestion of the lungs' after being exposed to an escape of phosgene gas from 'a leaky joint in the exit main.'[36] Phosgene gas was the nerve gas used in the trenches during World War One and even slight gassing could cause a dry burning throat, numbness, vomiting, chest pain, shortness of breath and a cough with phlegm. Patrick Mulroy had obviously been exposed to a large dose and the result was almost immediate. The gas would have dissolved in the fluid of his lung tissue and caused severe burns. Large quantities of the tissue fluid would then flood the lungs and pulmonary oedema would result. The notes attached to this case demonstrate the iniquity of the society in which people lived and worked. Mr Mulroy had gone to work that day to earn his living and had been killed simply because the UAC had failed to properly maintain the equipment that it used to transport known lethal substances. The UAC paid Mr Mulroy's widow the sum of £10, a sum that equated to just less than three weeks of her former husbands wages.[37] The legal secretary for UAC received the sum of £15.12.0 in respect of the work he had undertaken for the court. Commenting on the financial priorities of compensation schemes Bartrip noted that in 1912:

> Insurance companies were responsible for some 33 per cent of workmen's compensation payments, [yet] only 63 per cent of premium income was going towards benefits, the rest was financing commissions, management expenses and profit. Moreover, of the 63 per cent an undisclosed amount consisted of legal and medical expenses. The Holman Gregory Committee found, in the early nineteen twenties, that only some 48 per cent of premiums were being paid in benefit while profits exceeded 20 per cent.[38]

[35] DIC/UA8/5/18. Accident Book of United Alkali Company Limited, October 1920-August 1922
[36] DIC/UA8/5/22. Accident Book of United Alkali Company Limited, February 1927-June 1928
[37] The accident report states that the average weekly wage for Mr Mulroy was £3.10.6
[38] P. Bartrip, 'The Rise and Decline of Workmen's Compensation' pp.157-179 in P. Weindling, (ed) *The Social History of Occupational Health*, Croom Helm, (London 1985), p.171

As was discussed above, some 'new' gases were not officially acknowledged in 1913 although this did not prevent them from being manufactured or used. Indeed, it was not until 1924 that poisoning by carbon bisulphide or aniline became notifiable industrial diseases whilst chronic benzene poisoning had to wait until 1936 to achieve the same status.[39] Despite the statistical unreliability for data on cases of gassing it would seem that gassing remained a serious health risk to the workforce in chemical works up to the middle of the twentieth century. For example, between 1939 and 1947 there were a total of 4,386 reported cases of occupational gassings with 222 workers losing their lives.[40] Waldron has noted that conditions of work during the Second World War were 'arduous' and the need to meet blackout regulations led to a reduction in ventilation systems leading to 'a greater exposure than normal to some toxic substances.'[41] He further argued that there was 'a very considerable rise in the number of gassings' and that many of these were the result of exposure to carbon monoxide or nitrous fumes. Although the *numbers* of gassing accidents increased it was also significant that the *rate* of gassing accidents increased as can be seen in Table 6 below.

Table 7: Rate (10^5) of all gassing accidents reported to the Factory Inspectorate, 1938-1944

Year	**1938**	**1939**	**1940**	**1941**	**1942**	**1943**	**1944**
Men only	5.25	4.72	14.92	19.70	19.50	17.684	11.84
Men & Women	3.40	3.06	9.32	11.92	11.15	9.93	6.70

Source: H.A. Waldron, 'Occupational Health During the Second World War: Hope Deferred or Hope Abandoned?' pp.197-212 in *Medical History*, (41) 1997, p.204

Just as had been the case during the First World War, the inhalation of nitrous fumes was again associated with the manufacture of munitions and in the period

[39] Statutory Rule and Order 1924/1505. Association of British Chemical Manufacturers, *Safety Rules for Use in Chemical Works, Part II, Detailed Instructions*, (London, 1952), p.189 and Annual Report of the Chief Inspector of Factories on Industrial Health for the Year 1960, PP 1961 (Cmnd. 1478) HMSO, London, p.54
[40] Annual Report of the Chief Inspector of Factories for the Year 1947, PP 1949 (Cmd.7621) HMSO London, p.66
[41] H.A. Waldron, 'Occupational Health During the Second World War: Hope Deferred or Hope Abandoned?' pp.197-212 in *Medical History*, (41) 1997, p.202

1939 to 1945 there were 892 victims of nitrous fume poisoning with 10 men dying.[42] The evidence indicates that little had been learned since 1915 with more workers falling victim to this form of poisoning during the Second World War than during the First. Nonetheless, the *Chemical Trade Journal and Chemical Engineer* had little hesitation in announcing a 'striking reduction' in the numbers of nitrous fume victims during the years 1947 to 1950 when only 31 cases and one fatality occurred.[43] Again, a decrease in the demand for munitions is the most likely reason to explain this as no mention is made of any specific preventative measures having been implemented. Importantly however, reductions in the total number of occupational gassings began to be witnessed during the 1950s although 2,373 workers were still gassed and 285 of these died.[44] By the mid 1960s the numbers being gassed fell sharply and there were approximately 100 gassing cases and 4 fatalities reported each year in the latter half of the decade.[45] One reason that explains this improvement was that by the 1960s chemical engineers were being consulted at the process design stage and that the new chemical plants being constructed were having protective features built into their design.[46] One contemporary writer on occupational health issues commented on this changed approach and noted that, 'this is yielding good results because much attention has been given to methods of reducing the frequency of operations that involve risk to the workers.'[47]

The manufacture of some new products could also bring about improved conditions of work but these conditions were necessary to ensure uninterrupted production and were not implemented for the health of the worker *per se*. One example of this can be seen in the description of the essential conditions required for the manufacture of a new product (Melinex) at an ICI plant in Dumfries in 1960. Thus, according to one ICI publication:

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[42] E. Crooks, *The Factory Inspectors, A Legacy of Industrial Revolution*, Tempus, (Gloucestershire 2005), p.178

[43] *Chemical Trade Journal and Chemical Engineer,* January 13, 1950, p.112.

[44] Annual Report of the Chief Inspector of Factories on Industrial Health for the Year 1959, PP 1960 (Cmnd. 1137) HMSO, London, p.46

[45] Annual Reports of H.M. Chief Inspector of Factories for the Years 1965 to 1968, (Cmnd. 2724), (Cmnd. 3080) (Cmnd. 3358) (Cmnd. 3745) (Cmnd. 4146)

[46] Annual Report of the Chief Inspector of Factories for the Year 1960, PP 1961 (Cmnd. 1479) HMSO, London, p.53

[47] E.E. Lieber, *Occupational Health, Guide to Safeguards Against Employee Sickness and Accident*, Business Publications, (London 1964), p.45

> The clean air condition necessary for efficient and continuous production was a new phenomenon for employees. Considerable effort was devoted to training, for example, in explaining the purpose of each item of equipment, in emphasising the very high standards of cleanliness now essential, in demonstrating the meticulous care needed to set controls and dies, and in cleaning and polishing so that no possible contamination would enter the film.[48]

Therefore, in 1960, working in clean air was to become a *new* experience for the workers at this plant. This was enhanced by a range of other measures all implemented simply to ensure that 'efficient and continuous production' occurred. However, some of methods used to ensure that efficient and continuous production was achieved were less conducive to the physical wellbeing of the operators. To achieve a 'clean air condition' the building had no windows and was therefore artificially lit throughout. The process itself was a continuous one and required shift workers to attend to the product amidst very high noise levels. One of the former workers at this plant discussed his participation in a health survey that had been undertaken over a period of weeks in the mid 1970s. Following repeated and failed requests to ICI for a copy of the results of this research (the ICI manager claimed the results had been lost) the operator finally managed to obtain a copy from the survey team themselves. He stated:

> What the survey showed was that all the senses were being adversely affected due to the conditions and all their [ICI] operators with longer service were affected the worse. Basically, what was happening is at the start of our shift cycle and at the end of our shift cycle your hearing, your eyesight, and your reaction time was slower but on your days off they all picked up again and at the start of the next shift cycle you were practically where you were at the start of the first shift cycle. But, as you were getting older and your length of service was

[48] W.R. Irving, *Drungans Means Business, A Short History of the ICI Site at Drungans from 1939-1986*, Imperial Chemical Industries P.L.C. (Dumfries 1987), pp.17-18

> getting longer it was taking you longer to recover and your senses was going and it's worse…it was a lot worse than other people. But I mean we were a helluva noisy area, you were in an area where it was all fluorescent lighting there was no…it was all artificial lighting there was no natural light at all and they [the survey team] said that was one of the worst things about the whole place…was the lighting was affecting the eyesight and the noise was affecting the hearing. But…ICI promised to do something about it but…even the new plants that were designed, the likes of Melinex Two [started 1966] and Melinex Five [started 1985] after that had no windows.[49]

As the decades passed reductions in gassing incidents demonstrated that more effort was now being made to improve the working conditions. This trend was allied to the changed social and political atmosphere that had begun during the Second World War and which helped strengthen trade unions and brought the Labour Party into a position of influence within government. Johnston and McIvor have also argued that more employers and managers came to realise that by positively addressing health and safety issues productivity and company loyalty could be enhanced.[50] Within this new era the ICI Industrial Hygiene Research Laboratories set to work and by 1955 they had identified maximum allowable concentrations for 151 toxic dusts, fumes and metals.[51] By 1960, there were more than 250 threshold limit values (TLVs) listed for gases, vapours, toxic dust, fumes and mists.[52] At one level this signalled that some work had been undertaken to establish a safe working environment. However Markowitz and Rosner have argued persuasively that the establishment of a threshold limit value system in the US chemical industry was flawed in that:

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[49] Interview: D. Walker with KG, 25 November 2005, p.11
[50] R. Johnston, and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, (East Lothian 2000), p.55
[51] M.W. Goldblatt, 'Research in Industrial Health in the Chemical Industry' pp.1-20 in *British Journal of Industrial Medicine*, (12) 1955, p.1
[52] N.T. Freeman, *Protective Clothing and Devices*, United Trade Press, (London 1962), pp183-187

> The industry knew that threshold limit values (TLVs) were a benchmark of what was achievable, although not necessarily what was safe. Still the [chemical] industry continued to rely on standards for which there was often inadequate information and that today look arbitrary.[53]

Tweedale echoes such a view and has shown that the former head of the Medical Research Council's Pneumoconiosis Unit considered TLVs to be little better than 'informed guesswork rather than scientific fact.'[54] As will be shown, this indeed was the case and both the British and American chemical industries exposed their workforces to threshold limit values that were latterly found to be at best injurious and, at worst, lethal. Yet, in 1954 an optimistic outlook for the occupational health of chemical workers was presented when a *Times* article reported on the annual conference of the Sanitary Inspectors' Association. The article stated:

> The leading chemical manufacturers are constantly testing the carcinogenic properties of new substances so that in future there is much less chance of repeating the tragic story of the last 30 years.[55]

As was being acknowledged here, there had indeed been a tragic story. However, reducing the risks did not mean eliminating them and just as had occurred in the earlier period many of the 'new' chemicals that went into full production had yet to be fully analysed over the long term. Having invested heavily in the research and development of new chemicals employers had to ensure that the production of these would not be interrupted. It was therefore important to the employers that the chemical workforce believed that steps had been taken to protect their health. As will be shown below this sometimes meant that chemical firms were economical with the truth when it came to identifying health hazards.

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[53] G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003), pp.171-172
[54] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), p.258
[55] *The Times*, 'Cancer Tests on New Substances, Fighting Occupational Disease,' September 11, 1954, p.3

By definition, ‘accidental’ escapes of gas could never be eradicated yet, for example, no study was ever undertaken to determine the effects of repeated low-level exposures to the fumes of nitric acid, despite its continued use. By 1973, one source suggested that chronic bronchitis would be the most likely outcome.[56] From as early as 1907 the Departmental Committee Report on Compensation for Industrial Diseases had argued that bronchitis could not be included as an industrial disease as they could not distinguish between bronchitis of an industrial origin and bronchitis caused by some other means. This decision was reached despite their lack of doubt that bronchitis was often caused by the ‘inhalation of fumes of chlorine or other irritating gases.’[57] Indeed, one part of a wider research project has shown that between 1949 and 1967 Glasgow chromate workers suffered from a ‘significant excess mortality’ from bronchitis.[58] These deaths would not have been reported as occupational deaths and therefore would not have shown in government statistics as an increased mortality in the chromate manufacturing industry. Indeed, the uncertainty of what specific health damage was being visited upon chemical workers renders much of the associated health damage invisible. For example, methanol had been used in industrial processes since the nineteenth century and from that time had been identified as a dangerous substance. Nonetheless, even by the early 1950s the chemical industry remained unsure as to how much of this substance workers could be exposed to before the accumulation would constitute a toxic hazard.[59] In the meantime, amidst such levels of indifference and ignorance, chemical workers were expected to carry on working.

As indicated above, with the development of the industry in the twentieth century many thousands of ‘new’ chemicals came to be manufactured. In 1934 the Chief Inspector of Factories noted that whilst it was important to remain vigilant with regard to known industrial diseases ‘particular attention must be directed to new forms of poisoning occasioned by the use of chemicals, many of them complex in

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[56] J.M. Stellman, and S.M. Daum, *Work is Dangerous to Your Health, A Handbook of Health Hazards in the Workplace and What You Can Do About Them*, Vintage Books, (New York 1973), p.160
[57] Report of the Departmental Committee on Compensation for Industrial Diseases, HMSO, PP 1907, (Cd. 3495), p12
[58] J.M. Davies, D.F. Easton , and P.L. Bidstrup, ‘Mortality from Respiratory Cancer and Other Causes in United Kingdom Chromate Production Workers’ pp.299-313 in *British Journal of Industrial Medicine*, (48) 1991, p.300
[59] G. Leaf, and L.J. Zatman, ‘A Study of the Conditions Under Which Methanol May Exert a Toxic Hazard in Industry’ pp.19-31 in *British Journal of Industrial Medicine*, (9) 1951

character, the effects of which on the human subject little is known.'[60] The fact that so little was known did not deter manufacturers from pushing ahead in their pursuit of profits and it was left to others to play 'catch-up' and find out what they could about the substances being handled. In many cases, knowledge of the potential dangers was only gained through first-hand experience. For example, Oliver, a pioneer of occupational health, noted in 1935 that the workers he interviewed reported 'again and again' that they had been exposed to dangerous substances but only discovered that this was the case long after the event.[61] Two years later, Mackenzie, the founder of the Industrial Health Education Council (later the Industrial Health Education Society) wrote of the technological and scientific advancements being made in industry and expressed similar concerns to those reported by Oliver. Mackenzie was perturbed by the fact that industry was making rapid but unchecked advances leaving the unsuspecting process workers to act as human guinea pigs. As Mackenzie stated:

> Almost every advance in industrial method means the birth of some new baffling health problem and that tens, perhaps hundreds, of workers will suffer and many even die before effective preventive measures can be evolved.[62]

Twenty years later, in 1956, Meiklejohn, a specialist in occupational health, noted the large increase in the number of organic compounds being manufactured and how interest in these had focussed on their commercial value 'rather than in their toxic effects on the workman.'[63] Nonetheless, by the middle of the twentieth century, thanks to the efforts of a variety of groups and individuals, a list of substances had been identified as being of danger to workers and the resultant illness defined as an

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[60] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1933, PP 1934 (Cmd.4657) HMSO London, p.53

[61] Sir Thomas Oliver as quoted in A. Watterson, 'Occupational health education in the United Kingdom workplace: looking backwards and going forwards? The Industrial Health Education Society at Work 1922-1940, pp.366-371 in *British Journal of Industrial Medicine*, (47) 1990, p.369

[62] J. Mackenzie *Industrial Health Education Society Annual Report*, 1936 Quoted in L.G. Norman, 'Advancing Frontiers in Industrial Health', pp.73-81 in *British Journal of Industrial Medicine*, (20) 1963, p.73

[63] A. Meiklejohn, 'Sixty Years of Industrial Medicine in Great Britain', pp.155-165 in *British Journal of Industrial Medicine*, (13) 1956, p.159

occupational disease. This meant that the victims could potentially receive some financial compensation and that certain preventative measures may have been put in place to reduce or prevent exposure. In other words, the use or manufacture of known harmful chemical substances was to be regulated, not banned. At this juncture the list of occupational diseases associated with the industry included poisoning by lead, manganese, phosphorus, arsenic, mercury, carbon bisulphide, benzene, dinitrophenol, tetrachlorethane, tricresyl phosate, triphenyl phosate, diethylene dioxide, methyl bromide, chlorinated naphthalene, nickel carbonyl, nitrous fumes, beryllium, and chrome ulceration.[64] Perhaps the most insidious of all occupational diseases were those that had long latency periods and often resulted in death. Only a few such occupational diseases have ever been officially connected to the industry and granted 'prescribed' status. A specific examination will now be made of three areas of the industry to examine the causes and effects of exposure to chromates (metals), dyestuffs (organics), and vinyl chloride monomer (plastics).

Chrome Ulceration and Lung Cancer

Originally used in the dye, tanning and pigment industries during the early nineteenth century chromates have also been used in the manufacture of ceramics, paints, pharmaceuticals, explosives, wood preservatives, as well as for use in chromium plating. Chrome ulceration had been officially identified as an occupational hazard from as early as 1893 when a government inquiry reported on the dangers to the health of chemical workers.[65] Discussing chrome ulcerations in 1952 the Chief Inspector of Factories could still comment that:

> The work in the bichromate manufacturing industry is relatively heavy and contamination, particularly of minor cuts and abrasions,

[64] Association of British Chemical Manufacturers, *Safety Rules for Use in Chemical Works, Part II, Detailed Instructions*, (London, 1952), pp.190-191

[65] Report on the Conditions of Labour in Chemical Works, The Dangers to Life and Health of the Workpeople Employed Therein and the Proposed Remedies, Chemical Works Committee of Inquiry, PP 1893, (C.7235), p.5 (hereafter referred to as the Chemical Works Inquiry)

may occur from dust or liquid. In consequence the sites affected are more varied, and multiple ulcers occur more frequently.[66]

What this report did not comment on was that the cause of much of this physical damage was due to the fact that the chromate plants in Britain were old, dusty, and prone to leakage. Richard Fitzpatrick was employed at his local chromate manufacturing plant near Glasgow between 1939 and 1945, a place that his father had worked in for many years. Mr Fitzpatrick recalled, 'what a knew was just my father coming home and…I really didnae think it was a place to be working in to be honest with ye but ah had to finish up going there.'[67] He recalled the heavy and dirty work that a Polish colleague had to undertake on a daily basis during the mid 1940s thus:

> He was in there at half-past-four and five o'clock in the morning and finished up about twelve or one. He had a certain amount of wagons to empty and he never called on the pug (small train) to shift the wagons. He had a big thingmy (indicates a lever) and he shifted them himself. While he was emptying these wagons…obviously all the pipes round about there was always a leak somewhere…and he was always stripped and I think that wi' him sweating it (chromic acid) went on tae his back…he had quite a lot of liquor and chrome holes on his back.[68]

This man would have been supplied with an overall and obviously the heavy nature of the work had led him to remove this. Wearing the overall would perhaps have provided a limited amount of protection but exposed to regular leaks of chromic acid a cotton overall would provide little resistance. A more successful preventative measure would have been to secure the leaks through proper and regular maintenance but this was obviously not a feature of that workplace.

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[66] Annual Report of the Chief Inspector of Factories for the Year 1952, PP 1954 (Cmd.9154) HMSO London, p.165
[67] Interview: D. Walker with Richard Fitzpatrick, 13 August 2004, p.2
[68] Interview D. Walker with R. Fitzpatrick, 13 August 2004, p.7

Chrome ulcers were slow to heal and could penetrate to the bone and lead to the loss of fingernails or deformity of the joints of the fingers. Other damage being done to the chromate workers included the ulceration, perforation, or destruction of the lining membrane of the nostrils with the clouds of chrome dust also being suspected from an early stage of being responsible for causing damage to the respiratory system.[69] Despite the introduction of the Special Rules and Regulations

Illustration 6: Chrome ulcer caused by handling sodium bichromate

Source: D. Hunter, *The Diseases of Occupations, Sixth Edition*, Hodder and Stoughton, (London 1980), p.436

introduced by the government in 1893 there is clear evidence, as will be discussed below, that these were not fully complied with and workers within the chromate-manufacturing sector continued to lose their septum and suffer from chrome ulcerations right through to the 1970s.[70] Indeed, not all chromate workers were exposed to toxic dangers within the confines of the factory walls. Some raked the toxic waste on the dumping grounds and suffered terribly from chrome ulcers, dermatitis and the loss of the nasal septum. One former worker's wife claimed that, 'his ears wept and stuck to the pillow; his eyelids would stick together; his toes and

[69] Chemical Works Inquiry, p.7
[70] D. Walker, 'Working in it, through it, and among it all day' Chrome Dust at J&J White of Rutherglen, 1893-1967' pp.50-69 in *Scottish Labour History Journal*, Volume 40, 2005, pp.56-57

feet were badly affected with ulcers, leading to amputation of his feet and he eventually lost both legs.'[71] Indeed, this woman suffered from dermatitis herself caused by handling her husband's chromate impregnated clothing prior to washing them. One maintenance worker reported that having been employed at the Glasgow works from 1964 to 1966 his nasal septum had been destroyed within the first year.[72] Another, who drove the dumper trucks full of chemical waste, claimed that the waste blew into his face but 'we were given a wee gauze and cotton wool mask that was no good at all.'[73]

The loss of the nasal septum as a direct result of occupation had been recognised for centuries but this affliction was accompanied by little, if any, pain and therefore had been largely ignored by most. Described in the 1950s as a 'symptomless condition' by someone whose nasal septum was clearly intact the unsociable consequences of loss could nevertheless be experienced by the victims.[74] According to Hunter the inconvenience experienced by those who suffered from the loss of septum was that mucus plugs tended to form in the nasal passages.[75] Richard Fitzpatrick recalled that his father was always clearing his nose and, having followed his father into the local chromate manufacturing plant near Glasgow, Mr Fitzpatrick admitted that he too had lost the septum and that he was 'always blowing and picking.'[76] Whilst this socially unacceptable practice may have been annoying the painful and more noticeable symptom of working with chromates was chrome ulceration. By 1920 this had become a notifiable industrial disease and from that year onwards official figures became available to show the number of victims suffering from this occupational disease. However, as will be demonstrated below, this data is unreliable and fails to provide a true picture of the numbers of workers who suffered from this industrial disease.

In the late 1920s and 1930s an increase occurred in the amount of consumer goods receiving chrome plating. By the mid 1930s the Factory Inspectorate chose this reason to explain why there had been an increase in chrome ulceration cases in

[71] *The Rutherglen Reformer*, July 26, 1991, p.5
[72] *News of the World*, September 3, 2000, p.8
[73] *The Rutherglen Reformer*, July 26, 1991, p.5
[74] R. McL. Archibald, 'Perforation of the Nasal Septum Due to Soda Ash' pp.31-37 in *British Journal of Industrial Medicine*, (11) 1954, p.37
[75] D. Hunter, *The Diseases of Occupations, Sixth Edition*, Hodder and Stoughton, (London 1980), p.437
[76] Interview: D. Walker with R. Fitzpatrick, 26 August 2004, p.3

the chrome plating industry.[77] It follows that an increased demand for chrome plating had to be accompanied by an increased demand for chromates as without them no plating could be achieved. As can be seen in Table 7, apart from minor blips in 1929 and 1938 the increased demand does not appear to have led to any great surge in the numbers of reported cases of chrome ulceration. What is striking about these figures is that up to the late 1940s the men employed in the main chromate manufacturing plants in Britain worked on a 'high-lime' process using hand-fired furnaces and according to specialists who have studied the process technology this would have resulted in the men being exposed to 'especially high' levels of toxic dust, a catalyst for chrome ulcers.[78] Given that this was the case the figures for chrome ulceration should be high up to the mid 1940s when rotary kilns were finally installed in all three chromate works and thereafter should decline to some extent.[79]

Table 8: Number of reported cases of chrome ulceration in the chromate manufacturing sector, 1928 to 1938 and 1946 to 1956

1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	TOTAL
3	**13**	**6**	**2**	**2**	**2**	**1**	**Nil**	**1**	**2**	**15**	**47**

1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	TOTAL
5	**11**	**43**	**28**	**36**	**80**	**87**	**65**	**103**	**104**	**92**	**654**

Source: Annual Reports of the Chief Inspector of Factories and Workshops

Yet, as can be seen this is clearly not the case and remarkably a higher number of cases begin to appear in the mid 1940s onwards with a total of 654 cases of chrome ulceration being recorded between 1946 and 1956. This is approximately 14 times the number of chrome ulcerations that had been recorded between 1928 and 1938. The numbers employed in chromate manufacturing remained relatively static

[77] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1934, HMSO, PP 1935, (Cmd.4931), p.59
[78] J.M. Davies, D.F. Easton, P.L. Bidstrup, 'Mortality from Respiratory Cancer and Other Causes in United Kingdom Chromate Production Workers' pp.299-313 in *British Journal of Industrial Medicine*, (48) 1991, p300
[79] *Ibid*, p300. Rotary kilns had been available since 1928 but only installed at one British plant.

throughout the periods in question and therefore this variable cannot account for the larger number of victims in the mid 1950s.[80] Improved reporting by an increased number of factory inspectors could provide one plausible explanation for the higher figures as could the introduction of the Industrial Injures Act in 1948 as this had made it easier to claim compensation. As has been already commented upon, the 1920s and 1930s witnessed an increased demand for chrome plated goods and therefore the Depression era does not provide a satisfactory explanation for the lower figures recorded during that period.

Three other sources provide evidence to indicate that the figures for chrome ulceration are unreliable. First, a former employee at the Rutherglen works claimed that between 1939 and 1945 'chrome holes were pretty common' that 'dust was always flying about' and that there was no ventilation system.[81] This testimony is verified by the second source, an environmental survey undertaken by the Medical Research Council in 1951. Therein it was reported that 'perforation of the nasal septum was common' and that the concentration of chromium in the dust-laden atmosphere was 327 to 550 times higher than the maximum allowable concentration.[82] This information immediately raises doubts about the government data for chrome ulcerations. If such high dust levels existed in the 1950s then how could the numbers for chrome ulceration be so low during the 1930s when the old manufacturing process was still in use? Third, in 1960 the Chief Inspector of Factories on Industrial Health reported on the unusually high number of cases of chrome ulceration that had occurred in 1959. The reason offered for this was that some old plant buildings had been demolished and this had disturbed 'deposits of waste material' that were in the roof areas. In total, 167 workers were affected by the 'chrome bearing dust' that had accumulated in the rafters of the buildings and which had clearly not been dealt with earlier by the extraction or ventilation systems.[83] In

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[80] According to the research statistics provided by Bidstrup and Case the Rutherglen works employed around 500 chromate process men, the Bolton works employed 44 and Eaglescliffe works had 179. The Rutherglen works was the largest manufacturer and evidence exists to suggest that in the mid 1920s the workforce stood at 900. W.R. Shearer, *Rutherglen Lore, Story of an Eight Hundred Year Old Royal Burgh*, 1126-1926, Gardner (Paisley 1926), p.341

[81] Interview: D. Walker with R. Fitzpatrick, 26 August 2004

[82] M. Buckell, and D.G. Harvey, 'An Environmental Study of the Chromate Industry' pp.298-301 in *British Journal of Industrial Medicine*, (8) 1951, p.301

[83] Annual Report of the Chief Inspector of Factories on Industrial Health for the Year 1960, PP 1961 (Cmnd. 1478) HMSO, London, pp.34-35

the same report it was also stated that at a 'modern and well equipped' chromate manufacturers there had only been 14 cases of chrome ulceration.[84] Incredibly therefore, in this one modern and well-equipped chromate plant in 1959 there had been more cases of chrome ulceration than there had been in all three British plants put together in 1929. From the evidence above it is possible to argue that the entire data for chrome ulceration is unreliable and therefore provides no true insight into the extent of suffering that must have been endured by the chromate workforce. Indeed, the medical evidence and worker's testimony from 1900, together with the oral testimony and atmospheric and technological evidence for the 1940s and 50s strongly suggests that chrome ulceration could have been running at epidemic proportions amongst the chromate workforce until at least the 1960s when the new plant, improved ventilation, and enclosed handling systems were finally operational.[85] As will be discussed below, why these improvements were carried out in the late 1950s is not explained by the continued existence of chrome ulcerations but by the response to the fact that lung cancer had been linked to chromate manufacturing.

The *Glasgow Medical Journal* of 1890 reported that nasal cancer had been found in a 47 year-old chromate worker from Glasgow.[86] No follow up study was undertaken at this juncture and it was not until 1922 that the possibility was even considered when Thomas Legge observed 175 cases of nasal perforation but failed to find any cancers. It would take another 26 years before the British would consider the possibility that cancer could be an occupational hazard associated with chromate manufacturing. Meanwhile, German researchers published their first results in the 1930s followed by the United States in the 1940s with both sets of data indicating that the incidence of lung cancer among chromate workers was significantly higher than expected.[87] Indeed, according to Gross and Kölsch, the German health

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[84] Annual Report of the Chief Inspector of Factories on Industrial Health for the Year 1960, PP 1961 (Cmnd. 1478) HMSO, London, p.35

[85] D. Walker, 'Working in it, through it, and among it all day' Chrome Dust at J&J White of Rutherglen, 1893-1967' pp.50-69 in *Scottish Labour History Journal*, Volume 40, 2005

[86] D.A. Newman, *Glasgow Medical Journal*, 33, (1890), pp.469-470
The case involved a forty-seven year old male who had worked for twenty years in the Scottish chromate industry and suffered from adenocarinoma of the left inferior turbinated body and perforation of the nasal septum.

[87] E. Pfeil, 'Lungentumoren als Berufskrankung in Chromatbetrieben' *Deutsche Medizinische Wochenschrift*, (61) 1935, pp1197-2000 also W. Machle and F. Gregorious, 'Carcinoma of the

authorities had officially recognised that lung cancer was a possible occupational disease by 1936.[88]

Up to 1948 the British had conducted no research in this area and had no reliable mortality data to work with. With the re-invigorated trade union and labour movement urging and gaining reform in the post war era the state appointed Medical Research Council (MRC) were instructed to investigate this possibility. The MRC study involved just over 700 workers from three chromate-manufacturing factories in Britain with all of the workers being interviewed and *x*-rayed.[89] After 8 years of research the MRC were finally able to report that 12 men from their cohort had died from lung cancer. According to the researchers Bidstrup and Case, this demonstrated 'a statistically significant increase of deaths found over deaths expected from this cause' and that 'an excessive mortality from carcinoma of the lung' had to be admitted.[90] They estimated a latency period of 18 years but as the researchers had not been asked to determine the carcinogenic occupational factor then they could not state what precisely was causing this to happen. One earlier investigation of the working environment had suggested that it was reasonable to suggest that 'the most dangerous points in the manufacture' were where the highest levels of insoluble and soluble chromium compounds were found.[91]

Having received the results of the research in 1956 the employers responded by introducing a series of major plant and process changes designed to reduce the risk. As discussed above, rotary kilns had replaced hand-fired furnaces during the early 1940s at the Bolton and Glasgow works whilst Eaglescliffe had used these since 1928. Although this early improvement resulted in a more efficient output its significance to the health of workers was that they would have been exposed to lower levels of dusts containing sodium chromate and soluble calcium chromate. The consequences of the delay in introducing these to the largest factory in Glasgow are

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respiratory system in the United States chromate-producing industry', *Public Health Rep* (63) 1948 pp.1114-1127

[88] S. Langard, and T. Norseth, 'A Cohort Study of Bronchial Carcinomas in Workers Producing Chromate Pigments' pp.62-65 in *British Journal of Industrial Medicine*, (32) 1975, p.62

[89] The three plants were in Rutherglen (Glasgow), Bolton (Greater Manchester), and Eaglescliffe (Teeside). Chromates have been manufactured in these plants respectively from 1820s to 1967, 1893 to 1966 and from 1928 until the present.

[90] P.L. Bidstrup and R.A.M. Case, 'Carcinoma of the Lung in Workman in the Bichromate Producing Industry in Great Britain', pp.260-264 in *British Journal of Industrial Medicine*, (13) 1956, p.262

[91] M. Buckell, and D.G Harvey, 'An Environmental Study of the Chromate Industry' pp.298-301 in *British Journal of Industrial Medicine*, (8) 1951, p.301

self evident. Other improvements introduced from the mid 1950s included changes in the way that the raw materials, residues, and finished products were prepared and handled with these being largely dealt with on a mechanised basis. Improved kiln gas entry flues and improved ventilation systems were also introduced along with enclosed handling systems.[92] Annual *x*-rays were provided for all of the workers from 1955 onwards and all new recruits were given pre-employment medical examinations.[93]

Of the original cohort of 723 men who were medically examined in 1948, 217 sought other employment and were never traced, 57 retired because of ill health or age, and 59 men died. It is at least possible to argue that a percentage of the 217 men who could not be traced may have died from occupational lung cancer although their deaths would ever have been attributed to the chromate manufacturing industry.[94] What is known is that of the 59 men who died the cause of death in 12 cases was due to carcinoma of the lung. In 1956 Bidstrup and Case stated that the ratio between mortality found from carcinoma of the lung in their sample of workers and that expected was 360 per cent and that 'by the time all of the men at risk have lived their life span it will probably be found that the factor is very much higher.'[95] Indeed, in 1981 a follow-up study of the men employed between 1948 and 1977 found that there was a twofold excess of lung cancer deaths at the Eaglescliffe plant and a nearly threefold excess at the Rutherglen plant and that 116 deaths from cancer of the lung had occurred.[96] This study also reported an increased risk of cancer of the nose and nasal sinuses with 2 deaths recorded. It was not until 1986 that the Industrial Injuries Advisory Council would recommend that lung cancer be prescribed as an occupational disease but only for those handling or being exposed to

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[92] R. Beck, *A Poisonous Past Lies Buried Inches Below the Surface of Scottish Soil; Almost a Decade After Chromium Was Discovered in South Lanarkshire How Safe is Safe?* Masters of Environmental Studies, University of Strathclyde, (Unpublished) 1999, p.6

[93] J.M. Davies, D.F. Easton and P.L. Bidstrup, 'Mortality from Respiratory Cancer and Other Causes in United Kingdom Chromate Production Workers' pp.299-313 in *British Journal of Industrial Medicine*, (48) 1991, p.300

[94] In 1955 it was stated that 'those who lose their health in one job may seek another and it is to the latter that their death must be debited at registration since no full occupational history is, or could be, sought at that time.' A. Bradford Hill, 'The Measurement of Health and Disease in Industry', in *British Journal of Industrial Medicine,* (4) 1955, p.330

[95] P.L. Bidstrup and R.A.M. Case, 'Carcinoma of the Lung in Workman in the Bichromate Producing Industry in Great Britain', pp.260-264 in *British Journal of Industrial Medicine*, (13) 1956, p.263

[96] M.R. Alderson, N.S. Rattan, and L. Bidstrup, 'Health of Workmen in the Chromate-Producing Industry in Britain, pp.117-124 in *British Journal of Industrial Medicine*, (38) 1981

the dust of zinc chromate, calcium chromate or strontium chromate.[97] By 1991, an updated report showed that 218 chromate workers had died from cancer of the lung and that 4 workers had died with nasal cancer.[98] In a postscript to the 1991 follow-up study it was further stated that seven new cases of lung cancer had occurred and that two of the men had since died.[99]

The Dyestuffs Sector and Bladder Cancer

A German surgeon named Rhen first reported occupational bladder cancer amongst men in the dyestuffs sector in 1895 although at this stage he thought that aniline was responsible. By 1912, following a trip he had made to Germany, the existence of this disease was relayed to Britain by Thomas Legge, the then Senior Medical Inspector of Factories. Undoubtedly the war would have distracted attention from this matter but according to Goldblatt, by 1920, British manufacturers were aware that the German dyestuffs industry had been 'preoccupied on the bladder tumour problem.'[100] Nonetheless, it was not until 1926 that the first cases of bladder tumour were officially reported to have been found amongst British dyestuffs workers.[101] By the early 1930s more cases of bladder cancer were being reported whilst some attempt was being made to identify the precise cause. For example, reporting on five cases of bladder cancer in chemical workers in 1931 the Factory Inspectorate drew up a list of the suspect chemicals used in the manufacture of synthetic dyes. The list included, ά-naphthylamine, β-naphthylamine, benzidine, naphthionic acid, phenylene-diamine, toluene-diamine, nitro-naphthalene,

[97] P.A.B. Raffle, R.I. McCallum, R. Murray, (eds) *Hunter's Diseases of Occupations*, Hodder and Stoughton, (Kent 1987), p.275
[98] J.M. Davies, D.F. Easton , P.L. Bidstrup, 'Mortality from Respiratory Cancer and Other Causes in United Kingdom Chromate Production Workers' pp.299-313 in *British Journal of Industrial Medicine*, (48) 1991, p299
[99] *Ibid*, p.312
[100] M.W. Goldblatt, and J. Goldblatt, 'Industrial Carcinogenesis and Toxicology', pp.185-562 in Merewether, E.R.A. (ed) *Industrial Medicine and Hygiene, Volume 3*, Butterworth, (London 1956), p.234
[101] T.S. Scott and M.H.C. Williams, 'The Control of Industrial Bladder Tumours: A Code of Working Practice Recommended by the British Dyestuffs Industry for the Manufacture and Use of Products Causing Tumours of the Bladder' pp.150-163 in *British Journal of Industrial Medicine*, (14) 1957, p.150

dimethylamine, toluol, toluidine and aniline.[102] At this stage no one, or combination of any of these, were identified positively as the causative source of the cancer.

The manufacture of intermediate dyestuffs was just one of many industrial outputs that emanated from the city of Huddersfield in the north of England. In 1932 an investigation of the records held at Huddersfield Royal Infirmary revealed that admission for cases of papilloma and cancer of the bladder for the years 1900 to 1932 showed the following:

1900-1910	3 chemical labourers out of 12 males (25 per cent)
1900-1911	3 chemical labourers out of 15 males (20 per cent)
1922-1932	26 chemical labourers out of 37 males (70.2 per cent)[103]

Indeed, between 1900 and 1932 the Huddersfield Royal Infirmary admitted a total of 64 cases for bladder tumour and therefore one half of all admissions had been chemical labourers.[104] Further analysis for the period 1928 to 1932 revealed that the mortality rates among chemical workers with bladder cancer in the dyestuffs sector was 38 times higher than for the male insured population of Huddersfield.[105]

[102] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1931, PP 1932 (Cmd.4098) HMSO London, p.87
[103] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1933, PP 1934 (Cmd.4657) HMSO London, p.56
[104] M.W. Goldblatt, 'Vesical Tumours Induced by Chemical Compounds' pp.65-81 in *British Journal of Industrial Medicine*, (6) 1949, p.65
[105] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1933, PP 1934 (Cmd.4657) HMSO London, p.56

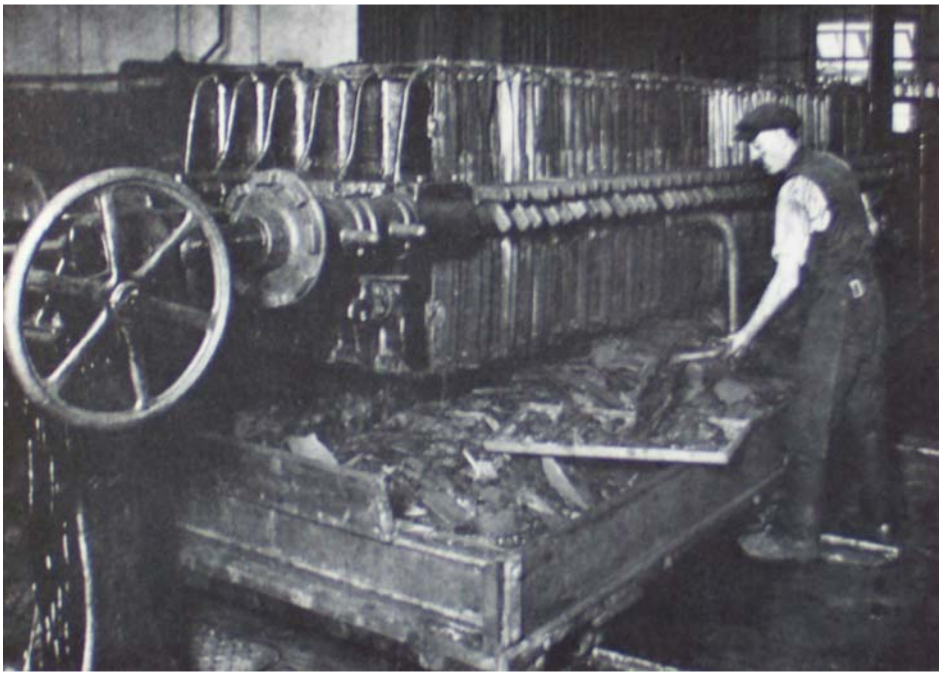

Illustration 7: Intermediates department, Huddersfield dyestuffs works, 1935

Source: W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.334

One reaction to these findings might have been to ban the use of the substances involved and find an alternative but another thirty years would pass before this option would even be partially considered. In the meantime the long drawn-out process of identifying the precise causative agent was pursued. As many related processes were worked alongside each other the investigators could only state that the causative agent or agents were likely to be found in a list that included, aniline, ά-naphthylamine, β-naphthylamine, benzidine, diphenylamine, toluidine, and dianisidine. Faced with the certainty that the increased numbers of cases of bladder tumour were a result of exposure to one or other of these substances measures were introduced to reduce dust and fume levels, to improve plant hygiene, and to train workers in the proper handling of the products.[106] With these improvements in place the workforce were relied upon to continue producing the intermediate dyestuffs.

[106] M.W. Goldblatt, and J. Goldblatt, 'Industrial Carcinogenesis and Toxicology', pp.185-562 in Merewether, E.R.A. (ed) *Industrial Medicine and Hygiene, Volume 3*, Butterworth, (London 1956), p.243

By the mid 1930s some efforts were being made to identify papilloma of the bladder much earlier in the medical history by means of chemical and microscopic examinations of the workers' urine. These examinations were not carried out on all of the workforce although having found some 'unsuspecting' early victims the firm concerned expressed their desire to carry out this procedure on all its employees three or four times a year thereafter.[107] The Factory Inspector welcomed this addition to the measures already in place because it was clear that in spite of the fact that protective clothing and respirators had been issued, 'many of the employees were inevitably exposed for a number of years to repeated doses of potentially carcinogenic intermediates.'[108] Demonstrating how ineffective this preventative policy was Goldblatt could make the same observation more than ten years later. Thus:

> It is certain that, in spite of many precautions and improvements introduced in recent years, the workers do come into significant contact with a great variety of compounds among which the supposed bladder carcinogens must be included…do what we may, there are operations in this industry which inevitably expose men to dust and sometimes fumes, for example, flaking, drying, grinding, filtering. Shovelling toxic products into reaction vessels is notorious as a dust disseminator.[109]

Indeed, even in 1947 solidified β-naphthylamine was broken by hand and then finely ground on hand operated roller mills in small sheds. Noting the conditions of work that had prevailed in 1947 Goldblatt suggested that:

> It is unnecessary to emphasise the state of the atmosphere in such a shed in which the workman was not only enveloped in naphthylamine

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[107] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1936, PP 1937 (Cmd.5514) HMSO London, p.50
[108] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1936, PP 1937 (Cmd.5514) HMSO London, p.50
[109] M.W. Goldblatt, 'Vesical Tumours Induced by Chemical Compounds' pp.65-81 in *British Journal of Industrial Medicine*, (6) 1949, p.67

dust, but every nook and cranny in the shed was filled with it and the floor was thick with it.[110]

Having analysed the annual incidence of tumours in two dyestuffs factories Goldblatt discovered that between 1934 and 1947, 99 men had been found to have a bladder tumour and that from that total 59 of the men died. The prognosis for the long-term survival amongst the 40 men still alive was considered to be poor.[111]

In 1947 the Dyestuffs Group of the Association of British Chemical Manufacturers (ABCM) decided to set up and finance a major research project on industrial papilloma of the bladder. According to the ABCM this research had been delayed due to the war. The study, undertaken by the Chester Beatty Research Institute, would later be acknowledged as the 'prototype of historical cohort studies' and involved the participation of twenty-one firms.[112] The results of the research were published in 1954 and showed that contact with ά-naphthylamine, β-naphthylamine or benzidine in either manufacture or use caused many more bladder tumours in workers than in those not exposed to these chemicals. Exposure periods of a few months were found to be sufficient to cause a tumour and working in the dyestuffs sector of the chemical industry increased the risk of dying from a bladder tumour by thirty-fold.[113] Latency periods ranged from 16 years following exposure to β-naphthylamine and benzidine and 22 years when exposed to ά-naphthylamine. It was also estimated that from a group of 2,466 men 'one in ten' of the men who had been exposed to ά-naphthylamine, β-naphthylamine and benzidine had already developed bladder tumour, and that this was expected to reach one in five before all the men were dead from all causes.[114] The survey showed that up until 1952 there

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[110] M.W. Goldblatt, and J. Goldblatt, 'Industrial Carcinogenesis and Toxicology', pp.185-562 in Merewether, E.R.A. (ed) *Industrial Medicine and Hygiene, Volume 3*, Butterworth, (London 1956), p.252
[111] M.W. Goldblatt, 'Vesical Tumours Induced by Chemical Compounds' pp.65-81 in *British Journal of Industrial Medicine*, (6) 1949, pp.70-77
[112] S.D. Stellman, 'Issues of Causality in the History of Occupational Epidemiology', pp.151-160 in *Social and Preventative Medicine*, 48 (3) 2003, p.151
[113] R.A.M. Case, M.E, Hosker, D.B. McDonald, and J.T. Pearson, ' Tumours of the Urinary Bladder in Workmen Engaged in the Manufacture and Use of Certain Dyestuff Intermediates in the British Chemical Industry, Part 1. The Role of Aniline, Benzidine, Alpha-Naphthylamine, and Beta-Naphthylamine' pp.75-104 in *British Journal of Industrial Medicine*, (11) 1954, p.79
[114] *Ibid*, p.95

had been 455 cases of bladder tumour found in the British chemical industry and that 'the disorder, tumour of the bladder, must be regarded as a killing disease.'[115]

These results were passed to the government prior to their publication and in 1953 papilloma of the bladder was officially recognised as an occupational disease. This now meant that the workers with this disease who could prove they had been exposed to β-naphthylamine were able to submit a claim for compensation. They could also be awarded court damages if they could show that the employer knew about the bladder cancer risk and did not take appropriate steps to prevent this happening[116] It was accepted that so far as β-naphthylamine was concerned 'no plant could be economically devised which could be operated with any degree of certainty that tumours would not occur' and therefore the manufacture and use of β-naphthylamine was stopped.[117] Alternatives to β-naphthylamine were introduced for the dyestuffs sector but no alternatives existed at that point to replace ά-naphthylamine, benzidine, or the homologues and derivatives of benzidine, and therefore all of these continued to be utilised in the industry although precautions were intensified for their manufacture and use. These precautions were contained in a 1957 publication that laid out the code of working practice that the ABCM 'hoped' would be implemented by the member firms.[118] With 'The Control of Industrial Bladder Tumours' as its title the paper went on to list a variety of preventative measures that included the provision of protective wear, medical supervision, the design of new plant and to 'reduce to the minimum, and where possible to eliminate, all contacts between operator and carcinogens.'[119] In 1958, having amassed further evidence, the Industrial Injuries Advisory Council recommended that the definition of this occupational disease should be extended to include 'the epithelial lining of the renal pelvis or of the epithelial lining of the ureter.'[120] It was also decided at this

[115] *Ibid*, p.76
[116] http://oem.bmjjournals.com/ifora/examplecpd.pdf
[117] T.S. Scott, and M.H.C. Williams, 'The Control of Industrial Bladder Tumours,' p.158
[118] T.S. Scott, and M.H.C. Williams, 'The Control of Industrial Bladder Tumours: A Code of Working Practice Recommended by the British Dyestuffs Industry for the Manufacture and Use of Products Causing Tumours of the Bladder' pp.150-163 in *British Journal of Industrial Medicine*, (14) 1957, p.162
[119] T.S. Scott, and M.H.C. Williams, 'The Control of Industrial Bladder Tumours,' p.154
[120] Review of the Prescribed Diseases Schedule, Report of the Industrial Injuries Advisory Council in accordance with Section 61 of the National Insurance (Industrial Injuries) Act, 1946 on the question whether any adjustments should be made in the terms of prescription of Prescribed Diseases other than Pneumoconiosis and Byssinosis, PP 1958 (Cmnd. 416) HMSO, London, p.22

stage to extend the occupational coverage to include working with ά-naphthylamine, β-naphthylamine and any of their salts, diphenyl, auramine and magenta.

Undoubtedly the voluntary measures introduced by the ABCM must have had some positive impact on the industry but in 1967 a study of occupational dermatitis carried out at the Blackley Works in Manchester revealed gaps in the attempts to eliminate contact between operator and the dyestuffs. These works belonged to ICI and produced a range of dyestuffs, dyestuff intermediates, rubber chemicals and other products. The description of the works, which were owned and operated by the largest and wealthiest chemical firm in Britain, reveal that it had not been possible to fully implement the ABCM measures. Thus:

> The works is an old established one and the buildings and plant vary considerably in age; some parts date back to before the 1914-18 war, and others are quite new. In general, the standard of industrial hygiene is fair, although some of the older plants are not up to the standards achieved in more modern structures. Process workers may have skin contact with chemicals when charging materials to the reaction vessels or in the later stages of the processes in the course of filtration or drying procedures.[121]

The report made no mention of carcinogenic materials but it did find that the chemical process workers had a rate of dermatitis that was six times that of those who had little or no chemical exposure.[122] The Carcinogenic Substances Regulations of 1967 finally prohibited the manufacture, use, and importation of β-naphthylamine, benzidine, and other closely related compounds. By this time the evidence that linked bladder cancer with working in the dyestuffs sector had been available for more than 40 years. In 1974 it was estimated that 20 per cent of all bladder cancers in industrial

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[121] K.S. Williamson, 'A Prognostic Study of Occupational Dermatitis Cases in a Chemical Works' pp.103-113 in *British Journal of Industrial Medicine*, (24) 1967, p.104

[122] K.S. Williamson, 'A Prognostic Study of Occupational Dermatitis Cases in a Chemical Works' pp.103-113 in *British Journal of Industrial Medicine*, (24) 1967, p.106

communities could be linked to occupational factors and that 'some occupations which were not previously suspected' were also subject to this hazard.[123]

Whilst investigating the incidence of bladder cancer amongst dyestuffs workers in the 1950s the research team also discovered that a high number of other workers were suffering from papilloma of the bladder. These workers were employed by Dunlop in the rubber industry and worked in a large factory in Birmingham where an antioxidant had been used throughout the 1930s and 1940s. The antioxidant, known as Nonox S, was manufactured by ICI and contained β-naphthylamine. The discovery of the papilloma cases amongst the rubber workers was mentioned to the medical officer of ICI's dyestuffs division who, due to his knowledge of the content of Nonox S, 'came up with the suggestion that Nonox S might be the responsible agent.'[124] In June 1949 Dunlop were informed of the potential dangers associated with Nonox S and they immediately stopped using this antioxidant. The following month ICI took the decision to withdraw Nonox S from sale. According to Fox, a former employee of ICI Organics Division, the Board of ICI Dyestuffs Division took this decision 'at the earliest opportunity.'[125] As will be discussed below whilst Fox may have believed this to be true this was not the case at all and despite the apparently swift decision 183 rubber industry workers are known to have died of bladder cancer between 1945 and 1964.[126] It is interesting to note that although Dunlop had stopped using Nonox S in 1949 the 'facts' surrounding this withdrawal only surfaced in parliament when cancer risks associated with the rubber industry were being debated in 1965.[127]

Employed from the mid 1940s at the Dunlop plant in Birmingham two workers who had been exposed to 'a great deal of fume originating from hot rubber in which Nonox S had been incorporated' were diagnosed as having bladder cancer

[123] C.A. Veys, 'Bladder tumours and occupation: a coroner's notification scheme' pp.65-71 in *British Journal of Industrial Medicine*, (31) 1974, p.66
[124] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB,* pp.311-332 in Knights Industrial Reports, Volume XI, October 1917- March 1972, Charles Knight & Co, (London 1972), p.313
[125] M.R. Fox, *Dye-Makers of Great Britain, A History of Chemists, Companies, Products and Changes, 1856-1976*, Imperial Chemical Industries PLC, (Manchester 1987), p.207
[126] P. Kinnersley, *The Hazards of Work*, Pluto Press, (London 1974), p.130
[127] *The Times*, February 16, 1965, p.17, 'Rubber Industry Hazards: Minister Orders Survey' See Chapter Six pp.

in 1966.[128] Represented by their trade union, both men pursued Dunlop and ICI from the late 1960s in order to establish liability. This was an important case not only for the two named men but also for the 450 other rubber industry workers who had been diagnosed with bladder cancer. Following the initial and inevitable denials of liability made by ICI and Dunlop the case had wound its way into the High Court by 1971. Here conclusive evidence was presented to prove that ICI were liable (and Dunlop to a lesser extent), as they had not acted as promptly as they could or should have done. ICI in particular were identified by the judge as having acted incorrectly and found that:

> By the beginning of 1939 the dangers of β-naphthylamine had been drawn forcibly to the mind of ICI by the negotiations for the undertaking to the Minister, the commissioning of the new β-naphthylamine plant and the large number of cases of bladder cancer at Huddersfield.[129]

The judge further held that:

> By 1942, ICI had in fact analysed Nonox S and received a report that it contained 1.8 per cent free naphthylamines by weight. That by 1942 ICI had in fact decided that the free naphthylamine content of Nonox S was a cancer hazard to their own workmen employed in handling the hot finished product. They certainly had decided this by 1945. That ICI knew the circumstances in which Nonox S was used in the rubber industry, including the temperatures to which it was subjected. That ICI must have assumed that part of the naphthylamine impurity was β-naphthylamine; at all events they could and should have discovered that the β-naphthylamine impurity was of the order of 0.25 per cent. That by 1943 ICI knew for certain that it was β-

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[128] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB,* pp.311-332 in Knights Industrial Reports, Volume XI, October 1971- March 1972, Charles Knight & Co, (London 1972), p.315 and p.330

[129] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB,* pp.311-332 in Knights Industrial Reports, Volume XI, October 1971- March 1972, Charles Knight & Co, (London 1972), p.318

naphthylamine itself that was a carcinogen rather than some impurity connected with its manufacture. At all material times ICI were wholly unaware of any safe level of exposure to β-naphthylamine.[130]

In reality therefore ICI had known of the lethal capabilities of Nonox S from 1942 and possibly from as early as 1940 and yet had knowingly delayed the removal of this deadly product for at least a further seven years and possibly nine. From this evidence it is also obvious that ICI had withdrawn Nonox S in 1949 as they had finally accepted the potentially lethal capabilities of this substance amongst the Dunlop rubber workers. Indeed, it was noted that there had been no indication from amongst 'the voluminous papers of Dr Goldblatt or any other medical officer of the dyestuffs division that the risk to users of either Nonox S or other products had ever been considered.'[131] Therefore, negligence is one factor that explains the delay surrounding the withdrawal of Nonox S from sale. The profit levels generated by this product would easily have covered the total sum of £21,000 paid in damages to both of the victims who took ICI to court.[132] ICI appealed the original decision but on October 31, 1972, this appeal was lost because negligence by ICI had been proven beyond doubt.[133] By 1973, an estimated 500 widows and former rubber workers had lodged claims against ICI, the largest and richest of the chemical firms that operated in Britain and, reputedly, one of the best.

Vinyl Chloride

Vinyl chloride is a colourless, flammable, toxic gas, first produced commercially in the 1920s and early 1930s in both Germany and the USA. It is used

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[130] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB,* pp.311-332 in Knights Industrial Reports, Volume XI, October 1971- March 1972, Charles Knight & Co, (London 1972), p.316

[131] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, October 31, 1972, Court of Appeal* pp.255-274 in Knights Industrial Reports, Volume XIII, October 1972- March 1973, Charles Knight & Co, (London 1973), p.259

[132] Profits in the rubber chemicals sector rose from £91,000 in 1928 to £301,000 by 1935. By 1948 home sales of Nonox S stood at 800,000lbs of which Dunlop took 325,000lbs. W.J. Reader *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.334 and *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB*, p.313

[133] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, October 31, 1972, Court of Appeal* pp.255-274 in Knights Industrial Reports, Volume XIII, October 1972- March 1973, Charles Knight & Co, (London 1973)

most extensively as a monomer (VCM) in the manufacture of polyvinyl chloride (PVC). The existence of PVC was noted by the British industry in 1937 but they did not begin producing it themselves until the need for substitute materials arose during the Second World War. With full production starting in 1942 around 5,000 tons of PVC was being manufactured annually by 1945 with the vast majority used as cable insulation for wiring systems on ships and aircraft. In the post-war era new and varied uses were found for PVC and, alongside the growing demand for new housing and cheap consumer goods, production levels rose from 149 thousand tonnes per annum in 1963 to 400 thousand tonnes by 1973.[134] Owen notes that PVC was a 'high-volume commodity chemical' and that the only companies able to make money manufacturing PVC were 'those who had the lowest costs, the best technology and a large share of the world market.'[135] Thus, chemical process workers manufactured VCM and PVC within a relatively new and modern sector of the British chemical industry. As will be shown below these factors did not prevent many workers experiencing a variety of occupational diseases and, for some of them, the outcome would prove fatal.

In 1953, with just over ten years or production already behind them, the plastics division of ICI published a research paper on the properties of PVC in which their scientists described VCM as a 'mild narcotic.' They issued a warning that if working conditions were to be 'considered satisfactory' concentrations of this gas 'were not to exceed 500 ppm' (parts per million).[136] The same threshold limit value (TLV) was established at the same point in time within the American plastics industry. A second article from the plastics division of ICI, published in 1959, discussed the toxic properties of the chemicals (such as lead and cadmium) that were now being added to the vinyl chloride in order to alter the properties of PVC.[137] In concluding the 1959 review of the plastics industry Harris noted, 'few substances

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[134] Annual Abstract of Statistics, No. 100, 1963, p.154 and No. 111, 1974, p.192
PVC was used extensively in the post-war housing boom as insulation in power cables as well as for plumbing and drain sections. Consumer goods made from PVC included unbreakable long-playing (LP) records, lightweight waterproof clothing, imitation leather, and for liquid containers.

[135] G. Owen, *From Empire to Europe, The Decline and Revival of British Industry Since the Second World War*, Harper Collins, (London 2000)

[136] D.K. Harris, 'Health Problems in the Manufacture and Use of Plastics' pp.255-267 in *British Journal of Industrial Medicine*, (10) 1953, p.260

[137] D.K. Harris, 'Some Hazards in the Manufacture and Use of Plastics' pp.221-229 in *British Journal of Industrial Medicine*, (16) 1959, p.222

have been subjected to such thorough investigations to ensure freedom from harm to those who make and use them.'[138] This was a bold claim yet there is little evidence to show that at that stage extensive occupational health research had been undertaken in Britain to confirm the validity of this statement. Indeed, according to Russell the German industry did not use lead in the manufacture of their PVC, even during the war, because of their strict factory legislation on lead compounds. However, the British plastics industry continued to use lead in the late 1960s despite the availability of many alternatives.[139] Moreover, according to Watterson *et al* the doubling of production levels of VCM and PVC between the 1960s and 1970s was not tracked in any way by activities that may have established if 'adverse health effects' were occurring amongst those who worked with VCM.[140]

This lack of thorough occupational health research became evident when, just five years after the ICI 'investigation' had been conducted, it was revealed in 1964 that a definite link had been established between exposure to VCM and a disease known as acro-osteolysis.[141] Acro-osteolysis was characterised by a deterioration of bone, particularly in the fingertips, with the fingers becoming slightly shortened and clubbed. The 'discovery' of this occupational disease was made in the American industry and according to Rosner and Markowitz, once the information had been passed to the heads of the US plastics industry they attempted to 'forestall any disclosures.'[142] Whether this deceit delayed investigations within the British industry it is not known, however, VCM related acro-osteolysis and Raynaud-like phenomena (coldness and numbness of the hands and feet) were not recognised as occupational hazards in Britain until 1966.[143] Contrary to the assurances given by the ICI scientists in the late 1950s investigations into these industry-related diseases revealed that the chemical workforce had actually been exposed to 'very high concentrations'

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[138] *Ibid*, p.229
[139] C.A. Russell, (ed) *Chemistry, Society and Environment, A New History of the British Chemical Industry*, Royal Society of Chemistry, (Cambridge 2000), p.250
[140] A. Watterson, S. Pickvance, M. Cairns and M.Wingfield, 'Report on a Health Survey of Ex-Vinatex Workers in Derbyshire and Associated Health Issues Surrounding Exposures to Vinyl Chloride Monomer', Chesterfield Trade Union Safety Team, Centre for Occupational and Environmental Health, De Montfort University, (Leicester 2000), p.2
[141] The word acro-osteolysis is derived from Greek. Akron means extremity, osteon means bone, and lysis means dissolution.
[142] G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003), pp.173-178
[143] www.iiac.org.uk/pdf/command_papers/Cm6645.pdf, p.5

of VCM.[144] Indeed, the Chief Inspector of Factories noted in 1975 that acro-osteolysis, Raynaud's phenomenon, and scleroderma (a disease of the immune system that causes the skin and soft tissue to become stiff, tight and shiny) had all been found amongst polymerisation workers who had 'regularly' been exposed to concentrations of VCM 'well over 1000ppm.'[145] That is, many chemical workers had been 'regularly' exposed to more than twice the TLV recommended by the industry itself and this exposure had resulted in workers suffering from an occupational disease.

Although acro-osteolysis had been identified in 1966 it was not until 1972 that the TLV for vinyl chloride was revised downwards to 200ppm and, according to the Chief Inspector of Factories, 'it was believed that this level, if properly observed, was adequate to control the fire, explosion and known health risks.'[146] As no reasons had been given to show that this level would guarantee a safe working environment it appeared that 'informed guesswork' was once again being used as a means to protect the workforce. The shortcomings of this method would surface within two years when the vinyl chloride TLV was reduced yet again, this time to a quarter of its previous value at 50ppm. Three years after this level had been agreed the levels were reduced once more in 1977 to 10ppm. The reasons that explain these reductions will be further discussed below.

According to Watterson *et al,* it was reported during the 1960s and 1970s that around 3 to 6 per cent of workers exposed to high VCM levels had contracted acro-osteolysis. However, research carried out amongst 162 former workers of the Vinatex VCM plant in Chesterfield, England, noted that 113 of those suffered from symptoms associated with Raynaud's Phenomenon and that 41 workers, or 25 per cent, had symptoms of acro-osteolysis.[147] Indeed, at an earlier juncture Vinatex themselves had settled the compensation claims of 35 workers who suffered from

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[144] A.J. Fox, and P.F. Collier, 'Mortality experience of workers exposed to vinyl chloride monomer in the manufacture of polyvinyl chloride in Great Britain' pp.1-10 in *British Journal of Industrial Medicine*, (34) 1977, p.9
[145] Annual Report of H.M. Chief Inspector of Factories for the Year 1974, PP1975, (Cmnd. 6322) HMSO, London, p.50
[146] Annual Report of H.M. Chief Inspector of Factories for the Year 1974, PP1975, (Cmnd. 6322) HMSO, London, p.49
[147] A. Watterson, S. Pickvance, M. Cairns and M.Wingfield, 'Report on a Health Survey of Ex-Vinatex Workers in Derbyshire and Associated Health Issues Surrounding Exposures to Vinyl Chloride Monomer', Chesterfield Trade Union Safety Team, Centre for Occupational and Environmental Health, De Montfort University, (Leicester 2000), p.6

acro-osteolysis. These Vinatex workers, like their counterparts in the USA, had all been instructed to enter pressure vessels (autoclaves) to clean the inner surfaces and in doing so had been exposed to heavy concentrations of VCM. The task itself involved workers lowering themselves into the pressure vessels that measured six feet in diameter and ten feet in height. Once inside the tank the only source of fresh air was a two-foot opening at the top.[148] Having begun manufacture in 1969 the Vinatex plant in Chesterfield had around 40 of these autoclaves. Discussing the high level of vapours in the tanks one former Vinatex worker, Geoffrey Larkin, noticed their intoxicating nature and commented that 'you'd feel as though you'd just came out of the pub.'[149] Another former worker, Colin Hadfield, recalled that in the early 1970s he kept asking his employer 'Is there any danger?' a question that always received the same reply, 'there was none.' Having worked for just over four years at the Vinatex plant Mr Hadfield contracted acro-osteolysis. This caused his fingers to whiten and numb, he became impotent, had pounding headaches, and was constantly tired.[150]

Levels of VCM recorded at the Vinatex plant varied considerably with one report for 1970 showing a level of 200ppm whilst in 1974 a level of 3000ppm was reported. Indeed, the readings were so varied that one figure for 1973 showed VCM levels of 50,000ppm, a level 100 times higher than that which was considered to be safe.[151] Therefore, although it had been acknowledged in the 1950s that vinyl chloride was a toxic substance and that it had 'anaesthetic properties' it remained the case that polymerisation workers were instructed 'regularly' to get inside autoclaves that contained excessively high concentrations of VCM.[152] The fact that these workers were instructed to do so (whilst being assured that all was safe) demonstrates that the owners and managers of the production process were either totally incompetent or had a deep disregard for the health of their workers.

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148 G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003), pp.192-193

149 www.chron.com/content/chronicle/special/vinyl/numbers.html, p.2

150 www.chron.com/content/chronicle/special/vinyl/numbers.html, p.1

151 A. Watterson, S. Pickvance, M. Cairns and M.Wingfield, 'Report on a Health Survey of Ex-Vinatex Workers in Derbyshire and Associated Health Issues Surrounding Exposures to Vinyl Chloride Monomer', (Leicester 2000), p.9

152 Annual Report of H.M. Chief Inspector of Factories for the Year 1974, PP1975, (Cmnd. 6322) HMSO, London, p.50

News of a more lethal health hazard surfaced in January 1974 when the Chief Inspector of Factories was informed that three American workers had died from angiosarcoma of the liver, a liver tumour caused by exposure to high levels of vinyl chloride monomer.[153] All of the deceased workers had been involved in cleaning autoclaves and the average period that the tumours had taken to develop was 19 years. In response, the Chief Inspector of Factories established an interim 'code of practice' which lowered the TLV for VCM from its 'safe' level of 200ppm (established just two years earlier) to one of 50ppm. He also insisted that VCM levels be monitored for each shift using computer technology and that this information be made available to the workforce.[154] Following some research into the industry it was found by 1975 that two British workers had died from angiosarcoma and that 32 VCM workers worldwide had been diagnosed with this occupational cancer.[155] The Health and Safety Executive (HSE) set up a register to collate cases of angiosarcoma and, through ICI initially, the British plastics industry established their own. Watterson *et al* have noted that although the industry register showed that 196 workers had this liver cancer by 1999 the register was 'incomplete.'[156] For example, the industry register contained no case histories of the Vinatex plant that employed 428 VCM workers. One of the former workers, David Foster, suffered from a liver condition and knew of others who were seriously ill or had died. He stated:

> These people have got away with industrial murder…they've known about this bloody stuff for a long time. They fooled people into believing it was bloody harmless…anytime anybody had any suspicions or qualms, they were soon dispelled by management…people were afraid to speak out.' [157]

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[153] Annual Report of H.M. Chief Inspector of Factories for the Year 1974, PP1975, (Cmnd. 6322) HMSO, London, p.48
[154] Annual Report of H.M. Chief Inspector of Factories for the Year 1974, PP1975, (Cmnd. 6322) HMSO, London, p.51
[155] A.J. Fox, and P.F. Collier, 'Mortality experience of workers exposed to vinyl chloride monomer in the manufacture of polyvinyl chloride in Great Britain' pp.1-10 in *British Journal of Industrial Medicine*, (34) 1977, p.1
[156] A. Watterson, S. Pickvance, M. Cairns and M. Wingfield, 'Report on a Health Survey of Ex-Vinatex Workers in Derbyshire and Associated Health Issues Surrounding Exposures to Vinyl Chloride Monomer', Chesterfield Trade Union Safety Team, Centre for Occupational and Environmental Health, De Montfort University, (Leicester 2000), p.8
[157] www.chron.com/content/chronicle/special/vinyl/numbers.html, p.2

Workers were afraid to speak out as they had to ensure continued employment and a regular income in order to provide some level of security for themselves or their families. Having witnessed her husband in this position the wife of a Vinatex worker recalled the final months of her husband's life who was dying from angiosarcoma. 'He was in terrible pain those last eleven months, terrible…he couldn't walk very far and his lung collapsed.' The HSE register for angiosarcoma was brought to an end after 20 years despite the fact that the longest recorded latency period for angiosarcoma was 40 years.

Conclusion

Perhaps the most significant reason that explains the relatively low numbers involved in accidents in the chemical industry is that accidents were more likely to be 'accidental' escapes of toxic dusts, gases, and fumes and where the consequences were not always immediately apparent. Yes, exposure to a toxic substance could result in almost instant death but many workers would unknowingly go on to suffer from chronic occupational illnesses and a relatively slow demise in their health. Indeed, many of the substances that were in full production were not fully understood and the consequences of 'accidental' exposure would only surface decades later when workers suffered from bladder cancer, respiratory damage and other cancers. Prior to being diagnosed as suffering from an occupational disease many workers became unfit for heavy manual work and were discarded by the chemical industry, forced to find work elsewhere. In many cases no official link existed between the industry and those who suffered and this meant that the statistical data for health damage in the chemical sector became wholly unreliable. Even where a link between exposure and ill health was acknowledged such as with chrome ulceration the figures have been shown to be totally untrustworthy and for those suffering from more insidious diseases such as occupational cancers the statistical evidence is patchy, poor, and incomplete. The true levels of death and injury that resulted from exposure to the many known and unknown toxins that were manufactured in the industry will never be known and therefore the official accident and injury data does not reflect the danger that existed for those who sold their labour power to the chemical industry between 1914 and 1974.

Chapter Four

The State, Factory Inspectors, and Medical Knowledge

> *But what are five Medical Inspectors among 150,000 factories and 130,000 workshops? They would need to be as old as Methuselah before they had once made the complete circuit.*[1]

> *Although a study commissioned by the firm, and carried out for them by respected academics, had found an excess of deaths over that to be expected, and this study had been published, the company had continued to exceed safe levels of the chemical carbon disulphide, and had reassured the workforce instead of telling them about the hazard.*[2]

Where little or no protection was available from the obvious hazards that existed within the workplace some workers developed their own means of protection to help ensure that they could continue to earn a living, at least in the short term. The limited knowledge they possessed about the effects chemical substances could have on the body heightened the risk factor and in most cases the methods workers devised were of a simple design and generally made from poor quality materials such as wrapping cheap muslin cloth over the mouth to prevent the inhalation of dusts or gases.[3] To a greater extent the workers were reliant on the efforts made by others to a) identify and investigate potential hazards, b) draw up sets of rules and regulations to ameliorate or remove dangers, and c) to widen the understanding of the risks and enforce legislative measures. Those with the responsibility for ensuring that these tasks were carried out and on whom the workers largely relied were the state, the Factory Inspectors, and those with medical knowledge.

The primary role played by the state was to pass and amend the legislation pertaining to industry. However, as Bowden and Tweedale have noted of the cotton industry, state decisions were influenced to varying degrees by the economic, social,

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[1] MSS.292C/140/4 (Medical Inspections, Reports and Articles of Sir Thomas Legge) TUC General Council, 'Prevention as a Benefit under the National Health Insurance Act' 24/06/1930

[2] S. Watkins, *Medicine and Labour, The Politics of a Profession*, Lawrence and Wishart, (London 1987), pp.118-119

[3] See Chapter Two, p.64

and political considerations relevant at the time.[4] Whilst considering appropriate areas for factory legislation account was taken of suggestions made by those with enough power to influence the decision makers. This would include, with varying degrees of success, the legal profession, social reformers, workers and their representatives, as well as employers and their representatives. The second agency of the three was the government appointed Factory Inspectors. In addition to their advisory role the inspectorate visited places of work to ensure that both employers and employees were meeting the conditions laid down in the legislation. Whilst the inspectorate had the power to prosecute employers for failing to comply with factory legislation historically, as Jones has argued, they tended to adopt a more educative stance.[5] The third group that influenced and shaped occupational health policies were those who had medical knowledge. This could include doctors working at a local level or more generally by occupational health specialists employed by the government, the Trades Union Congress (TUC), or by industrialists. Each of these three agencies will be examined in turn to see what impact they made on the working conditions that existed within the British chemical industry and to then draw these together to analyse their importance in shaping the way that working conditions were scrutinised.

The State

In 1915 the government showed no hesitation in becoming directly involved in the British chemical industry. It did so by taking responsibility for the development and supply of synthetic dyes and explosives as well as bringing help to the pharmaceutical and fertiliser sectors of the industry. In the aftermath of war the government also sent a secret mission to Germany to establish what methods the German manufacturers had used to produce explosives and poison gas. Of importance to the government was the fact that the German industry had been able to quickly convert their dyestuffs and pharmaceutical industries for war production. According to the British mission this 'illustrated the great military value of a well-

[4] Bowden, S. and Tweedale, G. 'Mondays Without Dread: The Trade Union Response to Byssinosis in the Lancashire Cotton Industry in the Twentieth Century' pp.79-95 in *Social History of Medicine*, Volume 16, No.1, 2003, pp.85-86
[5] H. Jones, 'An Inspector Calls: Health and Safety at Work in Inter-War Britain,' pp.223-239 in P. Weindling (ed) *The Social History of Occupational Health*, Croom Helm, (Kent 1985), p.224

organised dye and fine chemical industry.'[6] This report influenced the government's post-war policy on the chemical industry as was evidenced by their decision taken in 1919 to bring together two of Britain's dyestuffs manufacturers to form the British Dyestuffs Corporation and by their investment of £1.5 million in this firm.[7] The government then proceeded to protect the dyestuffs sector by introducing the Dyestuffs (Import Regulation) Act of 1920. This Act prohibited the import of dyes and pigments if they could be obtained from the British industry and was initially meant to last for ten years but actually remained in place until 1960.[8] By helping to consolidate, modernise, and protect the dyestuffs sector of the chemical industry the government had shown just how important it thought it was to the nation.

By contrast, protecting the workforce from the effects of chemicals provoked a less robust response from the government. Offering some limited protection to those working in the alkali, acid, and chromate sections of the industry the government introduced the first set of Special Rules and Regulations in 1893.[9] For the next thirty years these rules and regulations remained largely unaltered despite the many changes that occurred in the range of chemicals being produced.[10] Indeed, the 1893 rules and regulations had been framed mainly to address problems associated with the LeBlanc system of manufacture yet by 1914 this process was being replaced by the Solvay system leaving many of the rules out of date. Moreover, even where no change in the process or product had taken place the government were slow to respond to longstanding evidence of occupational disease in the industry. For example, in 1893 the government were informed that chrome ulcerations were caused by exposure to the chromate manufacturing process. They were reminded of this fact in the reports made by their appointed Factory Inspectors

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[6]Report of the British Mission Appointed to Visit Enemy Chemical Factories in the Occupied Zone Engaged in the Production of Munitions of War in February 1919, PP 1921, (Cmd. 1137), p.6

[7] The two firms involved were Read, Holliday and Sons and Levensteins Limited. Following a rather short period as BDC they were merged into ICI in 1926 to form the Dyestuffs Division of that firm.

[8] M.R. Fox, *Dye-Makers of Great Britain, A History of Chemists, Companies, Products and Changes, 1856-1976*, Imperial Chemical Industries PLC, (Manchester 1987), p.178

[9] Report on the Conditions of Labour in Chemical Works, The Dangers to Life and Health of the Workpeople Employed Therein and the Proposed Remedies, Chemical Works Committee of Inquiry, PP 1893, (C.7235)

[10] In 1908 some rules were made for the provision of welfare for those working with nitro or amino derivatives of benzene (dyestuff intermediates) and in 1913 for those working with chromates and bichromate of potassium or sodium (mordants). New products being manufactured included: organic solvents, various industrial gases, organic chemicals, and synthetics for which no provision had been made.

for the next 27 years before chrome ulceration finally became a notifiable industrial disease in 1920.[11] Similarly, recognised for its deadly and chronic effects from the early 1890s carbon bisulphide poisoning was not recognised as a notifiable disease until 1924.[12] A similar and sluggish government response is found in relation to other chemical substances through to the 1970s. Indeed, this type of response was not exclusive to the chemical industry with Weindling noting that it was a 'recurrent feature of the history of occupational health.'[13]

In 1921, the government reviewed the existing rules and regulations for the industry in order to take account of the developments that had taken place in the intervening years. Demonstrating just how limited the old rules and regulation had been once the Chemical Works Regulations (S.R.& O. 1922/731) were introduced some manufacturers were reported to have been puzzled interpreting those that attempted to address the liability of gas or fumes to escape.[14] Taking preventative measures was obviously an unknown consideration for many. However, other rules were much easier to understand such as Regulation 4 that prohibited the use of naked lights where flammable gases, fumes or dusts were used. This was designed primarily to protect the process but by doing so it also offered some protection to the process worker. Regulation 7 laid down stricter procedures for ensuring that those entering boilers, tanks, chambers etc. were safe to do so. This may have been a well-intended improvement to the rules but crucially no rule was created that called for a specific atmospheric test to be conducted prior to the men entering such vessels. Another fifteen years would elapse before this particular oversight was corrected under Section 27 of the Factories Act (1937). Indeed, although the Chemical Works Regulations of 1922 were more complex and did, to some extent, update the rules and regulations of 1893 they failed to take full account of the number of developments that had taken place in both the processes and type of chemicals being worked across the industry. For example, they offered no protection whatsoever

[11] Report of the Departmental Committee on Compensation for Industrial Diseases, HMSO, PP 1907, (Cd. 3495), p.8, and Annual Reports of the Chief Inspector of Factories, PP1909, p.215, PP 1911 pp.228-229, and PP1914, p.147
[12] Carbon Bisulphide Poisoning, (S.R. &. O. 1924/1505)
[13] P. Weindling, (ed) *The Social History of Occupational Health*, Croom Helm, (London 1985), p.16
[14] E. Crooks, *The Factory Inspectors, A Legacy of Industrial Revolution*, Tempus, (Gloucestershire 2005), p.143

against the new synthetic solvents that were being produced.[15] Moreover, unlike other industries that had relatively constant products or methods of manufacture, the chemical industry was in a constant state of evolution with new chemical substances being regularly developed and manufactured. Government legislators inevitably worked in the wake of this chemical development and their safety rules and regulations, if formulated at all, arrived too late for those who had been left vulnerable. For example, an untold number of dyestuffs workers suffered and died from bladder tumours even although this risk had been brought to the attention of the government in 1912, was known about by manufacturers from the 1920s, and reported by the factory inspectorate from the 1930s.[16] However, due to 'difficulties' in determining an exact definition of the precise cause of the disease the legislation designed to prevent this deadly hazard was not rolled out until 1967 and even then papilloma of the bladder was not made a notifiable disease.

Delayed since 1922, most of the measures within the Factory Act of 1937 were applicable to factories in general. Jones has argued that this Act 'embraced many more workers than previously and raised standards of safety, health and welfare.'[17] For example, the 1937 Act brought in the 48-hour working week to all factories as well as restricting overtime hours to 6 per week. Facilities to be provided in all factories now included those for first aid, washing, cloakroom, and seating. Food was no longer to be consumed where the dust or fume of lead, arsenic or any other poisonous substance was present and where these substances were worked suitable rooms were to be provided for meals. Following a series of explosions in the chemical industry during the 1930s more stringent rules were introduced to deal with the threat of dust explosion.[18] Again, protecting the process could lead to improved protection for the workers and in many cases it was this motivational factor that was in play. Indeed, even by the mid 1960s the Chief Inspector of Factories on Industrial Health could state that:

[15] TUC Report, 1945, p.296
[16] See Chapter Two, pp.113-121
[17] H. Jones, *Health and Society in Twentieth-Century Britain*, Longman, (London 1994), p.71
[18] E. Crooks, *The Factory Inspectors, A Legacy of Industrial Revolution*, Tempus, (Gloucestershire 2005), pp.148-151

> The total amount of any kind of dust needed to cause serious ill-health is not great and the dust itself is of little economic value; thus it confers no great commercial advantage to control it. In a pottery or a lead works, the amount of raw material needed to kill everyone would not show on the balance sheet, so that the demands for process cleanliness hardly ever approach the standards needed for biological control – except in those cases where some secondary factor such as damage to plant can be taken into account.[19]

Further evidence of steps being taken primarily to protect the product or plant rather than the worker were found at Dunlop. Having examined the 'showpiece' conditions of work that existed in the 1940s at a Dunlop rubber factory a judge, ruling on a case of employer negligence, stated that, 'Dunlop had applied their minds to the (carcinogenic) dust problem, not because they thought that it might be injurious to the work-people but because they knew that it would be injurious to the products manufactured.'[20] With the protection of plant in mind, the 1937 Factory Act saw safety rules for factories being strengthened so as to deal more effectively with fire, including new rules that covered the provision of fire alarms. Some consideration was given directly to the workers safety when measures were also introduced that called for better means of escape for workers in the event of fire. An ongoing project since 1893, the rules for the guarding and fencing of fixed vessels containing dangerous liquids or chemical materials were also improved. Medical inspections were to be provided for all those engaged on dangerous processes and records kept of the results. McIvor has argued that this measure 'significantly extended the 1901 Act and the role of preventative medicine in industry.'[21] Whilst this was true it was also the case that this and other measures within the Factory Acts had only incrementally improved the conditions of work and that these continued to offer only limited levels of protection to chemical workers. Indeed, the rules and regulations that had been

[19] Annual Report of the Chief Inspector of Factories on Industrial Health for the Year 1966, PP 1967 (Cmnd. 3359) HMSO, London, p.74
[20] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB,* pp.311-332 in Knights Industrial Reports, Volume XI, October 1971- March 1972, Charles Knight & Co, (London 1972), p.323
[21] A.J. McIvor, 'Manual Work, Technology, and Industrial Health, 1918-1939' pp.160-189 in *Medical History*, (31) 1987, p.177

drawn up in 1922 for the chemical industry remained in place in 1937, and beyond. The lack of safety and welfare provision would be highlighted during the Second World War when, just as had occurred in the First World War, it became apparent that in order to sustain or increase productivity more care had to be delivered to the workforce. Consequently, medical and welfare services were introduced for all personnel who were engaged within state owned factories that repaired or manufactured munitions of war.[22]

In 1945, the Chemical Workers' Union argued that due to the vast numbers of new products that had entered the industry the Chemical Works Regulations of 1922 were 'entirely out of date' and 'redundant.'[23] The resolution also noted that 'the danger is emphasised when it is realised that twenty years ago the number of solvents known and made in Great Britain was less than twenty, but in 1935 there were over 300.'[24] The Association of Scientific Workers agreed and further noted that, 'certain materials have come into widespread use in the plastics industry which involves the manufacture of 15 or 16 different classes of compounds.'[25] Despite bringing this to the government's attention the Chemical Works Regulations were not reviewed at this stage with chemical workers having to rely on the piecemeal legislative improvements contained in the general clauses of the Factory Acts. One consequence of such a policy has been identified by Harremoës *et al* who have argued that the legislative handling of asbestos led to a situation whereby, 'with each successive incremental improvement in conditions, the persistent risks associated with the new conditions would then in turn take further decades to become evident.'[26] As has been demonstrated in Chapter Three this interpretation fits with the manner in which the problems associated with the chromate and dyestuffs sectors were dealt with.

In the immediate post-war period the Labour government commissioned several reports to address occupational health and safety issues. One of these attempted to review the policies used for scheduling occupational diseases,

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[22] M.W. Goldblatt, and J. Goldblatt, 'Industrial Carcinogenesis and Toxicology', pp.185-562 in Merewether, E.R.A. (ed) *Industrial Medicine and Hygiene, Volume 3*, Butterworth, (London 1956), p.368
[23] TUC Report 1945, p.295
[24] TUC Report, 1945, p296
[25] TUC Report 1945, p.297
[26] P. Harremoës, D. Gee, M. MacGarvin, A. Stirling, J. Keys, B. Wynne, and S.G. Vaz, (eds) *The Precautionary Principle in the 20th Century, Late Lessons from Early Warnings*, Earthscan, (London 2002), p.193

something that had been ongoing since 1906. Thus, in 1948, the Departmental Committee on Industrial Diseases decided that rather than amend the former tests used to decide the eligibility of an industrial disease they would 'start afresh' and examine independently what criteria was appropriate in prescribing diseases under the National Insurance (Industrial Injuries) Act of 1946.[27] The National Insurance (Industrial Injuries) Act of 1946 came into effect in 1948 replacing the Workmen's Compensation Act on 1897. Under the old law a worker had to claim against the employer and prove how much the injury had caused loss to their earning capacity. Under the Act of 1946 the claim was made against the Department of Health and Social Security with the amount of benefit awarded based on an independent medical assessment. In 1974, twenty-five years after the Act had been introduced, one trade union commented that 'in practice it [the Act of 1946] has proved to be a substantial improvement over the Workmen's Compensation Scheme which preceded it, and large numbers of working people have benefited from its provisions.'[28] Such comments tend to strengthen Jones argument that the original Workmen's Compensation Act and similar measures were designed to fend off trade union and labour unrest.[29] Certainly, the Act of 1946 had the effect of dangling the carrot of a successful compensation claim a little lower. In the immediate post-war era amidst 'an upsurge of popular radicalism' this measure may have helped to defuse any potential worker unrest over the fact that working for a living could lead to death or injury.[30]

The Factory Act of 1948 contained more general updates and provisions to industry as a whole although some were specific to chemical works. As mentioned above, the rules and regulations were strengthened where dangerous fumes were liable to be present in tanks, vessels, etc. This was an attempt to reduce the number of workers being killed trying to save colleagues that had collapsed when cleaning out residues in tanks and where fumes had built up. Factory Inspectors were also now able to take away samples of any substances that they suspected might cause injury

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[27] Report of the Departmental Committee on Industrial Diseases, PP 1948 (Cmd. 7557) HMSO London, p.7
[28] E.A. Webb, *Industrial Injuries: A New Approach*, *The Evidence of the Post Office Engineering Union to the Royal Commission on Civil Liability and Compensation for Personal Injury*, Fabian Tract 428, (London 1974), p.3
[29] H. Jones, *Health and Society in Twentieth-Century Britain*, Longman, (Essex 1994), p.17
[30] J.E. Cronin, *Labour and Society in Britain, 1918-1979*, Batsford, (London 1984), p.127

to workers and to have them analysed. Yet again, the rules covering the risks of explosion and fire were tightened and although such regulations were designed to protect the plant they also had a beneficial effect on the health and safety standards for those employed in chemical plants. Nichols notes that whilst the prioritisation of profit over health would normally prevail within the capitalist system this does not negate the possibility that under certain circumstances improving the health and safety of the workers could coincide with an increase in profits. For example:

> Where there is threat of major explosions or of other major disruption to production, as well as life and limb, this is clear enough. Where injury is so frequent that production is severely interrupted the linkage is again clear enough. Where injuries threaten to become an effective organising issue there may also be an incentive for employers to improve health and safety…or…if they are *effectively* threatened with state regulation.[31]

Without doubt, the various pieces of legislation that had been enacted over many years had culminated in a bewildering mass of sections, sub-sections, and amendments. Some occupational diseases were prescribed, some were notifiable, and some were dealt with by statutory regulation (requiring employers to take precautionary measures). Some factory legislation was undermined by legal decisions and years could pass before it was reframed to take account of such decisions.[32] Against this backdrop, the chemical industry continued to increase the number of processes it used and types of chemicals produced. In 1965 the TUC stated that they had 'repeatedly expressed concern' that there was insufficient safeguards in place to protect workers from exposure to dangerous chemicals.[33] Obviously demonstrating a certain level of mistrust the TUC also called for government-sponsored research 'independent of private industry' to identify hazardous substances and they demanded statutory safeguards, including notifications under the Factories Act, for any substances that were found to pose

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31 T. Nichols, *The Sociology of Industrial Injury*, Mansell, (London 1997), p.104
32 D. Eva, and R. Oswald, *Health and Safety at Work*, Pan, (London 1981), p.31
33 TUC Report, 1965, p.181

health risks.[34] These demands helped elicit from the government some draft legislation on the use of toxic substances used in the manufacture of dyestuffs. Legislation was consequently passed entitled the Carcinogenic Substances Regulations (1967). This legislation prohibited the manufacture, use, and importation of β-naphthylamine, benzidine, and other closely related compounds. At this point in time the evidence that had linked bladder cancer with these substances had been discussed at state level for 40 years.[35] Also in 1967 the TUC demanded that the Minister of Labour introduce compulsory notification to the factory inspectorate when new chemical processes were introduced. This was refused by the Minister who stated that, 'because of the close watch kept on developments…and because of the co-operative attitude of industry it had generally been found that possible hazards had been less than expected.'[36] This response may have arisen out of the 'close relationship' that had been forged between the industry and government whereby, as Grant *et al* have noted, there was a 'predisposition to accept that the industry could be trusted.'[37] However, given the chemical industries attitude to bladder cancer this was a remarkable response. It also appeared to be ignoring the fact that just three years earlier the first victims suffering with acro-osteolysis had been reported despite the workers having been given assurances by the VCM industry in the mid 1950s that exposure to the process posed little threat to health. Indeed, although the industry made some effort to identify occupational health hazards a much more resolute effort had been made on the commercial side and by the early 1970s around 3,000 new chemicals were being introduced each year within the organic, inorganic and plastics branches of the chemical industry.[38] Whilst these levels of innovation reflected the scientific and economic dynamism associated with the industry they also demonstrated the magnitude of the problem that faced those who suspected that some of these 'new' substances posed a problem for the health of chemical process workers.

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[34] TUC Report, 1966, p.188
[35] TUC Report, 1966, p.189
The very first cases of bladder cancer amongst British dyestuffs workers were described in 1927 by J.C. Bridge, a Factory Medical Inspector.
[36] TUC Report, 1967, p.195
[37] W. Grant, W. Paterson, and C. Whitson, *Government and the Chemical Industry, A Comparative Study of Britain and West Germany*, Clarendon Press, (Oxford 1988), pp.272-273
[38] J.M. Stellman, and S.M. Daum, *Work is Dangerous to Your Health, A Handbook of Health Hazards in the Workplace and What You Can Do About Them*, Vintage Books, (New York 1973), p.155

In the early 1970s it was claimed that the legislation that existed to deal with industrial hazards was ‘somewhat disorganised’ and was really a ‘reflection of the history of industrialisation, rather than a rational attempt to protect the worker from the risks of his (sic) occupation.’[39] In an attempt to scrutinise the existing legislation and propose a more modern and efficient way to deal with the protection of the worker the government established a Committee (under the leadership of Lord Robens) to investigate. Taking evidence from a variety of sources the Committee’s recommendations were subsequently published in 1972 entitled ‘Safety and Health at Work’ although were more frequently referred to as the Robens Report. The report argued that health hazards connected with new chemical processes were to be identified *before* plant construction began and that any medical and safety advice was to be ‘fed in at the design stage.’[40] This idea had surfaced some time before but it was an important idea, especially in a continuously evolving industry such as chemicals. Here was a process that would help identify the hazards so that they could be avoided rather than taking retrospective steps to control them. Discussing the Robens Report the government noted that one of the main recommendations involved ‘moving away from the statutory approach towards effective self regulation by employers and work-people jointly, with much greater emphasis on agreed voluntary standards and codes of practice.’[41] Gill *et al* noted that the Report actually identified the difficulties in legislating for an industry that experienced large amounts of technological change but went on to criticise the Report for embracing the idea that an ‘identity of interest’ existed between the employer and the employee in relation to safety and health problems. According to Gill *et al* this ‘identity of interest’ was a myth as ‘health and safety considerations were too often sacrificed to the demands of production and costs.’[42] The evidence presented in Chapters Two and Three of this thesis largely confirms this view.

[39] J.M. Harrington, ‘Occupational Health and Safety in Great Britain 1973’ pp.247-250 in *British Journal of Industrial Medicine,* 1975
[40] R.C. Browne, ‘Safety and Health at Work: The Robens Report’ pp.87-94 in *British Journal of Industrial Medicine*, (30) 1973, p.90
[41] CAB/129/169/20, The Robens Report on Safety and Health at Work, Memorandum by the Secretary of State for the Home Department, 7 May 1973,
[42] C. Gill, R. Morris, and J. Eaton *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.240

The subsequent legislation that emerged from the findings of the Robens Report was the Health and Safety at Work Act (1974). This placed a duty on employers to consult safety representatives and to allow safety committees to be established. Working within an environment of 'shared responsibility' the provisions of the Act did not deal with particular hazards but dealt with all problems of health, safety, and welfare at work. One former ICI worker recalled the period when the Health and Safety at Work Act was introduced at his plant thus:

> We started getting meetings about health and safety and some of the ICI propaganda was that a lot of the Robens recommendations had been taken from ICI procedures. Now, we didnae have procedures (laughs) so how could they have done that? So when they were saying this I just laughed and said 'look, this is bullshit'. How can the executive (Health and Safety Executive) take recommendations off our procedures when we didnae have procedures at that time? Slogans was whit they had…after 1974 'SAFETY RANKS EQUAL WITH OUR PRODUCTION' now that was a joke, that was an absolute joke. We certainly never had evidence of that.[43]

This cynical view was echoed in a series of interviews conducted amongst chemical workers by Nichols and Armstrong wherein it was noted that, 'when you're over there in the office it's 'Safety before Production' but when you're down here it's 'Production before Safety.'[44]

Despite many years of campaigning by trade unions and occupational health specialists the state did not establish an occupational health service when they created the National Health Service (NHS) in 1946. Johnston and McIvor have argued that this had the effect of 'marginalising' occupational health issues.[45] Certainly, it was noted by the TUC in 1953 that only 2 per cent of factories had 'definite arrangements for medical services other than statutory examinations of

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[43] Interview D. Walker with KG, 25 November 2005, p.23
[44] T. Nichols, and P. Armstrong, *Safety or Profit: Industrial Accidents and the Conventional Wisdom*, Falling Wall Press, (Bristol 1973), p.12
[45] R. Johnston, and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, (East Lothian 2000)

young persons and that only 1 per cent provided a service amounting to a general medical supervision.'[46] However, trade unions and others, such as the British Medical Association (BMA), continued to argue that the division of functions between the various Ministries responsible for occupational health was 'most unsatisfactory' and that a single Department should be created.[47] Whilst the TUC argued that the most appropriate body to operate an occupational health service was the Ministry of Labour the BMA argued that the Ministry of Health was more appropriate.[48] The TUC continued to press for this provision and in 1968 again gained support from their annual conference to fight for the establishment of an occupational health service despite the persistent presence of the 'the clammy hand of the Treasury.'[49] By the early 1970s copious amounts of evidence were presented to the Robens Committee on issues of occupational health and safety and claims were made for a more specialist occupational health provision to be provided. Nonetheless, although decades of campaigning had taken place a specific occupational health service was not created by statute in 1974. It was argued that 'no country could afford 'double banking in medicine with a workplace health service superimposed upon a home and family health service' but emphasised the importance of these two to form close operational linkages.[50] Nichols and Armstrong have argued the Robens Report and its recommendations 'was largely written by administrators' who failed to fully understand that 'since safety is a question of putting people before production, the people who do the producing must have the power to ensure that *their* safety is put first.[51] The failure of the state to establish an occupational health service meant that many workers continued to be denied proper occupational health provision. Pickvance has noted for example that much of the

[46] MSS.292C/140/2 (Social Insurance and Industrial Welfare Department, 1957), 'Industrial Health Services', p.6 The figures that were quoted were taken from a TUC Report of 1953
[47] MSS.292C/140/2 (Social Insurance and Industrial Welfare Department, 1957) 'Industrial Health Services', pp.8-9
[48] MSS.292C/140/2 (Social Insurance and Industrial Welfare Department, 1957) 'Industrial Health Services', pp.8-9 and 'Hope of Progress Towards an Industrial Health Service,' *The Times*, March 17, 1958, p.6
[49] TUC Report, 1968, 'Occupational Health Service' p.543
[50] As cited in R.C. Browne, 'Safety and Health at Work: The Robens Report' pp.87-94 in *British Journal of Industrial Medicine*, (30) 1973, p.89
[51] T. Nichols, and P. Armstrong,. *Safety or Profit: Industrial Accidents and the Conventional Wisdom*, Falling Wall Press, (Bristol 1973), p.30

provision was 'employer led' and concentrated its efforts on 'pre-employment screening and fitness for work' rather than 'planned prevention.'[52]

The Factory Inspectorate

Established in 1833 with just four inspectors to cover the whole of Britain the Factory Inspectorate grew in number so that by 1914 it had increased to 206. Despite this increase in recruitment the inspectorate remained understaffed with a responsibility to inspect around 60,000 factories and somewhere between 100,000 to 200,000 workshops. In 1911, Arthur Henderson commented upon this deficiency in Parliament stating that visits by the Factory Inspector 'were like those of angels, occurrences which happen very seldom.'[53] Indeed, analysing the effectiveness of this branch of the Home Office Bartrip and Fenn assert that up to 1914 low levels of staffing had prevailed, that the lack of staff had impacted badly on their ability to inspect and report and, having only minimal fine levels at their disposal, the inspectors had been unable to penalise law-breaking employers effectively.[54] Wrigley has also shown that with a ratio of inspectorate to workplace of 1:1332 even the most basic standards of industrial welfare were unable to be enforced.[55] McIvor has also argued that the limited industrial legislation that had been enacted up to 1914 was 'uneven, full of loopholes, and difficult to police and enforce.'[56] Shortages of staff inevitably left gaps in inspection and this was exacerbated by an increase in production during the war. Members of the TUC continued to raise concerns on this issue both during and after the war but with only marginal effect.[57] Indeed, even by 1947 the Association of Scientific Workers could still argue that there were insufficient numbers inspecting workplaces and that of those employed there was a shortage of specialist skills.[58] Some increases were made in the numbers of

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[52] S. Pickvance, Occupational Health Issues and Strategies: A View from Primary Health Care' pp.220-237 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), p.222

[53] S. Meacham, *A Life Apart, The English Working Class, 1890-1914*, Thames and Hudson, (London 1977), p.129

[54] P.W. J. Bartrip and P.T. Fenn, 'Factory Fatalities and Regulation in Britain, 1873-1913' pp.60-74 in *Explorations in Economic History*, Volume 25, 1988, p.73

[55] C. Wrigley, (ed) *A History of British Industrial Relations, 1875-1914*, Harvester Press, (Sussex 1982), p.177

[56] A.J. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.128

[57] TUC Report 1916, p.375 and TUC Report 1929, p.132

[58] TUC Report, 1947, p.409

inspectors employed and by 1971 there were just over one thousand inspectors operating across Britain. Nonetheless, these inspectors were now responsible for over one million establishments. Working with this ratio of inspector to place of work the average rate of inspection was once every four years rather than annually as recommended by the International Labour Organisation.[59] Under such circumstances the Robens Committee recommended, not that there should be a massive recruitment of inspectorate, but that 'the resources of the inspectorate must be used selectively.'[60]

As noted above the low levels of inspection failed to impress trade unions and their view of the inspectorate was further diminished by the fact that on most occasions the inspectors gave notice to the employer of an impending visit. This practice was heavily criticised by trade unionists and in 1929 the TUC argued vociferously that the Factory Inspectorate should 'not make arrangements with employers prior to visits.'[61] The most obvious reason for objecting to this practice was that experience had shown that where notice was given the employers took temporary remedial action so as to give the impression that they were complying with factory legislation. As far as the trade unions were concerned giving notice to the employer meant that the inspectorate were siding with the employers. Despite repeated calls by the unions for the inspectorate to halt this practice the evidence shows that it did sometimes occur. One former ICI worker recalled that even in the late 1960s and early 1970s he was frustrated at not being able to identify safety hazards because the inspectorate would notify the employer of their intended visit to the plant. The immediate consequence of giving advance notice of a visit was that, '[ICI] always cleaned the place up and certain bits o' the process were shut doon' so that 'a' their flaws could be hidden.'[62] This former chemical worker assessed that both economic and political considerations were active agents in shaping the behaviour and decisions of the inspectorate. Thus:

> They [ICI] were always warned. Why did they [Factory Inspectors] no just arrive? It was the same when the insurance assessors came 'roun

[59] T. Nichols, and P. Armstrong, *Safety or Profit: Industrial Accidents and the Conventional Wisdom*, Falling Wall Press, (Bristol 1973), pp.1-2
[60] P.B. Beaumont, *Safety at Work and the Unions*, Croom Helm, (London 1983), p.69
[61] TUC Report, 1929, p.133
[62] Interview with K.G. p.39

> it was always bullshitted up for them but they should just arrive wi' nae notification. Why warn them? Again it's going back tae politics isn't it? If the Factory Inspector went in there and seen the way that plant was run they would have shut it doon. We couldnae do the process if everything had tae be done safely it would be impossible…there's the jobs gone. 'Oh a health and safety man has shut ye doon, a Factory Inspector, it's the government, no us. That's no suitin' anybody is it?[63]

In addition, the understaffed inspectorate adopted a 'deliberate policy preference for persuasion rather than prosecution,' a policy that did not always generate positive responses from employers who, under the logic of capitalism, sought to profit maximise by keeping production costs down.[64] Nonetheless, it has been suggested that the reason why this particular policy was preferred by the inspectorate was because there were insufficient inspectors to deal with the heavy workload and also that the legal regulations were 'rather unclear.'[65] Both the understaffing levels and the 'softly-softly' approach of the inspectorate have been examined and criticised by Tweedale and Johnston and McIvor who have all argued persuasively that these factors offered inadequate protection to those who toiled in the asbestos industry.[66] It will be argued here that a similar situation existed for those within the chemical industry.

As noted above the Factory Inspectorate had helped to update the rules and regulations for the chemical industry in 1922 and thereafter found themselves having to explain to employers the meanings behind some of the new rules. By 1929, the Association of British Chemical Manufacturers (ABCM) had established their own means to educate employers when the first edition of their 'Model Rules' were

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[63] Interview with K.G. p.39

[64] T. Nichols, and P. Armstrong, *Safety or Profit: Industrial Accidents and the Conventional Wisdom*, Falling Wall Press, (Bristol 1973), p.2

[65] O. A. Hartley, 'Inspectorates in British Central Government, in *Public Administration*, Volume 50, 1972 as cited in P.B. Beaumont, *Safety at Work and the Unions*, Croom Helm, (London 1983), p.69

[66] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), p.291 and R. Johnston, and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, (East Lothian 2000), p.216,

published for ABCM members.[67] Notwithstanding this effort, John C. Bridge, Chief Medical Inspector of Factories, could still write in 1932 of the 'anxiety' that existed amongst those being exposed to the new complex chemical substances that had been brought into use stating that 'new industries have brought their problems.'[68] Of course, the chemical industry was not strictly a new industry but during and after the First World War it had been transformed and thereafter would continuously renew itself in terms of the process technology it used and in the substances that it produced. The Chief Inspector of Factories noted the changes that had been taking place across the industry and wrote in 1933 that:

> It is inevitable that particular attention must be directed to new forms of poisoning occasioned by the use of chemicals, many of them complex in character, the effects of which on the human subject little is known.[69]

The comment above demonstrates that the chemical industry had not only devised and manufactured a variety of toxic substances but that they had been able to do so without anyone monitoring what the full effects these might have on the human body. The Inspectorate appeared to be powerless in this regard but in 1933 they did recommend that each new organic compound should be 'physiologically tested before it was placed on the market for general use.'[70] With little government support being offered to undertake the testing the Chief Inspector had to rely on ICI, the principal manufacturer of many of the these substances, to conduct the tests. The Inspectorate stated that they found this level of safeguard to be 'satisfactory.'[71] At this juncture the Inspectorate may have simply believed that some form of testing was better than none and that ICI would withdraw any suspect substance found.

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[67] The publication of these rules is discussed in greater detail in Chapter Six

[68] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1932, PP 1933 (Cmd.4377) HMSO London, p.57

[69] Annual Report of Chief Inspector of Factories and Workshops for the Year 1933, PP1934, Cmd.4657, p.53

[70] Annual Report of Chief Inspector of Factories and Workshops for the Year 1933, PP1934, Cmd.4657, p.9

[71] *Ibid*, p.9

However, as has been shown in Chapter Two, ICI's delayed withdrawal of Nonox S would show that a self-regulating system could be less than satisfactory.[72]

Following the introduction of the Factory Act of 1937 the CIF noted that there was a 'general willingness' amongst the employers to make sure that the new legislation was complied with.[73] By contrast, a more pessimistic view was expressed about the willingness of the employees to comply with the improved provisions for eye protection because 'workers for one reason or another will not wear goggles.'[74] The implication behind these statements was that the employers were doing all that they could to make sure the workers were safe from harm but that it was the workers' own fault that eye injuries were occurring. However, oral testimony covering the period from that late 1930s to the early 1970s reveals some reasons why this may not have been as straightforward as was being implied. One woman who worked in dusty conditions in a chemical plant during World War Two recalled that whilst she had been given an overall and cap neither goggles nor a mask were issued for her protection.[75] Another witness recalled that her husband had been exposed to high levels of soda ash dust throughout the 1960s and that 'they were given gloves and goggles and things but it didn't always work.'[76] Where the potential danger was most obvious there appeared to be more compliance with the wearing of goggles and other protective wear. Asked about accidents at his chemical plant in the 1960s one former ICI manager recalled 'not with acid, people knew to wear gloves and goggles.'[77] The British Occupational Hygiene Society noted the same effect within the atomic energy industry in the mid 1950s whereby 'employees were well aware of the danger of their working conditions and cooperated fully in the precautions advised.'[78] Similarly, the Nuffield Department of Industrial Health wrote in 1973 that, 'in the chemical industry it so frequently happens that the more dangerous a substance is to

[72] See Chapter Three, pp.136-139
[73] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1938, PP 1939 (Cmd.6081) HMSO London, p.61
[74] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1938, PP 1939 (Cmd.6081) HMSO London, p.62
[75] Interview D. Walker with MP, 08 October 2005 pp.9-10
[76] Interview D. Walker with H. Langley, 21 March 2005, p.2
[77] Interview D. Walker with B.J. Watson, 08 October 2005, p.4
[78] C.N. Davies, 'The Use and Abuse of Protective Equipment' pp.76-78 in *British Journal of Industrial Medicine*, (13) 1956, p.76

handle, the safer it is in fact handled.'[79] However, where workers were ignorant of potential dangers the heat of the plant, the design of the protective wear, and the pressure of work, could all lead to workers refusing to wear safety equipment. Peter Dodds was responsible for the safety of his shift at an ICI plant but recalled that many men didn't always wear the equipment 'because it was uncomfortable, it made their hands sweaty, the face visors would get condensation in them and a' the rest, they didnae want it, they just didnae want to wear it because it was cumbersome.'[80] Therefore, a combination of the employers' failure to provide protective wear, the poor design and manufacture of some equipment, and a lack of awareness of the dangers provide some reasons to explain why workers may not have always worn safety equipment.

It has been argued that the attitude shown by the Factory Inspectorate towards the manufacturer was not always forthright enough and that the advice they proffered was more often than not, 'quietly tendered.'[81] One example that shows how ineffectual this policy was can be seen in the way that dust in the chromate-manufacturing sector was dealt with. In 1960 it was reported by the CIF that there had been a 'marked increase' in the number of cases of chrome ulceration within one of the chromate-manufacturing plants.[82] On investigation, the CIF noted that this increase was attributable to a programme of work that had involved the demolition of buildings. It was explained that the demolition had 'disturbed old standing deposits of waste material, particularly in roof structures'…and was made worse when 'the most heavily contaminated parts of the factory were demolished.'[83] This would strongly indicate that chrome dust levels, described by Legge from 1900 as a 'source *par excellence* for chrome holes,' had not been dealt with as 'efficiently' as the inspectorate had for decades been suggesting they had been nor as the rules and

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[79] R.C. Browne, 'Safety and Health at Work: The Robens Report' pp.87-94 in *British Journal of Industrial Medicine*, (30) 1973, p.90
[80] Interview D. Walker with P. Dodds, 25 November, 2005, p.34
[81] M.W. Goldblatt, and J. Goldblatt, 'Industrial Carcinogenesis and Toxicology', pp.185-562 in E.R.A. Merewether, (ed) *Industrial Medicine and Hygiene, Volume 3*, Butterworth, (London 1956), p.368
[82] The plant in question was J & J Whites of Rutherglen, near Glasgow.
[83] Annual Report of the Chief Inspector of Factories on Industrial Health for the Year 1960, PP 1961 (Cmnd. 1478) HMSO, London, pp.34-35

regulations had demanded.[84] Bartrip has argued that employers accepted the introduction of special rules 'without demur' but self evidently they would have done so when there was so little pressure to fully implement them.[85] Indeed, it is possible to argue that the only reason the increased incidence had been reported was that the victims (sub-contracted demolition men) were new to this sort of workplace and therefore not inured to the conditions. Despite legislation having been in place since 1893 to deal with dust levels chromate manufacturers had come to accept chrome ulceration and loss of the nasal septum as part and parcel of the job. For example, Richard Fitzpatrick, a chromate worker at Whites between 1939 and 1945 provided oral testimony that he, his brother, and his father had all lost their nasal septum and that chrome holes 'were pretty common.'[86] This former worker also testified that in the crystal house 'there was always dust flying about' whilst the furnace area had 'nae windows' and 'nae ventilation system' and was 'always dusty and stoorie.'[87] Richard Fitzpatrick's memories of the 'stoorie' atmosphere are confirmed by the results of an environmental study of the chromate industry conducted by the Medical Research Council in 1951. Therein, it was noted that 'perforation of the nasal septum appeared to be common' with the concentration of chromium in the dust laden atmosphere being 327 to 550 times higher (3.27 mg./cu.m. and 5.5 m.g./cu.m) than the maximum allowable concentration (0.1 mg./cu.m.).[88] It should be emphasised that this scientific evidence was produced nearly twenty years after the Factory Inspectorate had claimed that levels of chrome ulceration had been reduced. Given the fact that only three chromate-manufacturing plants were in operation throughout the period in question, that specific rules had been put in place from 1893 that identified dust as the cause of the disease, this should have been one of the easier areas of the chemical industry for the Factory Inspectorate to police. Yet, the evidence indicates that the level of inspection at this plant must have been cursory at

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[84] Annual Report of the Chief Inspector of Factories and Workshops for 1899, HMSO, PP 1900, (Cd. 223), p.335 The special rules of 1922 stated that an efficient exhaust was to be in operation and that this was defined as 'localised ventilation effected by mechanical or other means for the removal of gas, vapour, fume, or dust which prevents it from escaping into the air of any place in which work is carried on.' Chemical Works Regulations, S.R.& O. 1922/731

[85] P.W.J. Bartrip, *The Home Office and the Dangerous Trades, Regulating Occupational Disease in Victorian and Edwardian Britain*, Rodopi, (Amsterdam 2002), p.268

[86] Interview D. Walker with R. Fitzpatrick, 13 August 2004 , p.7

[87] *Ibid*, p.5-6

[88] N. Buckell and D.G. Harvey, 'An Environmental Study of the Chromate Industry', pp.298-301 in *British Journal of Industrial Medicine*, (8), 1951, p.301

best and non-existent at worst. Certainly in his seven years of working in chromate manufacturing Mr Fitzpatrick was never aware of having met or seen a Factory Inspector.[89] The evidence of persistent chrome ulceration and loss of septum in this industry points to the fact that the Factory Inspector's repeated encouragement to the manufacturers to improve ventilation and extraction systems was not a successful strategy.

Explosions had been associated with industry for many years but it was not until 1944 that a Senior Chemical Inspector was appointed to the Engineering Branch of the Factory Inspectorate to address this problem more specifically. In 1958 a separate Chemical Branch of the Inspectorate was created that had twenty-six Chemical Inspectors and eight Senior Scientific Assistants whose roles were to advise on the risks associated with fire and explosion and to investigate and measure contaminants that were likely to be toxic or injurious in the working environment.[90] It should be emphasised that despite their title these inspectors advised on health and safety issues in various types of factories and were not specifically appointed to oversee chemical works. Despite the introduction of safety legislation designed to protect chemical plant and the fact that a specific Inspectorate existed to advise on this issue the Chief Inspector of Factories noted in 1968 that there had been sixteen 'serious explosions' in chemical plants over the previous five years.[91] This poor safety record should have perhaps alerted the industry and the inspectorate once again to this particular threat and highlighted the need for the risk of explosion to be considered at the design, building, planning, and approval stages. Six years later, on the first day of June 1974, an explosion occurred at a chemical plant near Flixborough. The blast instantly killed 28 people, seriously injured 36 and caused minor injuries to hundreds of others. Nearly two thousand homes and shops were damaged in the surrounding area.[92] Within two hours of this explosion the local Factory Inspectors had arrived at the scene and later that evening inspectorate staff from London Headquarters hurried to the site. The following day the management of

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[89] Interview D. Walker with R. Fitzpatrick, 13 August 2004, p.11
[90] Annual Report of H.M. Chief Inspector of Factories for the Year 1967, PP1968, (Cmnd. 3745) HMSO, London, p.56
[91] Annual Report of H.M. Chief Inspector of Factories for the Year 1967, PP1968, (Cmnd. 3745) HMSO, London, p.67
[92] This explosion is dealt with in detail in Chapter Two, pp.87-90

the firm were interviewed and eye witness accounts were recorded. By the 27th June the Secretary of State for Employment had ordered a formal investigation into this 'accident' and as was noted by the Chief Inspector of Factories 'where necessary inspectors and others worked round the clock for seven days a week.'[93] The Chief Inspector of Factories noted in his report of 1975 that 'the Flixborough explosion was a catastrophe to all who suffered from it directly or indirectly' before adding, quite remarkably, that:

> Although the Chief Inspector at the time had given previous warning of the possibility of such a disaster, the fact of its occurrence may in time be seen to have altered very significantly the work of the Inspectorate and greatly extended its role in the prior assessment of major hazards. Certainly, it has already influenced the priorities and efforts of the Health and Safety Commission.[94]

In other words, warnings had been given and these chemical workers need not have died. This was in fact an avoidable 'catastrophe.' Moreover, demonstrating the lack of regulation in this industry the Court of Inquiry that had been established in the wake of the explosion found that pressure systems in the chemical industry were not subject to the same statutory inspection as in factories. Recommendations were duly made for the Acts to be amended and as Crooks notes 'these recommendations were endorsing the application of the statutory requirements of the old Factories Act upon an industry that had avoided this type of prescriptive legislation.'[95]

Medical Knowledge

The government appointed the Health of Munitions Workers' Committee (HMWC) in September 1915 to conduct a variety of investigations designed to address issues of industrial health, efficiency, fatigue and medicine. Having

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[93] Annual Report of H.M. Chief Inspector of Factories for the Year 1974, PP1975, (Cmnd. 6322) HMSO, London, p.18

[94] Annual Report of H.M. Chief Inspector of Factories for the Year 1974, PP1975, (Cmnd. 6322) HMSO, London, p.18.

[95] E. Crooks, *The Factory Inspectors, A Legacy of Industrial Revolution*, Tempus, (Gloucestershire 2005), p.206

undertaken various pieces of original research the work of the HMWC was described by the Senior Medical Inspector of Factories as ‘a crucial phase in the evolution of industrial medicine’[96] Whilst this may true it was also true that the primary objective of the HMWC in introducing rest pauses, shorter hours, improved ventilation, etc, was to improve the working conditions of the (mainly female) munitions workers. At that stage little or no attention was paid to other occupations where poverty and ill health continued to be found amongst the male industrial workers of Britain. Indeed, demonstrating just how little care was shown to those who had to earn a living Stevenson notes that in some industrial areas between 1917 and 1918 as much as 70 per cent of men were classed as ‘unfit for overseas duties’ at a time when Britain was desperate for troops.[97]

McIvor has identified that members of the HMWC campaigned to extend their research work beyond the war period and this campaign bore fruit when in 1917 the Industrial Health Research Board (IHRB) was established. Again, McIvor, analysing the impact that the IHRB had on the workplace has argued that although some of the ‘crucial tenets of IHRB ideology’ reached ‘enlightened industry leaders’ it remained the case that the work of the HMWC and the IHRB ‘was rarely realised in inter-war workshop practice.’[98] It would appear then that employers had enthusiastically cherry-picked the research of the HMWC during a period of full employment but this enthusiasm had waned during the inter-war period when most employers could fill the gaps left by those killed, injured, or worn-out, from the plentiful supply of cheap, willing, and unemployed labour.[99] In 1939, Haldane also noted that employers frequently ignored industrial diseases. To correct this situation he suggested rather than gently persuading employers to take an interest in medical research their prompt attention would be gained if only they were made to pay more

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[96] J. C. Bridge as cited in A.J. McIvor, ‘Manual Work, Technology, and Industrial Health, 1918-1939’ pp.160-189 in *Medical History*, (31) 1987, p.162

[97] J. Stevenson, *British Society 1914-45*, Penguin, (London 1990), pp.65-66

[98] A.J. McIvor, ‘Manual Work, Technology, and Industrial Health, 1918-1939’ pp.160-189 in *Medical History*, (31) 1987, p.175 and p.189

[99] M. Rose, *Industrial Behaviour, Theoretical Development Since Taylor*, Penguin, (Middlesex 1975), pp.98-99. After 1920 unemployment never fell below one million and reached a peak in 1932 when nearly three million people were out of work. This meant that nearly one quarter of the working population were unemployed. The vast majority of these workers were from the staple industries such as coal mining, cotton, and shipbuilding. Cited in E. Hopkins, *A Social History of the English Working Classes, 1815-1945*, Hodder and Stoughton, (London 1990) pp.229-230

frequently for the health damage that they caused by their negligence.[100] Waldron has also argued that so far as industrial medical services were concerned, a similar pattern to that found in the First War emerges in the Second World War with state and employer enthusiasm for these services blossoming during the war but fading once again with the coming of peace.[101]

In was during the inter-war years, in 1925, that the Industrial Health Education Society (IHES) was formed with the aim of raising awareness of occupational health issues amongst a wider audience. This organisation received some financial support from the TUC and between 1925 to the late 1930s the number of talks arranged by the IHES rose from 150 per year to just under 400 per year with the audiences consisting 'mainly, but not exclusively of male trade unionists.'[102] Having examined this organisation Watterson concluded that although they did have some successes amongst trade unionists, 'the Society did not succeed in involving employers in its work to any great extent.'[103] In other words, it was mostly those who were vulnerable that were interested and mostly those who had made them vulnerable that were not. Indeed, in 1935, ten years after it had been founded, Lord Horder, President of the IHES, could still state in *The Times* that the programme of work that they had delivered was, 'I fear, but little known.'[104] Interestingly, amongst the employers who had taken an early and active interest in the work of the IHES was Lord Melchett, otherwise known as Sir Alfred Mond, the first Chairman of ICI. Mond's interest may have been driven by a desire to ensure that his workforce was kept abreast of occupational health issues or perhaps it was done to create a positive public profile for ICI. After all, Mond's former company, Brunner Mond, had led the way within the chemical industry on the lowering of working hours and introducing the three-shift, in place of the long and arduous two shift, system.[105] The welfarist

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[100] J.B.S. Haldane, *Science and Everyday Life*, Lawrence & Wishart, (London, 1939), p.174
[101] H.A. Waldron, 'Occupational Health During the Second World War: Hope Deferred or Hope Abandoned?' pp.197-212 in *Medical History*, (41) 1997, p.212
[102] A. Watterson, 'Occupational health education in the United Kingdom workplace: looking backwards and going forwards? The Industrial Health Education Society at Work 1922-1940, pp.366-371 in *British Journal of Industrial Medicine*, (47) 1990, p.368
[103] *Ibid*, p.370
[104] *The Times*, 'Industrial Health', May 29, 1935, p.10
[105] Whilst these changes were beneficial to the workers Bruner Mond calculated and adjusted the wage costs involved. These changes also formed part of a wider welfarist package designed to defuse trade unionism and to ensure that productivity was not hindered by industrial disputes. See D. Walker, *An*

and labour policies that had been established by Brunner Mond were largely imported into ICI and by 1929 the Works Council system was introduced to act as a forum that would allow workers some say in work-related matters.[106] Wages, hours and the conditions of work, were not to be discussed in these Works Councils or, as Reader caustically notes, 'any subject but the really important ones.'[107] Effectively, this decision removed a real opportunity for ICI workers to discuss occupational health issues with their colleagues and plant managers in relation to the conditions of work they each experienced.[108] It is at least possible therefore to argue that privately Mond may not have actually wanted his workers to be fully *au fait* with occupational health education as implementing preventative measures may have led to increased production costs. However, being involved with IHES did demonstrate publicly to the government, the workforce, the trade unions, and any potential recruit, that ICI was an employer that cared about occupational health.

This is not to argue that ICI made no efforts to research occupational health problems but these were now to be identified, examined, and discussed by the scientific researchers who were funded by ICI whilst the 'unscientific' voice of the ICI worker had been effectively muzzled. As has been argued by Navarro and discussed in Chapter One, the ownership of medical knowledge is important to those who control and own the means of production.[109] From 1930, the ICI Dyestuffs Group Medical Service was given responsibility for all aspects of safety, health hazards, and occupational illnesses within the Group. By 1934, a medical officer had been appointed at the Huddersfield plant with part-time or consultative officers also working in other factories belonging to the dyestuffs division. In 1935, Dr M.W. Goldblatt was engaged by ICI as Group Medical Officer with the remits of 'overall co-ordination of medical services and of initiation of research on toxicity or other medical aspects relating to the Group's products and processing.'[110] Looking back at his appointment in the 1930s Goldblatt recalled in 1955 that this was important as he

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Inconvenience of the Trade, Occupational Health and Safety in the British Chemical Industry, 1870-1914, M.Phil Dissertation, University of Glasgow, 2003. Unpublished, pp.31-35

[106] The policies devised by ICI to win the workers loyalty are discussed fully in Chapter Five

[107] W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.61

[108] ICI workers were weaned away from trade unions. See Chapter Five.

[109] See Chapter One, p.22

[110] M.R. Fox, Dye-Makers of Great Britain, A History of Chemists, Companies, Products and Changes, 1856-1976, Imperial Chemical Industries PLC, (Manchester 1987), p.215

had actually been put in charge of 'the first industrial hygiene laboratories established by industry in Britain' and that this was 'tangible proof of the awakened realisation among industrialists that industrial health is not a question of policy, but of science, of conscience, and of civility.'[111] Industrial health research may have been all of these to the newly 'awakened' industrialist but, as will be discussed below, it remained the case that the health of the worker was ultimately determined by economics.

In 1956, discussing 'the great difficulties' that manufacturers faced when discovering that their product was lethal to the men manufacturing it, Goldblatt claimed that halting production would be, 'too facile and would, if applied, rebound more severely on the worker than on his employer.'[112] Instead, and in line with the thinking of most industrialists Goldblatt recommended that production should continue until 'alternatives should be found to hazardous processes.'[113] Goldblatt knew that one method for the early detection of bladder cancer amongst dyestuffs workers was routine urine examinations but that these had not been conducted in the 1930s.[114] He also knew by the late 1950s that cystoscopic examination (explained below) was the best method available to control the bladder cancer hazard but that this was not being done in Britain because it was thought that this would have a detrimental impact on production or, as Goldblatt put it himself, 'it would mean either mass evacuation of parts of the industry or a demand from all exposed men for a transfer to other work.'[115] It was explained that although some routine cystoscopy was performed on dyestuffs workers in France, Italy, Switzerland, and America the British workers attitude to this operation was 'far from favourable.'[116] In the 1970s, a judge, in a case brought against ICI, commented on the use of cystoscopy and reveals why this might have been so:

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[111] M.W. Goldblatt, 'Research in Industrial Health in the Chemical Industry' pp.1-20 in *British Journal of Industrial Medicine*, (12) 1955, p.1
[112] M. W. Goldblatt, and J. Goldblatt, 'Industrial Carcinogenesis and Toxicology', pp.185-562 in Merewether, E.R.A. (ed) *Industrial Medicine and Hygiene, Volume 3*, Butterworth, (London 1956), p.225
[113] *Ibid*, p.225
[114] M.W. Goldblatt, 'Vesical Tumours Induced by Chemical Compounds' pp.65-81 in *British Journal of Industrial Medicine*, (6) 1949, p.65
[115] *Ibid*, p.76
[116] *Ibid*, p.66

> Since the plaintiff had to endure, and I use the word deliberately, some 13 further cystoscopies, it is necessary to consider what this means. The operation involves passing a cystoscope through the urethra and into the bladder. This instrument is in the nature of a telescope, but in addition, it can be used to remove small tumours and for carrying out diathermy or cauterising processes. It is inserted under anaesthetic, but after it has been removed, the patient suffers very considerable discomfort for a period of some two to seven days, during which micturition [urination] is very painful.[117]

From 1933, the ICI research department knew that bladder cancer 'was one of the most serious occupational diseases ever encountered' and later admitted in a court of law that 'the disease is horrible, the prognosis is shocking; and one cannot overemphasise the sufferings of the men who contract it.'[118] Nonetheless, although Goldblatt was responsible for several published articles on bladder cancer this leading occupational health research scientist employed by the largest chemical manufacturer in Britain was not prepared to argue that the production process be stopped. Instead he noted that, 'the burden of study at present is to devise methods of manufacture and design of plant which will eliminate the hazard.'[119] Indeed, despite Goldblatt's claim that industrial health was not a matter of policy the fact that a lethal process could remain in place in order that it meet the needs of production indicates a contrary position. As noted in Chapter Three, following a long campaign and delayed research, the carcinogenic substances involved in the dyestuffs process were finally banned in 1967.

Whilst Goldblatt may have been correct in claiming that the ICI Industrial Hygiene Research Laboratories were the first of their kind they were not the only such industrial research group. Tweedale has noted that the asbestos industry funded the establishment of the Asbestosis Research Council (ARC) in 1957. This asbestosis

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[117] *Fox v. Imperial Chemical Industries Ltd.* QB pp.113-116 in Knights Industrial Reports, Volume I, January- March 1975, Charles Knight & Co, (London 1975), pp.114-115

[118] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, October 31, 1972, Court of Appeal* pp.255-274 in Knights Industrial Reports, Volume XIII, October 1972- March 1973, Charles Knight & Co, (London 1973), pp.257-258

[119] M.W. Goldblatt, 'Vesical Tumours Induced by Chemical Compounds' pp.65-81 in *British Journal of Industrial Medicine*, (6) 1949, p.67

research organisation sought to enhance the public image of two asbestos manufacturers and as Tweedale notes 'the ARC performed a public-relations function and provided a measure of political and legal protection.[120] A similar pattern can be seen in the chemical industry. As noted above, by publishing regularly in the *British Journal of Industrial Medicine* the ICI industrial health research laboratories reinforced their position to others that the health and welfare of ICI workers was an important issue and that it was being addressed. The occupational health science that was owned by ICI was also used in the early 1950s during a legal case to rebut claims made by an ICI personnel manager that insufficient effort had been made to protect workers from ά-naphthylamine.[121] In the 1970s, ICI again cited the work of their industrial hygiene unit to defend their position in court proceedings regarding the culpability of ICI in the sale and use of Nonox S.[122]

Whilst some criticism has been made of the ICI Laboratories they did expend effort and resources researching a variety of substances that the company manufactured as well as investigating the working conditions that existed. In fact, many of the research results were published in the *British Journal of Industrial Medicine,* a journal that Goldblatt had been involved with since 1942.[123] His own, as well as his colleagues input would have undoubtedly highlighted to the regulators and fellow scientists that ICI addressed the issue of employee health and safety seriously. Many improvements to processes and products were recommended in these research papers and once implemented these would have led to a more

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[120] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), p.175

[121] The Times, 'Law Report, May 2, High Court of Justice, Trumper v. Imperial Chemical Industries Limited', May 3, 1952, p.3

[122] Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB, pp.311-332 in Knights Industrial Reports, Volume XI, October 1971- March 1972, Charles Knight & Co, (London 1972) and, Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, October 31, 1972, Court of Appeal pp.255-274 in Knights Industrial Reports, Volume XIII, October 1972- March 1973, Charles Knight & Co, (London 1973)

[123] Goldblatt sat on the editorial board. 'British Journal of Industrial Medicine, The First 25 Years', pp.1-3 in *British Journal of Industrial Medicine,* (25), 1968, p.1 Examples of ICI published research results include, M.W. Goldblatt, 'Vesical Tumours Induced by Chemical Compounds' pp.65-81 in *British Journal of Industrial Medicine*, (6) 1949, A.L. Walpole, M.H.C. Williams, and D.C. Roberts, 'Tumours of the Urinary Bladder in Dogs after Ingestion of 4-Aminodiphenyl' pp.105-109 in *British Journal of Industrial Medicine*, (11) 1954, C.P. Chivers, 'Respiratory Function and Disease Among Workers in Alkaline Dusts' pp.51-60 in *British Journal of Industrial Medicine*, (16) 1959, G.T. Bowra, D.P. Duffield, A.J. Osborn, and I.F.H. Purchase, 'Premalignant and Neoplastic Skin Lesions Associated with Occupational Exposure to 'Tarry' Byproducts During Manufacture of 4,4'-Bibyridyl' pp.76-81 in *British Journal of Industrial Medicine*, (39) 1982

conducive and healthy environment being created for the chemical worker.[124] Nonetheless, having paid for it, the results of any medical research belonged to the company and the dissemination of the findings was therefore under the company's control. Indeed, this very issue is commented on by the judge in the Nonox S case who stated that:

> It is as well to state plainly that a company's responsibility for the proper discharge of all its duties lies squarely on the executive of that company, the board or its committees…it is not correct in law to attribute to a medical officer such as Dr Goldblatt sole responsibility for all aspects of health problems in industry. He was not a member of the board or of any executive committee though he was called to advise.[125]

Therefore, whilst the medical research information was owned by the company chemical workers could remain ignorant of how the substances they worked with were actually affecting their health. For example, the Research Department of the Alkali Division of ICI conducted a test in 1953 to assess the health effects of soda ash packing. In this area of work the men were 'constantly exposed to a heavy concentration of ash dust' some of which they inhaled.[126] The researcher found that one consequence was that the nasal septum of workers was being perforated but he decided not to share this knowledge with those exposed to the risk because:

> A nasal examination of all applicants for employment and subsequent periodical examinations in our works would probably lead to an

[124] For example, D.K Harris, 'Some Hazards in the Manufacture and Use of Plastics' pp.221-229 in *British Journal of Industrial Medicine*, (16) 1959, C.P. Chivers, C. Lawrence-Jones, and G.M. Paddle, 'Lung function in workers exposed to polyvinyl chloride dust' pp.147-151 in *British Journal of Industrial Medicine*, (37) 1980

[125] Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, October 31, 1972, Court of Appeal pp.255-274 in Knights Industrial Reports, Volume XIII, October 1972- March 1973, Charles Knight & Co, (London 1973), p.270

[126] R. McL. Archibald, 'Perforation of the Nasal Septum Due to Soda Ash' pp.31-37 in *British Journal of Industrial Medicine*, (11) 1954, pp.33-34

> undesirable focussing of attention on the nose and a consequent possible production of neurosis.[127]

In this particular case the health damage being done was not life threatening. However, if more people had known of the physical damage associated with the production process this may have led to difficulties in recruiting workers and an 'undesirable focussing' of managerial attention on why it was that production was being affected. The 'scientific' explanation that sharing this knowledge could lead to neurosis amongst the workforce tended to emphasise to the readership of the *British Journal of Industrial Medicine* that the ICI occupational health researcher really had the interests of the worker's health uppermost in his mind. After all, the researcher had also stated that the loss of the nasal septum was a 'symptomless condition.'[128] The other health effects caused by the inhalation of soda ash were not published until 1959 when much of the blame for the reduced respiratory performance amongst the workers was placed on their smoking habits.[129]

In 1930 the government contributed £250,000 for the building and equipping of the London School of Hygiene and Tropical Medicine. Sir Thomas Legge, a prominent industrial hygiene expert noted the list of proposed lecturers forwarded by the Minister of Health and then drafted a letter claiming that 'there is no name among them of any medical man who would be likely to insist on the claims of industrial medicine and surgery.'[130] The following year at a meeting of the TUC General Council Legge further claimed that 'no medical school gave any instruction to students on industrial medicine' and that 'attempts to give lectures on industrial diseases to medical students had always been thwarted.'[131] The lack of academic interest and financial support in the field of industrial health research was not unique

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[127] *Ibid*, p.37

[128] R. McL. Archibald, 'Perforation of the Nasal Septum Due to Soda Ash' pp.31-37 in *British Journal of Industrial Medicine*, (11) 1954, p.37

[129] 'Significant reductions' were found in the workers' expiratory flow whilst respiratory sickness absence was 'slightly greater' amongst workers in dusty occupations. No cases of pneumoconiosis were found. C.P. Chivers, 'Respiratory Function and Disease Among Workers in Alkaline Dusts' pp.51-60 in *British Journal of Industrial Medicine*, (16) 1959, p.60

[130] MSS.292C/140/4 (Medical Inspections, Reports and Articles of Sir Thomas Legge), Letter drafted by Thomas Legge on 31/7/1930 regarding: British Post-Graduate Hospital and medical School, London School of Hygiene and tropical Medicine.

[131] MSS.292C/140/6 (TUC Deputations), TUC Deputation to the Minister of Health and Labour at the House of Commons, 25/02/1931

to the 1930s. In the 1950s the Medical Inspector of Factories could report that 'a considerable improvement in notification is needed from the medical profession and from employers' to assess the levels of industrial disease and thereby take steps to control them.[132] Also in 1955, after ten years in operation, the Nuffield Foundation could report that the study of industrial health was 'among the less successful of its ventures.'[133] Demonstrating that the industry suffered from wilful deafness even by 1973 the Nuffield Department of Industrial Health felt it necessary to continue to lobby for health hazards to be identified in new chemical processes *before* plant construction began and to ensure that both medical and safety advice was incorporated into the design.[134] That the Nuffield should still be promoting this preferred method in the 1970s indicates that the Association of British Chemical Manufacturers (ABCM) 'Safety Rules' were more impressive on paper than in reality as in 1951 they had stated under rule 1-16 that:

> Before commencing any large-scale experimental work or any new manufacture, the employer shall take steps to ascertain definitely all the hazards involved both from the actual operations and the chemical reactions. The properties of the raw materials used, the final products made, and any by-products arising during manufacture shall be carefully studied and provision made for dealing with any hazards including effects on workers which may arise during manufacture. The design of the building and plant shall be based on the information thus obtained.[135]

According to Raffle, the applied research method most commonly used for investigating occupational health has been the epidemiological survey.[136] Bohme *et*

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[132] R. Murray, 'The Contribution of the Factory Department to the Assessment of Health and Disease in Industry', pp.331-332 in *British Journal of Industrial Medicine*, (4), 1955, p.331
[133] A. Meiklejohn, 'Sixty Years of Industrial Medicine in Great Britain', pp.155-165 in *British Journal of Industrial Medicine*, (13) 1956, p.161
[134] R.C. Browne, 'Safety and Health at Work: The Robens Report' pp.87-94 in *British Journal of Industrial Medicine*, (30) 1973, p.90
[135] Association of British Chemical Manufacturers, *Safety Rules for Use in Chemical Works, Part 1, Model Rules, 3rd Edition*, (London, 1951), p.10
[136] P.A.B. Raffle, 'The Purposes of Occupational Medicine' pp.102-109 in *British Journal of Industrial Medicine*, (32) 1975, p.105

al have argued that the chemical industry 'in particular' stressed the use of this research method claiming that 'animal models, molecular understanding, and pathologic data cannot establish cause-effect relationships.'[137] Indeed, the use of this long term research method was pioneered in Britain by Case *et al* to establish the causes of bladder cancer in dyestuffs manufacture and then by Bidstrup and Case when examining the causes of lung cancer in chromate manufacturing.[138] The original research conducted by Case *et al* was financed by the ABCM who stated in 1953 that this research was based 'on a study of all the death certificates of males in England and Wales between 1920 and 1950 where tumour of the bladder was mentioned.'[139] In other words, and notwithstanding the value of the results drawn for such studies, this form of research was heavily reliant on having dead workers to count. Drawing on a wide variety of evidence it has been argued by Bohme *et al* that the chemical industry's *preference* for this methodology is that human epidemiological data are difficult to acquire, the surveys are time-and-resource-consuming and inevitably delays ensue with regard to regulatory decision making.[140] This will be explored further in Chapter Six where the chemical employers will be examined to assess their responses to occupational injuries and deaths.

Conclusion

Three agencies were identified who had the potential to offer chemical workers a better level of protection from occupational hazards than they could themselves. It has been argued that the state was relatively ineffectual in offering a

[137] S.R. Bohme, A.J. Zorabedian, and D.S. Egilman, 'Maximising Profit and Endangering Health: Corporate Strategies to Avoid Litigation and Regulation' pp.338-348 in *International Journal of Occupational and Environmental Health*, (11) 2005, p.340

[138] R.A.M. Case, M.E. Hosker, D.B. McDonald, and J.T. Pearson, ' Tumours of the Urinary Bladder in Workmen Engaged in the Manufacture and Use of Certain Dyestuff Intermediates in the British Chemical Industry, Part 1. The Role of Aniline, Benzidine, Alpha-Naphthylamine, and Beta-Naphthylamine' pp.75-104 in *British Journal of Industrial Medicine*, (11) 1954

P.L. Bidstrup 'Carcinoma of the Lung in Chromate Workers' *pp.302-305 in British Journal of Industrial Medicine, (8) 1951,* P.L. Bidstrup and R.A.M. Case 'Carcinoma of the Lung in Workman in the Bichromate Producing Industry in Great Britain', pp.260-264 in British Journal of Industrial Medicine, (13) 1956, M.R. Alderson, N.S. Rattan, and L. Bidstrup, 'Health of Workmen in the Chromate-Producing Industry in Britain, pp.117-124 in *British Journal of Industrial Medicine*, (38) 1981

[139] MSS.292/174.47/7 (Cancer of the Bladder), The Industrial Injuries Advisory Council, Concerning the Proposed Prescription of Papilloma of the Bladder, Appendix A, Letter from ABCM, 30/09/1953

[140] S.R. Bohme, A.J. Zorabedian, and D.S. Egilman, 'Maximising Profit and Endangering Health: Corporate Strategies to Avoid Litigation and Regulation' pp.338-348 in *International Journal of Occupational and Environmental Health*, (11) 2005, p.340

protective matrix to address the many hazards that existed within this industry. It is however the quality rather than the quantity that left so many workers exposed to risk. The first rules and regulations had been introduced in 1893 and were easily outdated by the time the second set was enacted in 1922. A further forty-five years would pass before the Carcinogenic Substances Regulations were introduced to deal with specific industrial carcinogens that had been first identified in the 1920s. To some extent these legislative measures were enhanced by the general rules and regulations contained within the Factory Acts and by the recognition of occupational diseases such as chrome ulceration (1920) and poisoning by carbon bisulphide (1924). However, what has been argued here is that many of the general legislative measures were designed to prevent the most obvious hazards such as fire and explosion and therefore, whilst ultimately providing a level of protection to the workforce, they had not been introduced for that purpose *per se* but to protect investment and profit.

The slow state response to occupational health and safety issues contrasts dramatically with the dynamic development of the British chemical industry and what has been argued is that at no point did the state ever catch up with the pace of chemical development. Consequently, what might be termed 'a gap of neglect' opened up between the first acknowledgements that a health problem existed and legislation being passed to address the causes. Tweedale, and Johnston and McIvor have found a remarkably similar situation with respect to the asbestos industry. The state must be criticised for accepting the industry's 'co-operative attitude' in identifying possible deadly substances whilst virtually ignoring the toll of death and suffering that had mounted for more than forty years.

It has been argued that the work of the Factory Inspectorate was far from exemplary although to some extent their work was seriously impeded by the constant lack of funding and personnel that plagued this organisation from its inception. It has also been suggested that the legislation they were charged with policing was not always clear. This left areas of doubt that could be exploited by the legal profession who represented employers threatened with court proceedings for failing to adhere to the rules and regulations. This resulted in the inspectorate adopting a position that sought to encourage rather than force employers to comply with the legislation. The chromate-manufacturing sector was used as an exemplar to show how this ‘softly-softly’ policy was virtually useless in preventing chrome ulcerations and the loss of nasal septum and these must have been running at epidemic proportions from the 1920s through to the late 1950s. Perhaps the inspectorate’s approach was simply a pragmatic response to the lack of interest shown towards occupational health and safety issues by the state and in general. Nevertheless, suspicion that the inspectorate worked on behalf of the employer’s interests rather than the workers is seen in their practice of giving warning to employers that an inspection was imminent. The frustration amongst those workers who wished to have faults and hazards witnessed by the inspectorate has been outlined and it has also been argued that this practice tended to alienate large sections of the trade union movement.

The final area to be examined was concerned with medical research. Beginning with the wartime work of the HMWC it was shown that this was primarily designed to increase production and that whilst this was required during a period of full employment the enthusiasm of the state and employers for this type of research waned with the return of mass unemployment in the inter-war period. Indeed, McIvor’s analysis has argued persuasively that employers largely ignored the work of the IHRB whilst Watterson has shown that a very similar situation prevailed in relation to the educative work of the IHES. Some doubt exists as to the motivation that led the head of ICI to become involved with the IHES although it has been suggested that he did this to enhance the caring image that was created around ICI that helped to diffuse concerns about the safety of the industry.

From the 1930s ICI added to their vision of being a safe employer by setting up and paying for a research laboratory that was staffed with ICI scientists. This group conducted various occupational health research projects and published their results in reputable journals. There is evidence that their work did deliver some improvements to the working environment, however, what is argued here is that this was acceptable to the employer so long as it was affordable and did not interfere with production. It has also been argued that research paid for by the company was owned by the company and consequently it was they who controlled the results. What has been shown here is that on occasion information concerning the welfare of the workers was withheld as was the case of those working amongst the hazardous dusts of soda ash. The medical research was also used by ICI to defend its position in legal cases that sought to show that the firm did not take sufficient precautions to protect its employees or customers. The use of the epidemiological method has also been criticised. This methodology was first used in 1947 by a chemical industry commissioned research project on industrial papilloma of the bladder with the results being published seven years later. It has become the most commonly used methodology in the industry but has drawn criticism from Bohme *et al* who see its use as a delaying tactic within a wider strategy that seeks to 'manufacture doubt' about the dangerous processes and products associated with the chemical industry.

Chapter Five

Trade Unions and Occupational Health

> *The employers have now agreed that the question of safety in the chemical industry is something that concerns both the trade union side and the employers' side of the JIC (Joint Industrial Council). In order that this matter can be fully discussed it has been agreed that an appropriate item be placed on the agenda of the next JIC meeting.*[1]

Introduction

As this chapter is concerned with the trade union movement it is perhaps appropriate to begin by defining them. Trade unions are fundamentally composed of individuals who have little option but to sell their ability to work in the labour market. Once a buyer of this ability is found a wage is paid for so long as the employer is willing to do so. As individuals, waged labour has little effective leverage in the relationship with the buyer of their abilities. Most labour historians would agree that those who sold their ability to work came to realise that they had a common interest and learned that if they organised they could exert more influence collectively than they could as individuals. As a result of becoming organised in trade unions concessions could sometimes be won from the employer including improved wages, shorter hours, or by gaining some improvements in the working conditions. However, these concessions were not won in a uniform pattern and as McIvor has argued, the growth of trade unionism and strike propensity was uneven with gains sometimes later lost.[2]

Amongst those joining a trade union there are some that voluntarily participate by attending branch meetings whilst some even allow themselves to become elected by their peers to representative positions at a local, regional, or national level. However, most members of trade unions do not participate in the day-to-day running of 'their union.' Indeed, in 1950, a survey of the Transport and General Workers Union (TGWU) found that although branch meetings were held on a regular basis the meetings were only attended by a minority of the membership due to 'timidity resulting from inadequate education, the inconvenience of time and place of meetings,

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[1] Minutes and Reports of TGWU Chemical & Allied Trades National Committee, January 1963, MSS.126/TG/449/E

[2] A. J. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.201

time-consuming household duties, alternative sources of leisure and finally, in a few cases, dissatisfaction with the actual operation of the branch.'[3] Therefore, being a member of a trade union did not mean becoming a member of an army or of a business. Members could, and did, absent themselves whenever they did not wish to participate in the trade union. Choosing to participate in a trade union would perhaps have come about for pragmatic reasons such as noted above. That is, having realised their relatively weak position to those who owned and controlled the means of production they banded together and collectively challenged this power on occasion to win some limited concessions. Nonetheless, according to Poole, many reasons exist that explain participation in a trade union and he asserts that there are 'five clusters of attitudes' which members judge to be legitimate forms of union activity. These can be seen to be 'ideological, revolutionary, conservative, instrumental, or political in nature' with all being consistent with a desire to enhance their position in decision making at a workplace level.[4]

Within the history of the labour movement there has been a very limited examination of the role played by the trade unions in the chemical industry. In his study examining the period 1900 to 1930, Haber offered one explanation for the gaps in archival material relating to chemical workers by claiming that the government concentrated their efforts on industries where trade unions had become increasingly active such as in coal mining, textiles and engineering. The chemical industry was considered to be one of the 'less organised trades' and therefore many changes within the industry tended to 'escape notice.'[5] Factors such as unemployment, the business cycle, changes in the composition of the workforce, legislation, etc. may all have played some part in contributing to this position. However, one theme affecting recruitment that emerges consistently from the literature is the employers' attitude towards trade unions. In some firms the tactic deployed to prevent recruitment was straightforward. One former worker recalled that his manager 'refused to have a union in the place at all and he threatened that he'd sack the first man that started one.'[6] However, a more subtle approach was adopted by those chemical employers who

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[3] J. Goldstein, *The Government of British Trade Unions, A Study of Apathy and the Democratic Process in the Transport and General Workers Union*, George Allen, (London 1952)
[4] M. Poole, *Workers' Participation in Industry*, Routledge, (London 1978), pp.87-88
[5] L.F. Haber, *The Chemical Industry, 1900-1930, International Growth and Technological Change*, Oxford University Press, (Oxford 1971), p.387
[6] P. Pagnamenta and R. Overy, *All Our Working Lives*, British Broadcasting Corporation, (London 1984), p.17

came to dominate the industry and who designed and implemented a variety of welfarist strategies that sought to neutralise trade unionism within their businesses. Nonetheless, what will be demonstrated in this chapter is that although a low density of trade unionism persisted within the chemical industry, chemical trade unionists were able to make some impact on issues of occupational health by utilising the strength of their union organisations that recruited and operated largely outside of the industry.

Many accidents occurred in the chemical industry but the task facing the trade unions in attempting to improve the working conditions was not just to deal with the obvious but also to deal with the sometimes obscure, complicated, and insidious presence of industrial diseases. These diseases were most often accompanied by long latency periods of up to 20 years and consequently posed no immediate threat in the consciousness of many workers. That is, although chemical trade unionists suspected that death and sickness was occurring as a result of exposure to fumes, gases and dusts, these lacked the dramatic immediacy of seeing someone being severely scalded by caustic or having their arm removed by ore crushing machinery.[7] Such events could be officially recorded and the statistics collated. For trade unionists that then wished to campaign on such unambiguous health and safety issues the problem of convincing others to join them was less arduous. However, the worker's response to industrial disease was less immediate and as Meiklejohn noted in 1950:

> If diagnosis does not automatically involve certification and compulsory suspension, advice to the workman to find a safe job out of the dust is summarily dismissed. In our highly industrialized modern state, economic employment and family considerations supersede slight deviations from full health …the pay packet recognizes no danger, piece work and output bonus admit no hindrance, and health seldom becomes a reality until lost beyond recovery. [8]

Convincing the government to schedule industrial diseases so that damaged workers might receive compensation by right rather than litigation was no simple task

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[7] Several such incidents appear in the Accident Books of United Alkali Company Limited, 1914-1928, DIC/UA8/5/11- 22

[8] A. Meiklejohn, 'Doctor and Workman' pp.105-115 in *British Journal of Industrial Medicine*, (7) 1950, p.109

and often failed. However, recognising unofficially that some workers were dying as a result of exposure to their profit making processes some large chemical employers who came to dominate the industry introduced their own compensation schemes. Was this altruism? Whilst firms such as Bruner Mond and ICI proclaimed to have a long history of 'sympathetic and progressive' policies it will be argued here that these employers may have had less than altruistic reasons for introducing such schemes.[9] Trade unions had a moral responsibility to mitigate the physical damage that was visited upon their membership and they had been drawn into the bureaucratic web of compensation schemes since the 1880s and 1890s. From a workers perspective it was the trade unions that were delivering compensation to victims and in return trade unions gained gratitude and sometimes more members. However, where compensation was not available workers could become aggrieved and industrial relations could worsen. By providing their own compensation schemes chemical employers not only controlled the system but also drew kudos away from trade unions and towards themselves. This type of strategy is made abundantly clear by the chief executive of ICI Central Labour Department who stated in 1928 that:

> The value to the company of benefits, privileges and concessions depends on the workers recognising them as voluntary acts by the company and not as a product of negotiations with the trade unions.[10]

The managed response to industrial injury and disease through employer led compensation schemes and other benefits removed the need in the minds of many chemical workers to join trade unions. Compensation schemes also worked for employers because a) they had a set economic value on human life, b) some claims could fail whilst others were never made c) payment of a claim was full and final and d) compensation acted as a palliative to many workers and trade unions allowing the capital intensive processes to carry on largely uninterrupted.

Industrial diseases emerged from within a chemical industry that rapidly expanded both its range of products and methods of production from 1914 onwards. This would create a bewildering array of complex and toxic chemical substances that

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[9] *Alkali News,* 75th Anniversary Edition, 1873-1948, February 1949 (Northwich), pp.10-11
[10] C. Gill, R. Morris, and J. Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.87

required the trade union movement to conduct increasingly difficult investigations in their attempt to have some of these officially recognised as occupational hazards. Inevitably time lags existed between the first suspected identification of ill health or death and official recognition of such by the employers, the state, and the medical and legal establishments. The existence of delays was not created by trade unions and they had limited resources or power to circumvent the socially constructed requirement for irrefutability. Nonetheless, because delays did exist between the original identification of a health problem and positive preventative action being implemented this has led some to criticise the trade unions for not doing enough. It will be argued that this criticism has arisen because trade unions have mistakenly been perceived of as having an equal and powerful place alongside those who were responsible for the implementation of preventative measures to deal with occupational hazards.

To begin this investigation there will be a brief analysis of where things stood at the beginning of the period; the industry as it was during the First World War. By using this as an introduction to some of the themes this will be linked to an engagement with the historiography of occupational health and it will be argued that much of the criticisms made of trade unions are overstated. Indeed, this study will add to the body of evidence that has challenged the revisionist position on trade unions and occupational health. In order to establish some context for this examination the size and density of the trade unions will be examined and this will include a comparative element to show where the chemical trade unions stood in relation to other trade unions that were also affected by occupational health hazards. This analysis of membership and density will chronologically follow the economic and political events that impacted on the development of trade unionism and will include an analysis of the employers' attitudes to trade unions within the industry. Thereafter, drawing on a variety of primary source documents, predominantly those belonging to the Transport and General Workers Union (TGWU) and the Trades Union Congress (TUC), this analysis will chart the progress of the trade union movement within the British chemical industry to see what impact they had on many of the occupational health issues that they faced between 1914 and 1974.

The material needs of the First World War highlighted just how old fashioned the chemical industry had been with the majority of manufacturers being described as, ‘Victorian in their ideas and equipment.’[11] Within such a backward environment increasing demands for munitions brought increased risks of occupational health and these risks were now shared between the tens of thousands of men and women newly recruited to the workplace. Ineson and Thom have highlighted the dangers to the health of the women that arose from their exposure to TNT whilst more recent evidence has identified the dangers that were associated with the development and production of poison gas, undertaken regardless of the death, or disablement to chemists and workers.[12] Whilst the manufacture of poison gas at Porton Down was highly secretive and many of the human guinea pigs were ‘volunteers’ this was ostensibly not the case with the manufacture of TNT. By 1915, in response to information of ill health and sickness emerging from the industry, many refused to accept work that involved TNT whilst others who were already doing so absented themselves. Faced with declining production levels the Health of Munition Workers Committee (HMWC) were appointed in 1915 and within a year had listed the consequences to the workers health if exposed to the vapours and dusts of various chemical compounds used in the manufacture of munitions and war related products.[13] In 1916, the Miners’ Federation, the Cotton Spinners’ Association and the Dock and Riverside Workers’ Union called for the Workmen’s Compensation Act to be amended so that ‘all diseases which may be contracted by munitions workers owing to the handling of TNT or other chemicals be scheduled as industrial diseases.’[14] However, the ability of the trade unions to help many victims of TNT poisoning was circumscribed. Although the HMWC had identified many causes and symptoms of TNT poisoning some of this medical and scientific work was suppressed or used unethically to hide the true levels of disease whilst some was distorted to pacify the workers who agitated against TNT work.[15]

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[11] S. Miall, *A History of the British Chemical Industry*, Ernest Benn, (London 1931), p.37

[12] A. Ineson and D. Thom, ‘T.N.T Poisoning and the Employment of Women Workers in the First World War’, pp.89-107 in P. Weindling (ed) *The Social History of Occupational Health*, Croom Helm, (London 1985) and J. Parker, *The Killing Factory, The Top Secret World of Germ and Chemical Warfare*, Smith Gryphon, (London 1996), p.24 and p.210. Secret reports withheld until 1981 revealed that at Porton Down in 1917-18 ‘workmen were used extensively for experimental work.’

[13] Health of Munition Workers Committee, Memorandum No.7, Industrial Fatigue and Its Causes, PP 1916, (Cd. 8213), p.2 and Health of Munition Workers Committee, Memorandum No.8, Special Industrial Diseases, PP 1916, (Cd. 8214) The list included drowsiness, headaches, loss of appetite, eczema, cyanosis, shortness of breath, severe coughing, vomiting, anaemia, pains in the limbs, staining of the worker’s skin and hair, jaundice, liver destruction and even death

[14] Trades Union Congress Report, 1916, ‘Amendment of Workmen’s Compensation Act,’ p.321

[15] A. Ineson and D. Thom, ‘T.N.T Poisoning and the Employment of Women Workers in the First World War’, pp.104-105

What is important to the study of occupational health is that the HMWC had shown that it was possible within a very short period of time to conduct research and identify a number of dangerous methods and materials that existed within the workplace. Moreover, the work of the HMWC had only gained significance as ill health and death interfered with the output of munitions for the war effort. As for the health of workers not involved with munitions the HMWC stated, 'no useful purpose would be served by dealing with those of less immediate importance.'[16] From amongst the 'less important' one official estimate has calculated that 21, 942 of them died as a result of occupational injuries between 1915 and 1919.[17] Perhaps at a time when a much greater crop of deaths and injuries was being recorded on the fields of France the HMWC statement and actions were understandable. As the findings of the HMWC were being published in a variety of journals it is interesting to note what the chemical industry thought about them. In the industry's main publication, the *Chemical News,* the following statement informs us that:

> Many of those problems under consideration, whether concerning the employment of men, women, or children, have only recently been grappled with, and it is amazing that such a stage of industrial progress should have been reached without any serious attempt to solve them. Had the attempt been made earlier much of the bitter heritage of labour unrest which has descended to us might have been spared. We can only hope that, with the new insight which the war has brought us, better understanding may prevail, and the welfare of the industrial population, upon which the prosperity of the Empire depends, be safeguarded to the utmost of our power.[18]

Here was a vision of an ignorant past and an enlightened future. Yet, what was indeed 'amazing' was that none of this 'new insight' had been intrinsically missing in the period preceding the war. Years before the above statement was made, occupational health experts, medical experts, factory inspectors, as well as trade unions had all identified occupational health problems within the chemical industry specifically and

[16] *Ibid*, p.3
[17] Figures quoted in A.J. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.132
[18] *Chemical News*, March 23, 1917, p.142

within industry generally.[19] Offering solutions to deal with these problems they had claimed that many deaths and injuries were preventable. As a result of war and the desire to win it this 'new insight' had been immediately called upon but clearly there must have been some form of external economic or political factors preventing it from being used much earlier, and latterly more fully.[20]

Although in 1917 the *Chemical News* had predicted progress, Beaumont claims that forty years later trade union representatives still had no right to inspect the statutory safety and health records at the workplace, had no legal right to liase with a visiting factory inspector or to see the report and had no legal right to information either from the employer or inspectorate about the hazards to which any of the members might be exposed to at work.[21] Eva and Oswald have further argued that the persistence and failure of the voluntary approach to safety committees, the weaknesses in the law and the failure to properly fund or staff the factory inspectorate were all subsequently identified by the trade unions who in turn pressured the Labour Party for reform.[22] Fifty-six years after the ending of the First World War the Labour Party introduced the Health and Safety at Work Act (1974) something that Nichols has identified as leading to 'a heightening of safety-consciousness.'[23]

Some of the barriers to occupational health reform have been briefly touched upon but amongst historians of occupational health some have posited that the trade unions also impeded progress. These historians have claimed that trade unions could have done more, that they prioritised wages over health issues and that they used their resources to win compensation payments rather than campaigning more effectively for preventative measures.[24] Whilst acknowledging the contribution that these

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[19] For a brief history of industrial medicine and the experts who worked in this field see A. Meiklejohn, 'Sixty Years of Industrial Medicine in Great Britain', pp.155-165 in *British Journal of Industrial Medicine*, (13) 1956. For an extensive overview of many of the health problems associated with work in the late nineteenth and early twentieth centuries see T. Oliver (ed) *Dangerous Trades, The Historical, Social and Legal Aspects of Industrial Occupations as Affecting Health by a Number of Experts*, John Murray, (London 1902). For the chemical industry see A. P. Laurie, 'The Chemical Trades' pp.568-598 in T. Oliver (ed) *Dangerous Trades*, (London 1902). Also Report on the Conditions of Labour in Chemical Works, The Dangers to Life and Health of the Workpeople Employed Therein and the Proposed Remedies, Chemical Works Committee of Enquiry, PP 1893, (C.7235) The Chemical and Copper Workers' Union gave evidence to this Committee on the unhealthy and dangerous conditions in the workplace.

[20] J.D. Bernal, *The Social Function of Science*, Routledge, (London 1944), p.172

[21] P.B. Beaumont, *Safety at Work and the Unions*, Croom Helm, (London 1983), p.71

[22] D. Eva, and R. Oswald, *Health and Safety at Work*, Pan, (London 1981), p.37

[23] T. Nichols, *The Sociology of Industrial Injury*, Mansell, (London 1997), p.140

[24] P. Weindling, (ed) *The Social History of Occupational Health*, Croom Helm, (London 1985), P.W. J. Bartrip, The Home Office and the Dangerous Trades, Regulating Occupational Disease in Victorian and Edwardian Britain, Rodopi, (Amsterdam 2002)

historians have made to the study of occupational health and safety their conclusions are not without criticism and thus an alternative point of view has emerged. Although remaining partially critical of the trade unions these historical studies tend to emphasise the employers prioritisation of profit over health as well as serious state neglect. For example, Tweedale and Johnston and McIvor place much of the blame for the toll of disease and death amongst asbestos workers at the door of the employers and the regulators.[25] Similarly, Markowitz and Rosner's recent research has argued that American chemical workers were unnecessarily exposed to disease and death when the vinyl industry responded to occupational health problems by:

> Hiding information, controlling research, continuing to market their products as safe when they were known to be dangerous, enlisting industry-wide groups to participate in denying that there was a problem, and attempting to influence the political process in order to avoid regulation.[26]

The British firm of Imperial Chemical Industries (ICI) were also cited in this study as having colluded with these US manufacturers during the early 1970s.[27]

The work of Tweedale and Johnston and McIvor amongst others has revealed persuasive evidence to show that those who wielded the true economic, social and political power could have done much more to emphasise, encourage, legislate and implement occupational health reform. By delaying or limiting research the actions and attitudes of the powerful impacted adversely on the ability of the trade unions to campaign effectively. This was exacerbated by the fact that some essential information that would have been vital for campaigns on occupational health was withheld entirely. The problem then faced by the trade unions was that although they may have been able to call upon work-related experience as evidence of occupational health problems this was not enough to counter the opposing views forwarded by many legal, medical, employer or government establishments. The evidence shows that many trade unionists suspected for years that certain processes were damaging

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[25] R. Johnston and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, East Linton 2000 and G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003)
[26] G. Markowitz and D. Rosner, *Deceit and Denial, The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003), p.300
[27] *Ibid*, p.182, 189 and 213

but found it impossible to prove this without having access to 'the facts.'[28] As Watterson has argued there is a general presumption in Britain against the idea that work and occupational illness go hand in hand unless 'an extensive body of research data is provided and a very high level of proof of causality established.'[29]

The processes that would begin to deliver this research took many years to become established but in the intervening years compensation legislation was used not only as a cheap option by the state and employers to address occupational health problems but also to concentrate the minds of those concerned on the value of money rather than life. Compensation became the immediate viable option for trade unions and they had a responsibility to the victims to pursue claims. However, in doing so they were also drawn into a bureaucratic process that was not of their making. The compensation process was loaded against unions although in the absence of any other available option it may not have appeared that way at the time. The clarity that shows how heavily weighted the system was is contained in a series of studies of occupational health and safety that have revealed many cases of weak regulation, under-funded and under-staffed inspection, ineffective medical monitoring, corporate or state deception, and the placing of profit maximisation ahead of safety.[30]

Those who criticise the trade union movement have tended to adopt a pluralist perspective when doing so. One weak point of this perspective is that it fails to sufficiently demonstrate in what way the trade unions had equal access to information and power with which they could have done more to launch

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[28] TUC Report, 1945, p.297. Motion forwarded by the Chemical Workers' Union and supported by the Association of Scientific Workers identifying the inadequacies of the Chemical Works Regulations, 1922 and the lack of specialist knowledge to help identify the health risks associated with new plastic compounds and solvents.

[29] A. Watterson, 'Why We Still Have 'Old' Epidemics and 'Endemics' in Occupational Health: Policy and Practice Failures and Some Possible Solutions', pp.107-126 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), p.110

[30] P.W.J. Bartrip, and S.B. Burman, *The Wounded Soldiers of Industry, Industrial Compensation Policy, 1833-1897*, Clarendon Press, (Oxford 1983), N. Daykin, & L. Doyal, (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999) D. Eva, and R. Oswald, *Health and Safety at Work*, Pan, (London 1981) W. Graebner, 'Hegemony Through Science: Information Engineering and Lead Toxicology, 1925-1965' pp.140-159 in D. Rosner and G. Markowitz (eds) *Dying For Work: Workers' Safety and Health in Twentieth-Century America*, Indiana University Press, (Indianapolis 1989) B. Harrison, *Not Only the Dangerous Trades, Women's Work and Health in Britain, 1880-1914*, Taylor and Francis, (London 1996) A. Ineson, and D. Thom, 'T.N.T. Poisoning and the Employment of Women Workers in the First World War,' pp.89-107 in P. Weindling (ed) *The Social History of Occupational Health*, Croom Helm, (Kent 1985) R. Johnston, and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, (East Lothian 2000) F. Pearce, and S. Tombs, *Toxic Capitalism: Corporate Crime and the Chemical Industry*, Ashgate, (Hants 1998) G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003) C. Woolfson, J. Foster, and M. Beck, *Paying for the Piper, Capital and Labour in Britain's Offshore Oil Industry*, Mansell, (London 1997)

preventative campaigns. If they did have equal social, economic and political power then why did the trade unions perversely chose not to use it to prevent damage and death amongst their members? A more self-evident explanation is that no such equality existed. This is precisely what Melling has found when examining trade union responses to occupational risk between the 1890s and 1940s. Thus, for Melling:

> The responsibility for the levels of industrial illness and injury lay primarily not with the union but rather with more powerful players in a context where market conditions and institutional rules defined the capacities of the different actors. The capacity of the unions and their members to secure safe working or to press for better compensation depended on circumstances over which they possessed limited control.[31]

Hyman echoes such a view noting that the power of organised labour never managed to exceed that of capital and the support it receives from the state and other dominant sections of society.[32] According to Tweedale, trade unions who represented members in the asbestos industry played only a 'limited role' in matters of health and safety but this was mainly due to the decision of Turner & Newall to exclude them from decision making, by their lack of access to medical knowledge, by a dearth of funding and by low levels of trade union membership.[33]

It is at least possible to argue that the problems of accessing information within the chemical sector was more difficult to establish than in any other industrial sector. Within the chemical industry the numbers of chemicals handled not only increased in number but also became increasingly complex in their formulation and were manufactured using a variety of newly developed technical and scientific processes. The pace of change far outstripped legislation and examination. This becomes evident when it is seen that in 1925 less than 20 solvents were manufactured but only ten years later there were over 300 and yet the Chemical Works Regulations

[31] J. Melling, 'The Risks of Working and the Risks of Not Working: Trade Unions, Employers and Responses to the Risk of Occupational Illness in British Industry, c.1890-1940s' pp.14 –34 in *ESRC Centre for Analysis of Risk and Regulation*, Discussion Paper No.12, December 2003, p.16
[32] R. Hyman, *Industrial Relations, A Marxist Introduction*, MacMillan, (London 1978), p.23
[33] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), p.288

of 1922 covered all of these solvents.[34] It has been estimated that by the late 1970s the international chemical industry produced 500 new chemicals and marketed over 120,000 new synthetic compounds annually.[35] Due to the high capital costs incurred on research and development, information on the chemical compounds and processes was guarded with only certain engineers, scientists, or chemists being in full possession of the knowledge.[36] The importance of the secrecy attached to the job was expressly referred to in the contract of employment.[37] Given that this secrecy existed in connection with the products and processes this would inevitably make it more difficult for trade unions or any other external party to establish just how safe or unsafe they were. As previously stated, the task faced by the trade unions was to provide conclusive proof of the existence of an occupational risk in order to have the process banned, safeguarded against or have those suffering from an illness or injury compensated. For those who may have suffered or witnessed others suffering from industrial diseases it was not enough to simply suspect that the process or material handled was the cause. Diseases such as cancer could be occupational, non-occupational or a combination of both.

The trade unions were under a moral obligation to mitigate the worst effects on the existing victims and pursuing compensation claims was one way of doing this. It was also argued by the trade unions that compensation law financially penalised the employer and that by winning more cases for the workers the employer would then be forced to save capital by implementing preventative measures. Whilst being perfectly logical at the time the decision to pursue compensation on this basis was perhaps naive and failed to take into full account the basic economic calculations that some employers chose to make. That is, by conducting (generally secretive) cost-benefit analyses some found that it was cheaper to pay compensation than to pay for more expensive preventative measures. Thus, the trade union belief in human morality was

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[34] TUC Report, 1945, p.296.

[35] C. Gill, R. Morris, and J. Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.219

[36] In the post-war period research and development expenditure by the chemical industry exceeded that spent by all other industries except aircraft and electronics. G.C. Allen, *British Industries and Their Organization*, Fifth Edition, Longman, (London 1970), p.212

[37] An example of this is contained within two ICI Contracts dated 1948 and 1959. Section 4 a) states, 'The employee shall keep the secrets of the Company and its subsidiary companies and shall not either during his employment hereunder or at any time after the termination thereof divulge any matters or things relating to the business or interests of the Company or its subsidiary companies to any unauthorised person or utilise any secret or confidential knowledge or information acquired in consequence of the employee's service hereunder to the detriment or prejudice of the Company or its subsidiary companies.'

overridden by the desire for capital accumulation. Prominent amongst those adopting this form of economic thinking into their business strategies have been the oil, asbestos, car, and chemical industries.[38]

Trade Union Recruitment and Retention

Trade unionism within the chemical industry has its origins in the last decade of the nineteenth century and campaigns by the Chemical and Copper Workers' Union contributed to the establishment of safety rules and regulations for the relatively simple pre-war chemical processes.[39] However, the pace of change and complexity within the industry would leave in its wake those who were concerned to monitor health and safety issues. This was the case whether it was to establish compensation payments or to have more stringent preventative measures put in place. Amongst the less prominent unions that recruited in the chemical industry were the Amalgamated Union of Engineering Workers (AUEW), the Union of Shop, Distributive and Allied Workers (USDAW) and the Union of Construction and Allied Trades and Technicians (UCATT). The prominent trade unions in the chemical sector from the early 1920s were the Transport and General Workers Union (TGWU) and the National Union of General and Municipal Workers (NUGMW) both of whose main interests and membership lay outside the chemical industry. Total trade union membership figures for 1914 to 1974 are available for the 'chemical and allied industries' sector but it is almost impossible to identify an accurate pattern for each separate union as they themselves kept no such specific records. The data that is available shows that in 1954 the TGWU represented 40,095 members across the industry rising to 48,528 by 1956.[40] This membership increased marginally and in

[38] See D. Eva, and R. Oswald, *Health and Safety at Work*, Pan, (London 1981), on Ford Pinto cost benefit analysis for burn deaths and injuries, p.48. G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), on 'an acceptable level of death' amongst asbestos workers, p.280. The human price of oil extraction has been examined by C. Woolfson, J. Foster, and M. Beck, *Paying for the Piper, Capital and Labour in Britain's Offshore Oil Industry*, Mansell, (London 1997). For the chemical industry see G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003) and F. Pearce, & S. Tombs, *Toxic Capitalism: Corporate Crime and the Chemical Industry*, Ashgate, (Hants 1998)

[39] D. Walker, *An Inconvenience of the Trade, Occupational Health and Safety in the British Chemical Industry, 1870-1914*, M.Phil Dissertation, University of Strathclyde, 2003. Unpublished

[40] Minutes and Reports of TGWU Chemical & Allied Trades National Committee, April 1954 and March 1957, MSS.126/TG/449/E

1960 stood at 52,000.[41] Without revealing his source Verma estimated that in 1963 the TGWU had 60,000 members whilst the GMWU had slightly less than this figure.[42] Of the other unions in 1963 USDAW claimed to have 15,000 members whilst the AUEW and other small craft unions had 24,000. UCATT had a relatively small membership of 3,000.[43] The sluggish increases in membership experienced by the TGWU continued to be the norm and by 1966 they noted that they had 61,004 members within the chemical industry.[44]

In competition for members with the TGWU and NUGMW was the National Union of Drug and Chemical Workers (NUDCW). This union emerged in 1912 and by 1919 had 5,000 members but the economic depression saw its membership halved by 1922.[45] Lerner provides a short history of this union noting the 'poaching' claims that surrounded its disaffiliation from the TUC in 1924.[46] Renaming itself the Chemical Workers' Union in 1936 the CWU was readmitted to the TUC in 1943 with a membership of 22,000. The CWU, a union born within the industry, continued to maintain a presence but argued that trade unionism in the chemical industry should be industry based and not general.[47] Following years of campaigning, often in competition with the TGWU, the CWU decided in 1971 to amalgamate with the TGWU who as a result gained an estimated 7,000 former CWU members.[48]

A gender breakdown of union membership has not been fully established for the chemical industry and only Drake provides figures, which show that in 1914 there were 325 female trade union members and that by 1918 there were 3,000.[49] Although non-quantifiable what is known is that many thousands of women entered the industry

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41 Minutes and Reports of TGWU Chemical & Allied Trades National Committee, GEC Report, October 1960, MSS.126/TG/449/E

42 C.Gill, R. Morris and J.Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants 1978), p.123

43 *Ibid*, p.123

44 Minutes and Reports of TGWU Chemical & Allied Trades National Committee, September 1966, MSS.126/TG/449/E

45 S.W. Lerner, 'The Chemical Workers' Union, A Case Study', pp.13-65 in S. W. Lerner, *Breakaway Unions and the Small Trade Union*, George Allen & Unwin, (London 1961), p.19

46 *Ibid*

47 B. Edwards, *Chemicals. Servant or Master? Life or Death?* National Labour Press, (London *c*.1945), p.32. In 1945 the Assistant General Secretary of the CWU argued that, 'The trade union catering for chemical workers should be structurally organised commensurate with the trustified power of the employers. The old kind of pre-war general labour and craft organisations cannot function effectively in this industry. To pose such organisations against mighty enterprises like ICI is like entering a race with a donkey cart against a modern aeroplane.'

48 C.Gill, R. Morris and J.Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants 1978), p.147

49 B. Drake, *Women in Trade Unions*, Virago, (London 1984)

during both world wars and exited it thereafter. For example, the presence of women is noticeable in the accident books of the United Alkali Company up to 1918 but thereafter the number of recorded accidents involving female workers is very much reduced.[50] This firm embraced 38 factories and employed hundreds of munitions workers between the years 1914 to 1928 and it is not implausible to conclude that this reduction was due to the dismissal of the female employees. A similar pattern is seen for the period 1939 to 1945. One former chemical worker testified that during World War Two many women were employed at his chemical plant in Glasgow but 'once the war finished the women were all disappeared' except for those few who were retained to work in the canteen serving food.[51] What is known and quantifiable is that for those women who did continue to work in the industry their position was marked by receiving the poorest pay with 51.5 per cent of the female manual workers in 1981 earning under £80 whilst only 3 per cent of the male manual workers fell into the same category.[52]

In order to appreciate the position of trade union membership within the chemical sector it is perhaps appropriate to see where they stood in comparison to other unions over the period 1914 to 1974. Thus, Table 9 compares the densities and membership of the coal mining, cotton and chemical trade unions for the period 1914-74. The choice of coal and cotton has been made on the basis that these industries were large and were also involved in occupational health and safety issues. The data below reflects fluctuations in membership and density and Bain has suggested six main areas that impact on the growth and stability of trade unions. These are, the vagaries of the economic system, the recognition and acceptance of trade unionism by the state and the employer, the structure of the industry itself, personal and job-related characteristics, the composition of potential union membership, and union leadership.[53] Where possible, it will be shown to what extent these factors played a part in shaping trade unionism within the industry.

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[50] United Alkali Company Limited, 'Accident Books, 1914-1928' DIC/UA8/5/11-16
[51] Interview D. Walker with Mr Richard Fitzpatrick, 26 August 2004, SOHC
[52] C. Pond, 'Wages Councils, the Unorganised, and the Low Paid', pp.179-208 in G.S. Bain (ed) *Industrial Relations in Britain*, Basil Blackwell, (Oxford 1983), pp.188-189
[53] G.S. Bain and R. Price, 'Union Growth: Dimensions, Determinants, and Density' pp.3-33 in G.S. Bain (ed) *Industrial Relations in Britain*, Basil Blackwell, (Oxford 1983) pp.12-13

Table 9: British trade union densities for cotton, coal and chemicals, 1914-1974**.**

The figures in brackets signify trade union membership

Year	**Chemicals & Allied Industries**	**Cotton**	**Coal**	**Average for UK**
c.1914	**11.0** (18,700)	**49.1** (382,200)	**74.1** (867,300)	**23.0** (4,145,000)
c.1920	**23.6** (76,800)	**78.5** (527,700)	**92.4** (1,199,300)	**45.2** (8,348,000)
c.1933	**10.5** (26,600)	**51.4** (324,600)	**52.4** (570,600)	**22.6** (4,392,000)
c.1948	**35.3** (141,500)	**78.3** (274,300)	**86.4** (691,400)	**45.2** (9,363,000)
c.1968	**39.4** (186,900)	**81.0** (146,300)	**89.9** (398,900)	**44.0** (10,200,000)
c.1974	**48.4** (233,600)	**101***(149,200)	**96.1** (301,900)	**50.4** (11,764,000)

Source: G.S. Bain & R. Price, *Profiles of Union Growth*, Basil Blackwell, (Oxford 1980), pp.37-38

* This figure is accounted for by the inclusion of active retired members.

It can be seen that in all three sectors trade union membership and density increased in the period 1914-1920. The largest increases of all three belong to the 'chemical and allied industries' where union density doubled and membership quadrupled. One specific reason for this was the physical expansion made by the chemical industry to meet the demands of war and the increased supply of workers that were needed to meet this demand. The increases seen in all three during this period can also be accounted for by the government and employer acceptance of trade unionism and the existence of tight labour markets. Indeed, where employers attempted to hinder union recruitment the Ministry of Munitions intervened to rectify the position and consequently munitions workers 'flocked into the unions.'[54] To achieve acceptance by the government and employers the trade unions agreed to the conditions of the Munitions of War Act that banned strikes, made the restriction of output an offence, and put some safety regulations into abeyance. Following the membership advances made by the trade unions the 1920s were to become a pivotal moment for trade unionism but again this was especially so for the chemical sector and therefore this requires a more detailed and lengthy explanation.

Staving off the earlier economic slump that had begun in 1922 Reader notes that the depression of 1929 turned expansion within the chemical industry into

[54] H.A. Clegg, *General Union in a Changing Society, A Short History of the National Union of General and Municipal Workers, 1889-1964*, Basil Blackwell, (Oxford 1964), p.65

'standstill or contraction.'[55] Whilst this point is valid in economic terms it should also be noted that the decline in union density and membership can also be accounted for by the chemical employers' attitude to trade unionism and particularly within Imperial Chemical Industries (ICI). This firm was an amalgamation of the four largest chemical firms in Britain and was formed shortly after the miners' strike and General Strike of 1926.[56] Both of these strikes ended in defeat for the trade unions but despite their victory employers remained concerned with the persistent and public evidence of conflict between labour and capital as well as the loss of around 162 million working (potentially profit maximising) days arising from these strikes.[57] Three important issues arose as a result of these strikes. Firstly, in 1927 the Conservative government passed the Trade Disputes and Trade Union Act. This Act did not seek to ban trade unions but was designed to control and restrict them. Secondly, some trade union leaders and prominent employers became receptive to the idea that cooperative and consultative industrial relations were the way forward within capitalism. This idea briefly flickered into life in the Mond-Turner talks of January 1928. Thirdly, the state and leading employers realised that broadcasting and publishing were a 'potent form of propaganda.'[58] Sir Alfred Mond and his son Henry were in charge of all labour issues at ICI and were determined at the outset that the 33,000 employees should be loyal to the company and not to the trade unions. Although most chemical workers were deemed 'semi' or 'unskilled' their daily tasks revolved around an increasingly capital-intensive process technology and this meant that their co-operation was very important to the employer. To this end, ICI introduced a loyalty strategy- the profit-sharing scheme – as one vital component within their range of welfarist policies. Similar schemes were introduced elsewhere in the industry including at Brunner Mond and in 1922 at Joseph Crossfield & Sons. At Crossfield a co-partnership scheme was introduced alongside other paternalist benefits such as, insurance schemes covering sickness, unemployment, and death, all of which were designed to induce company loyalty.[59] Crossfield were also strongly anti-union with the leaders

[55] W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.116
[56] The four firms involved were Brunner Mond & Company Ltd, Nobel Industries Ltd, the United Alkali Company Limited and The British Dyestuffs Corporation Limited.
[57] W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.58
[58] M. Morris, *The General Strike*, Penguin, (Middlesex 1976), p.251.
[59] A.E. Musson, *Enterprise in Soap and Chemicals, Joseph Crossfield & Sons Limited, 1815-1965*, Manchester University Press, (Manchester 1965), p.317

often referred to as 'communists' whilst in the company magazine, *The Crossfield Flag*, they emphasised 'hard work, enthusiasm and loyalty' in opposition to the unions 'ca-canny.'[60] In examining such ideas Fenelon argued in 1939 that by increasing the mutuality of interest and focussing interest on the accumulation of capital its purpose was to 'bridge the gap between labour and capital.'[61]

Alfred Mond, a right wing Victorian paternalist, firmly believed that the workers' self-interest would cement labour to the company's interest and, echoing the sentiments of the anti-trade union Economic League, Mond announced that 'the best answer to socialism is to make every man a capitalist.'[62] Industrial relations strategies within ICI were thus designed in such a way that any benefits that might be gained from employment had to be seen to have been gained from ICI and not the trade unions. In January 1928 the ICI magazine produced the illustration overleaf which was used to depict the ICI labour policy. Spike was a well-known cartoonist at the time and this may have been part of a deliberate campaign to make the message more digestible to the workers. Propaganda was used in Mond's anti-trade union policy and the heavily subsidised ICI magazine was one vehicle that was used to deliver the anti-trade union message. As a channel of communication this monthly magazine contained sixty-four pages of illustrations and news dealing with 'all matters of interest to the workers.'[63] In its first year of publication the magazine cost 4p per copy to produce, retailed for less than 1p and 400,000 copies were bought by the 47,000 strong workforce.[64] With a content designed to create a feeling of 'harmonious industrial co-operation' the magazine was circulated widely amongst the ICI employees and presumably their families.[65]

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[60] *Ibid*, p.318
[61] K.G. Fenelon, *Management and Labour*, Methuen & Co, (London 1939), p.259
[62] W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.60. It is unknown whether Mond or the Economic League coined the original phrase.
[63] *Ibid*, p.62
[64] *Ibid*, p.57 and p.62
[65] R. Fitzgerald, *British Labour Management & Industrial Welfare, 1846-1939*, Croom Helm, (London 1988), p.121

Illustration 8: The Bridge, by Spike, 1928

Source: W.J. Reader, *Imperial Chemical Industries,* (London 1975), p.46

The illustration is very similar to those that were used in children's books to depict the Prince who, after an arduous journey, finds the castle where the Sleeping Beauty lies waiting for his embrace. The Sleeping Beauty is a simple tale of love at first sight, has clear definitions of good and evil, and concludes with a happy ending. Text was inserted by Spike to provide clear signposting to the viewer. Labour (the Prince) is seen emerging from the dark and densely entangling mass (strikes, lock-outs, poor industrial relations) and, in contrast to what is being left behind, sees the castle (ICI) standing in bright sunlight, uncluttered. The bridge of the 'new labour programme' has been lowered indicating that labour can safely avoid the troubled waters of the 'out of date methods.' The portcullis has been lifted and the door of the protective castle has been left open for labour to enter. The sturdy and protective walls of the castle are constructed and reinforced with a selection of ICI's welfarist measures that included, profit sharing schemes, improved status schemes, works councils and increased security.[66] On entering this castle labour will see that the keystone of co-operation is situated firmly between management and the employees signifying that co-operation is vital to both as without it the secure castle will be in danger of collapsing. Once inside the castle labour will fall in love with and embrace the Sleeping Beauty (capitalism) and both labour and capitalism can live happily ever after. No evidence exists to precisely reflect what the ICI workers thought of this illustration and its message at the time but by adopting a strategy of benign paternalism ICI had narrowed the potential areas for negotiation and the already weakened trade unions began to be construed as oppositional. Between 1927 and 1950 trade union membership in ICI plummeted from approximately 60 per cent to around 20 per cent of the workforce despite a general increase in trade union membership in other firms from 1935 and into the war years.[67]

The rearmament programmes and the material demands of the Second World War revived the economy and as before with war, the government again intervened in industry and embraced trade unions in an effort to avoid disruptions to production. The low levels of density within the chemical sector can be seen and an explanation has been offered above as to why this was the case. From 1948, the increases in membership and density were facilitated by the changed political scene as well as by the increased numbers who were now needed to fill the jobs in the expanded chemical industry. These workers were now helping to produce a much wider range of products that included synthetic resins, dyestuffs and detergents, as well as chemical fertilisers.[68] Whilst membership continued to increase in the chemical and allied sector the density remained stubbornly low in comparison to the other industries. Indeed, slow progress marked the entire period with the density in the chemical sector always remaining below 50 per cent. That is, actual trade union membership in the chemical industry was always less than half of the potential membership for every year of the sixty years between 1914 and 1974. Taking into consideration the other variables that existed it is at least possible to argue that the anti-union strategies of the

[66] The Works Councils idea had been transferred from Brunner Mond & Co and those attending were not allowed to discuss wages and conditions. Other welfarist measures included, sick pay schemes, company housing, sports facilities and subsidised canteens.
[67] A. McIvor *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.99
[68] G.C. Allen, *British Industries and Their Organization*, Fifth Edition, Longman, (London 1970), pp.210-11

chemical employers had influenced the pattern of trade union recruitment at least up to the late 1940s. Chemicals were never nationalised and therefore comparing the density of the chemical sector with the UK average would be misleading. Nonetheless, increased government intervention in industrial relations from 1945 may well account for the improvements to chemical union density seen by the 1960s and 1970s.

The Trade Union Response to Occupational Health

At the beginning of this chapter a brief overview of the period 1914 to 1918 was provided. It was seen that although trade unions had called for industrial diseases to be scheduled the state and employers had sought to evade their full responsibility for the health of the workers. Apart from this episode no other issues on occupational health could be found in the archives for these years in relation to chemicals and trade unions. One possible reason for this was that it was during the war that the industry expanded and most of those joining trade unions had no experience of this sector. More telling perhaps is that much of the industrial diseases associated with the industry had long latency periods and were yet to be brought to the fore. Welfarist employers in the meantime dealt with the many accidents (burns, scalds, eye damage, crushed limbs, etc) by paying reduced wages to the survivors and making one-off payments to widows. This system was operated at the United Alkali Company (UAC), a firm composed of 34 firms with the combined will to address labour issues at a variety of levels. Within the UAC there was 7,254 recorded accidents and 67 fatalities between the years 1914 to 1928.[69] Many of these victims received some form of monetary compensation although this was mostly at the behest of the firm who controlled the scheme. The lack of consistency can be seen in the following two examples that both occurred early in 1919 at the same factory. The first case involved a 72 year-old labourer with 14 years experience who 'accidentally' inhaled chlorine gas after it had escaped from a fractured pipe. Unable to carry on working he received a third of his pay for 28 weeks until the employer 'granted pension due to old age.'[70] There is no mention in any of the accident books of 'failure to properly maintain plant equipment.' The second case involved a 49 year-old man with 12 years experience who 'inhaled gas that was floating about.' No claim was made, the man did not return

[69] 'Accidents Books' of United Alkali Company Limited, DIC/UA8/5/11-22
[70] Details of an accident at Allhusen Works, 12/2/1919, DIC/UA8/15

to the works and no compensation was paid out.[71] With very limited trade union penetration it was mostly individuals that could appeal for reduced wages after being injured in the employ of the United Alkali Company.

It was previously suggested that the welfarist employers' approach to industrial relations won over the hearts and minds of many workers. In 1923, the firm of Brunner Mond published a book to celebrate their fiftieth anniversary and this contained the description of a presentation of an illuminated address made in 1920 to the directors of the firm. Although apologies were given for their non-attendance the following individuals were willing to go along with the sentiments contained in the address, J. Fitton, Amalgamated Engineering Union; G.H. Posties, Weaver Watermen's Association; and the Rt. Hon. J.R. Clynes MP, National Union of General Workers.[72] In 1923, the AEU members presented their own illuminated address to the directors of Brunner Mond. This address complimented the employer on the 'cordial relationships' that existed between the firm and its employees.[73] Not all workers shared this point of view and at Castner Kellner Alkali (a part of Brunner Mond) one manager reported that some 'fiery characters' had said 'things would not be right with the workers until they had a forceful leader like Lenin.'[74] However, there is no evidence of any revolution or even of industrial disputes at this time. Indeed, the UAC stated that their operations for war purposes had been on a 'gigantic scale' but that they had experienced 'an absence of anything approaching labour troubles.'[75] Demonstrating the weakness of the trade union movement within the chemical sector this statement was made at a time when strikes had doubled in intensity in other sections of British industry.[76] Indeed, at the end of the First World War the UAC were cited by a government report as a model to others on how to conduct harmonious industrial relations.[77]

In an effort to update the 1893 rules and regulations the government did introduce the Chemical Works Regulations of 1922. These were framed just at the point when the chemical industry was undergoing massive developments and

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[71] Details of an accident at Allhusen Works, 18/3/1919, DIC/UA8/15
[72] The 50th Anniversary, BM&Co, 1873-1923. The book forms a part of a private collection of a former chemical worker.
[73] Archives and records collected for the 50th Anniversary history of Brunner Mond, DIC/BM14/13
[74] Internal Report dated 25 February 1922, DIC/BM20/102
[75] *The Times*, 'United Alkali Company (Limited), War Work,' April 20, 1917, p.13
[76] A.J. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.160
[77] P. Pagnamenta, and R. Overy, *All Our Working Lives*, British Broadcasting Corporation, (London 1984), p.155

therefore they were drawn up before any of the new materials and processes could be included. As has been shown, the trade unions were in no position to make any claims about these materials and how they may have affected the workers health and this position would continue for some time. In 1928 the TUC noted the work being undertaken by the Industrial Health Education Society and chose to support this organisation by making a financial contribution. Founded in 1925, the IHES provided a series of 'health talks' to industrial and other workers across Britain with the purpose of imparting knowledge on how best to mitigate health risks at work. This organisation delivered 3,500 such talks in a ten-year period.[78] The TUC could only hope that by supporting such an organisation the information supplied by the IHES would help to expand the knowledge of occupational health amongst trade union members.[79] By 1928, some knowledge had reached the Workers' Union who began to raise the issue of the health problems being caused by the 'large amount of chemicals' used in the 'new' artificial silk industry.[80] This union called upon the TUC to pursue the government for the establishment of a Committee that would investigate the 'causes of disabilities to the workers in such factories with a view to the prevention of the same or failing such prevention to ensure that the workers concerned should be fully covered by the Workmen's Compensation Acts.'[81] The following year the weakened TUC could only report that the government had no intention of opening an inquiry, that the industry would not be scheduled, and that to deal with the problems raised the Chief Inspector of Factories would meet with the employers.[82] Commenting on the weakness of the trade unions in 1929 ICI stated that the union presence was small and useful enough for indicating issues of concern to the firm but not large or powerful enough to do anything about them.[83]

In 1931, the British Medical Association proposed a series of changes to the general medical services being provided. In response to the proposals the TUC General Council recommended the need for more specific treatment being made available to workers so that a proper diagnosis and treatment programme could be followed. Bevin, the leader of the TGWU and member of the General Council stated,

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[78] *The Times*, 1935, p.10
[79] TUC Report, 1928, p.187
[80] TUC Report, 1928, p.375
[81] TUC Report, 1928, p.374
[82] TUC Report, 1929, p.127
[83] W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.66

‘If any alterations were to be made in the existing medical services the trade union movement would stress the preventative point of view rather than the curative.’[84] Sir Thomas Legge, appointed in 1930 by the TUC as Medical Consultant and Advisor to the Social Insurance Department, supported the General Council’s position and complained that his attempts to give lectures to medical students on industrial medicine had always been ‘thwarted.’[85] By this Legge meant that his fellow medical professionals had not supported this specific teaching. The previous year Legge had suggested that the General Council of the TUC write to the Minister of Health to support his desire to be added to the list of appointees for the new London School of Hygiene as ‘none of those being appointed were likely to insist on the claims of industrial medicine and surgery.’[86] Given the position of the trade unions at the time most of these points were met with a concerned indifference. This confirms McIvor’s view that ‘the TUC was denied access to the corridors of political power throughout the inter-war years. Pro-labour legislation capable of reforming exploitative working conditions was difficult to attain.’[87] Nonetheless, the weak position of the trade unions did not prevent them from at least attempting to keep the issues on the agenda. By 1938 they had again raised concerns about the lack of research being undertaken that could have provided the necessary proof required to establish cases of industrial disease.[88] Bladder tumours were one of those diseases identified and the Factory Inspectorate and the trade unions had initially raised these in the mid 1930s. Indeed, the Factory Inspectorate had recorded the presence of many bladder tumours and in 1933 had reported 28 deaths caused by this disease.[89] As will be discussed below this particular disease would continue to be researched for many years to establish whether or not it was an industrial disease. Whilst that process was ongoing efforts to limit exposure and to have it officially prescribed as an industrial disease (thereby allowing workers to be compensated by right and without litigation) were made by the trade unions.

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[84] Deputations to Government Ministers Regarding Industrial Health & Welfare, p.3 MSS.292C/140/6
[85] *Ibid*, p.4. On the appointment of Sir Thomas Legge on February 3rd 1930, the TUC stated that this marked ‘a further step towards the Movement’s policy of exercising increasing control over industrial conditions.’ TUC Report 1930, p.87
[86] TUC Files, Articles and Reports of Sir Thomas Legge, MSS.292C/140/4
[87] A.J. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001) p.223
[88] TUC Report, 1938, pp.341-342
[89] T.S. Scott, and M.H.C. Williams, ‘The Control of Industrial Bladder Tumours: A Code of Working Practice Recommended by the British Dyestuffs Industry for the Manufacture and Use of Products Causing Tumours of the Bladder’ pp.150-163 in *British Journal of Industrial Medicine*, (14) 1957, p.150

It wasn't the absence of trade union will or effort that was preventing research from being undertaken but a lack of resources on their own part as well as in other quarters. This can be seen when in 1939 the Industrial Solvents Committee of the Medical Research Council (MRC) met to discuss the lack of facilities, personnel and funding to deal with the issue of toxic poisoning associated with solvents. In a private letter from Dr Morgan of the MRC to Mr Smyth at the Social Insurance section of the TUC it was stated that:

> It is tremendously important that the work in industrial solvents and scientific investigation of the toxic and harmful properties of these substances should be investigated and known; and the TUC Social Insurance Department should be ready at any time to press the government the necessity for a continuance and development of this work.[90]

A second point was raised in this letter concerning a representative of the employers' group, the Association of British Chemical Manufacturers (ABCM), who had attended the meeting. According to Morgan this representative had asked the MRC Committee if it would pay for the investigations of any chemical substance if requested by chemical firms. In response to this question the Committee had stated that 'this could not be done' as, a) it might be objected to on principle, b) it might mean delay and postponement of the work already in hand and c) applications might be so numerous that the Committee's pathologist would be unable to undertake any other work.[91] The questioning by the ABCM representative is very interesting and could be interpreted as an attempt to ascertain more fully what the MRC Committee's position was with regard to resources. Whilst the question may have been asked innocently or even out of concern Morgan saw it as important enough to write to Smyth about it at the TUC. Clearly, once the MRC situation had been relayed to the chemical employers via the ABCM it would become common knowledge amongst employers that the MRC were unable to fully investigate their industry. There is no record of the ABCM offering to foot the bill for this research once they knew that the

[90] Medical Research Council Committee on Industrial Solvents, MSS292C/140.2/2
[91] Medical Research Council Committee on Industrial Solvents, MSS292C/140.2/2

MRC resources were not available but perhaps minds were elsewhere as yet another war loomed.

With war, the government once again sought trade union support and compliance. In 1940, the leader of the TGWU was asked by Attlee, the leader of the Labour Party, if he was prepared to become Minister of Labour within a coalition government. Bevin responded by stating that 'if the Ministry of Labour remains as it is now, purely a glorified conciliation board with the register for national service, unemployment and public assistance, it will be a waste of time.'[92] It did not remain so and one of the first things that Bevin did on his appointment was to transfer the administration of factory legislation and the Factory Inspectorate to his ministry.[93] As a member of the War Cabinet and Minister of Labour, Bevin increased the number of doctors in industry from 80 to more than 1,000 and nurses to 7,800.[94] These efforts, whilst laudable, did not by themselves resolve the many problems faced by the workers. Accidents, both fatal and non-fatal increased with most found in the munitions sectors of industry. The incidence of industrial disease amongst aniline workers rose from 10 in 1937 peaking at 249 by 1941 whilst the total numbers gassed by carbon monoxide and nitrous fumes rose from 196 peaking at 782 in the same period.[95] Nevertheless, the wartime improvements that were introduced to government factories across Britain set a higher standard than had gone before and there had been an increased interest shown in occupational health issues. Attending a conference on industrial health in 1943 Bevin stated that:

> The great strides in production which we have achieved in this struggle would never have been possible without all the efforts to improve safety, health and hygiene in the past year … what we have done during the war must be consolidated and developed after the war.[96]

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[92] M. Stephens, *Ernest Bevin, Unskilled Labourer and World Statesman*, TGWU Publication, (London 1981), p.90
[93] H.A. Waldron, 'Occupational Health During the Second World War: Hope Deferred or Hope Abandoned?' pp.197-212 in *Medical History*, (41) 1997, p.206, footnote (33)
[94] M. Stephens, *Ernest Bevin, Unskilled Labourer and World Statesman*, TGWU Publication, (London 1981), p.102
[95] H.A. Waldron, 'Occupational Health During the Second World War: Hope Deferred or Hope Abandoned?' pp.197-212 in *Medical History*, (41) 1997, pp.203-204
[96] *Ibid*, p.206

Many trade unions grew in strength during the war and as can be seen from Table 9 between 1933 and 1948 trade union membership in the chemical sector more than tripled. This was clearly a pivotal period although following this surge a density of 35.3 per cent was still 10 per cent lower than the average membership across the United Kingdom. In other words it was still the case that almost two out of every three chemical workers were not in a trade union. Gill *et al* have also noted that by the late 1940s the majority of those that had joined were craftsmen in the North West area.[97]

Wartime memories provided by a member of the NUGMW can perhaps help shed some light on how a chemical worker viewed occupational health at the time. This man was employed between 1939 and 1945 in a chromate processing plant near Glasgow, an industry that was known to have carried health risks since the late 1890s. The man's father and brother had lost the septum of their noses due to the corrosive nature of the chrome dust and this would also happen to him. Asked if his union did anything about health and safety he replied,

> I don't think so, no. I don't think they were up tae that as regards health and safety but their mainstay wis getting you a bit a pay, getting ye a rise and such like.

This worker testified that within the works, 'there was always dust flying about' and it had 'nae windows' and 'nae ventilation system' and was 'always dusty and stoorie.' Asked if the union had raised any issues about the prevalence of chrome ulcerations he replied:

> Well there was nothing they could do, you know whit a mean, it was up to yerself, if ye were a bit careless or …different if there was a leak somewhere and wisnae getting repaired, but there was always leaks all round the place ye know, high strength stuff.

The former worker was then asked if he had ever known of anyone called an Industrial Medical Officer? His response was 'No' Had he ever heard of workmen's

[97] C. Gill, R. Morris, and J. Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.87

compensation whilst working there? Again, he responded, 'No' Had he ever seen a factory inspector? Once more his response was in the negative, 'No' Had he ever seen warning notices on the walls about the dangers of chrome? 'No' Had any of the managers warned him about any dangers when he had first started? 'No, yer in here tae work – that's it'[98] This wartime memory clearly reveals a lack of awareness of what should have been happening in the workplace and perhaps blame could be aimed at the local trade union representative for not ensuring that this information had been relayed to the members. Nonetheless, the proper maintenance of plant was detailed in the Factory Acts (1937) and the warning posters of the dangers associated with the process were supposed to be placed by the employer in a prominent position for all their workers to read.[99] Not to do so was also a breach of the rules and regulations introduced in 1922. Crucial for the health of the worker, information on the poster included advice on how to reduce the risk of damage to the septum or contracting chrome ulcers. This legislation however was of no use if it was not being implemented.

Chrome ulceration had been a notifiable industrial disease since 1922 and the factory inspectorate had emphasised the need to reduce dust levels years before this legislation was introduced and for many years thereafter. Whilst the employer had a legal responsibility to know the rules and regulations there was little evidence in this case to show that this was happening. Conversely, prior to, and during most of the war, chemical trade union membership remained relatively low and unable to take a proactive stance on issues of occupational health. An ignorance of the dangers associated with the materials was one reason but perhaps this arose out of the lack of published materials dealing with occupational health risks. Bernal, writing in 1944, noted that the much of the research of the Industrial Health Research Board was not even read far less implemented because the IHRB was 'precluded from popularising its findings by risk of becoming involved in controversy to an extent which might impair its neutral and detached position.'[100] Despite this, some knowledge of occupational health was able to filter through and this was aided by the publication of the *British Journal of Industrial Medicine* that began its life in 1943. By the end of the war an improved awareness on occupational health issues had begun to take shape

[98] Interview with R. Fitzpatrick, 13 August 2004
[99] TUC Files, Chrome Ulceration, Poster 'Caution – Effects of Chrome on the Skin' MSS292C/144.2/6
[100] J.D. Bernal, *The Social Function of Science*, Routledge, (London 1944), p.68

and the trade union movement would respond with a heightened interest to the dangers associated with chrome and other chemicals from the late 1940s.

V.L. Allen has shown that in response to the ongoing recruitment of the CWU, the TGWU decided to establish a chemical section within their union. In 1943 it was stated by the TGWU that this was being done to give the chemical workers' membership 'a sense of being a national entity within the union.'[101] Thus, in 1944 the TGWU Chemical Section of the National Group Committee came into being. At the inaugural meeting of this committee on 11 July the matter of industrial disease was discussed at length. The National Officer, H.R. Nichols, outlined the problem that chemical workers faced in relation to diseases that they had experienced but which had not been scheduled under the Workman's Compensation Acts. The discussion then considered a financial compensation arrangement that had been made with the chemical employers through the Home Office. This arrangement ensured that those workers affected by industrial disease 'were dealt with not less favourably than they would have been under the Acts.'[102] It was noted that there were no reported problems with the firms paying the agreed amounts and that any application made for scheduling might have an adverse effect on this arrangement. The Committee were clearly unsure of their position at this stage and on 4 August a letter was sent to the area secretaries, trade group secretaries and all officers concerned informing them of the discussion and adding that:

> The Committee decided that it was preferable to examine ways and means of minimizing incidence of the disease by way of ascertaining whether improvements in plant, design and operation could be introduced. If you have any cases which have arisen in your area where chemical workers suspected of suffering from an industrial disease not scheduled have been refused compensation, will you please let me have particulars together with any special observations you may be able to make in connection with the improvement of general working conditions.[103]

[101] V.L. Allen, *Trade Union Leadership, Based on a Study of Arthur Deakin*, Longmans, (London 1957), p.158
[102] Minutes and Reports of TGWU Chemical Section, National Group Committee, MIN 10, July 1944, MSS.126/TG/449/E
[103] Minutes and Reports of TGWU, August 1944, MSS.126/TG/449/E

Having recognised the enormous difficulties in having occupational diseases scheduled the TGWU had pragmatically accepted that some form of compensation should be paid. However, it is clear from the above statement that with this payment in place the TGWU's preference was to seek out ways of preventing industrial diseases occurring. Another chemical union at this time was also strongly of the opinion that the prevention of poisoning and disease was an urgent issue. In 1945, the Assistant General Secretary of the CWU called for the industry to be cleaned up and to emphasise his point he citied 441 cases of chrome ulceration, 580 of epitheliomatous ulceration, 165 of aniline poisoning, the high levels of gassing and 23,724 cases of dermatitis that had all been reported between 1943 and 1945. According to the CWU cleaning up the industry was 'more important than wages.'[104]

Also in 1945 the National Secretary of the TGWU chemical committee was seeking further information about the areas where bladder tumours were occurring so that some idea could be obtained of the incidence as well as the treatment being offered.[105] In April of that year he reported that correspondence had been entered into between the TUC and the Home Office with the Home Office identifying 'difficulties connected with the scheduling of this disease.'[106] These difficulties remained and at this stage the TGWU appear to have taken the view that until the disease could be scheduled the arrangements with the employer should be kept in place. There was no mention in the TGWU minutes about any consideration being given for the withdrawal of their members from this area of dangerous work. Indeed, concern to maintain the compensation arrangements with the employer was embedded and in 1948 one delegate to the chemical group pointed out a 'mistake' that had been made in the minutes of the TGWU engineering group. The engineering group had written in their minutes that 'it was deemed advisable that papilloma be placed on the list of scheduled diseases' whilst the concerned chemical delegate pointed out that this should have read 'inadvisable' so that the arrangements with the employer would remain intact.[107]

[104] B. Edwards, *Chemicals, Servant or Master? Life or Death?* National Labour Press, (London 1945), p.28
[105] Minutes and Reports of TGWU, MIN 63, January 1945, MSS.126/TG/449/E
[106] Minutes and Reports of TGWU, MIN 106, April 1945, MSS.126/TG/449/E
[107] Minutes and Reports of TGWU, MIN 405, April 1948, MSS.126/TG/449/E

It should be noted however that having this compensation in place did not preclude further attempts by the TGWU to have the risks associated with the work identified and employers were now at last making efforts to reduce the incidence of exposure. Indeed, both the ABCM and the Association of Chemical and Allied Employers (AC&AE) jointly appointed a health and safety officer in 1951.[108] Following some negotiation with the employers one delegate reported that he had managed to obtain 'substantial improvements' in the conditions attached to the manufacture of benzidene and informed the TGWU Committee that a new plant was to be built that would 'eliminate the dangers' inherent with the manufacture of this substance.[109] To what extent the employers were simply appeasing the trade unions cannot be stated with any surety but writing in the *British Journal of Industrial Medicine* in 1949 Goldblatt discussed the precautions that had been introduced to chemical works. Noting the improvements Goldblatt emphasised that it remained the case that the workers came into 'significant contact with a great variety of compounds among which the supposed bladder carcinogens must be included.'[110] The tumours found, were, he thought, the result of exposure to aniline, ά-naphthylamine and β-naphthylamines and benzidene. It should be noted that although Goldblatt had produced a scientific report on the incidence of tumours the language he chose to use in connection with his findings were hedged with a certain amount of uncertainty. This uncertainty was confirmed when the TGWU Committee agreed that the National Officer should write to the Legal Department of the TGWU to find out what progress was being made on papilloma of the bladder in relation to the National Health Insurance Act.[111] The Legal Department duly replied in January 1950 stating that:

> With reference to getting this disease prescribed, this does not appear to be possible at the present time owing to the difficulties of diagnosis and relating the disease to the employment. I am however pleased to tell you that some important research work is going on under the auspices of the MRC the expense of which, I understand, is being borne by the employers in the industry. This work is on an extensive

[108] C. Gill, R. Morris, and J. Eaton, *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), p.28
[109] Minutes and Reports of TGWU, MIN 797, July 1951, MSS.126/TG/449/E
[110] M.W. Goldblatt, 'Vesical Tumours Induced by Chemical Compounds' pp.65-81 in *British Journal of Industrial Medicine*, (6) 1949, p.67
[111] Minutes and Reports of TGWU, MIN 573, October 1949, MSS.126/TG/449/E

> footing and it may be some time before there are any results but I will communicate with you as soon as I learn anything as to progress.[112]

Whilst the MRC research was ongoing the TGWU raised an appeal under the National Insurance (Industrial Injuries) Act 1946, at a tribunal in Huddersfield in 1950 in an attempt to advance the case for papilloma of the bladder to be recognised as an industrial disease. This shows that the concerns voiced by the delegate in 1948 not to have the disease scheduled was no longer the official position. The case concerned a chemical worker who had worked with β-naphthylamine for a considerable time period when in July 1949 he became incapable to work. The tribunal Commissioner stated that the real question at issue was:

> Whether the claimant had been in an occupation involving the handling of or exposure to the fumes of or vapour containing a nitro-or-amido-derivative of benzene or of a homologue of benzene. More narrowly stated, the case turned upon the question of whether beta naphthylamine was an amido-derivative of benzene or of a homologue of benzene.[113]

A very detailed and complex chemical explanation then followed on the properties of the chemicals in question and whether beta-naphthylamine was an amino-derivative of benzene or of a homologue of benzene. The Commissioner stated 'The claimants case fails, in my opinion, because beta-naphthylamine is neither an amino-derivative of benzene nor a homologue of benzene' adding 'I think that I should be legislating rather than interpreting existing legislation if I assumed to attribute to the word homologue some unrecognised meaning which I made bold to define.'[114] The appeal was dismissed.

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[112] Minutes and Reports of TGWU, MIN 588, January 1950, MSS.126/TG/449/E

[113] TUC Files, Cancer of the Bladder, National Insurance (Industrial Injuries) Act 1946, Claim for Industrial Injury Benefit, Decision of the Commissioner, Decision No. CI/195/50, MSS.292/174.47/7

[114] *Ibid*. According to the transcript of the hearing, homologue means a derivative reached by the addition of one or more CH2 groups. Beta naphthylamine C10 H7 N H2 is an amine of naphthaline C10 H8. Naphthaline is not a homologue of benzene O6 H6 because it cannot be reached from benzene by the addition of CH2 groups. This shows the huge complexities involved in the case and it can be speculated that this was well beyond the understanding of most chemical workers or trade unionists.

Although defeated, correspondence was entered into between the TUC and the TGWU on the issue of the precise wording and scientific terms that would have to be used in future cases.[115] Letters were then sent to the appropriate trade union sections informing them of the decision and the reasons for dismissal. In April 1951 the Huddersfield and District Associated Trades and Industrial Council wrote to the General Secretary of the TUC to thank the TUC for the information on the case and to express their appreciation for the efforts being made, including the representations that had resulted in the MRC scientific research. The Huddersfield District were however 'perturbed' at the high rate of the disease and wanted to know, a) were the British Empire Cancer Committee doing any research, b) had meetings taken place with the Chief Inspector of Factories, c) was there any action being taken by the Ministry of National Insurance.[116] In reply the TUC stated that representations had been made to the Ministries concerned for the disease to be prescribed but that this request had been denied because the research being conducted by the Chester Beattie Cancer Research Institute was not yet complete. It was further noted that the British Empire Cancer group were not researching this disease but that the Chief Inspector of Factories had been informed of the unions position and that the inspectorate themselves had repeatedly noted the presence of the disease since 1931.[117]

Whilst it is clear that many interested parties knew there was a health problem it had been impossible to speed up the research results that were a necessary requirement of both legal and medical institutions to officially confirm this. Much of the delay it should be noted was due to the epidemiological methods that were a necessary part of this work. However, in 1951 the Legal Officer of the TGWU wrote to inform the Committee that the research, although ongoing, was now nearing completion and that the TUC would continue to press for the disease to be prescribed.[118] The following year the Ministry of National Insurance wrote to the TUC about the delay having received a reply to their enquiries about this from the ABCM. The ABCM letter was marked 'CONFIDENTIAL' and the TUC were asked by the Ministry to treat it as such. The ABCM outlined their position with regards to

[115] TUC Files, Cancer of the Bladder, Letter from Stillwell, TGWU Legal Officer to Dale, TUC Legal Dept, 30 June 1950. Reply from Dale to Stillwell, 11 October 1950, MSS.292/174.47/7
[116] TUC Files, Cancer of the Bladder, Letter to General Secretary of TUC from Huddersfield and District Associated Trades and Industrial Council, 2 April 1951,MSS.292/174.47/7
[117] TUC Files, Cancer of the Bladder, Letter from TUC to Huddersfield and District Associated Trades and Industrial Council, 9 April 1951, MSS.292/174.47/7
[118] Minutes and Reports of TGWU, MIN 733, February 1951, MSS.126/TG/449/E

the implementation of their compensation scheme shortly before the war. This, they stated, had been implemented due to the difficulties encountered in 'devising satisfactory definitions under which the disease could be defined.'[119] It was further explained that the necessary research to discover the causes of the disease had been postponed due to the war but that a five-year scheme, financed by the industry, had been instigated in 1948. It finally stated:

> The draft report of the survey has only recently become available and is now awaiting consideration and discussion by the joint body of subscribers. It is the intention of the industry that the report should be made available to your Ministry once they are satisfied with the findings.[120]

The TUC was not a subscriber and was therefore unable to hear what issues needed to be discussed in order to express a satisfaction about the findings. It is also evident that the chemical trade unions were not party to these discussions at all leaving only those who would never be exposed to the risks coldly discussing this issue. Having received their reply the TGWU delegates expressed some satisfaction that the process was nearing an end and had earlier suggested that one consequence of the trade union persistence on this issue had been that 'greater improvements had been made in the methods of preventing this disease than ever before' and that at one workplace techniques had been developed that might even eliminate the disease.[121]

Such acclaim was not wholesale and some criticised the approach taken by the TUC and TGWU. Several pieces of correspondence provide evidence that also include criticism of the employers' attitude to the loss and damage to life. Frustrated by the lack of any signs of progress the CWU wrote to the TUC in May 1951 seeking any material that the TUC might have in their possession to help the CWU with a fatal accident case they were hoping to contest in the courts. The CWU noted that:

[119] TUC Files, Cancer of the Bladder, Copy of letter from ABCM to Ministry of National Insurance to Mr Dale (TUC), 31 October 1952, MSS.292/174.47/7
[120] TUC Files, Cancer of the Bladder, Copy of letter from ABCM to Ministry of National Insurance to Mr Dale (TUC), 31 October 1952, MSS.292/174.47/7
[121] Minutes and Reports of TGWU, MIN 828, January 1952, MSS.126/TG/449/E

> ICI together with a number of chemical establishments are admittedly fully aware of the dangers of papilloma arising from particular work and whilst they have explored every known possibility of preventing the contraction of this disease the answer has not yet been found. Our point in this case will be that knowing of this danger the employers are gambling with the men's health and lives to carry on their manufacture when in our view they should cease manufacture entirely unless they can guarantee reasonable safety.[122]

In February 1952 the General Secretary of the NUGMW wrote to the General Secretary at the TUC about the papilloma compensation scheme in operation at ICI. Requesting that the industrial disease be recognised as such within the Industrial Injuries Act he noted, 'the fact that ICI are paying this compensation means that they, as a private company, have recognised that certain processes cause death.'[123] In August 1952 the TUC received a terse letter from a Mr Carter, a former union member and chemical worker who was aggrieved with the arrangements that had been made between the unions and the employers. He noted that the TUC had given 'their blessing' to this arrangement 'no doubt due to the efforts of the TGWU' and the former worker proceeded to provide details of cases where compensation had either not been paid or where so little had been paid as to make little difference.[124] This former chemical worker had been employed at Clayton Aniline until 1937 but later discovered that a tumour had developed in his bladder. He had not suspected that his employment was the cause until told of this possibility by a specialist (not his union). He then claimed against Clayton Aniline and received £5 per week for a set period of time but in return had to sign a document stating that no further claim could be made against the firm. Mr Carter stated:

> Well, I want to say this, I did not pay trade union contributions all my life to have a trade union of the TUC assist a firm to jeopardise the interests of my family. … Also I should like to ask is the TUC satisfied

[122] TUC Files, Cancer of the Bladder, Letter from General Secretary of the CWU to General Secretary of the TUC, May 1952, MSS.292/174.47/7
[123] TUC Files, Cancer of the Bladder, Letter from NUGMW to TUC, 12 Feb 1952, MSS.292/174.47/7
[124] TUC Files, Cancer of the Bladder, Hand written letter from Mr F.W. Carter to Sir Vincent Tewson, TUC General Secretary, 31August1952, MSS.292/174.47/7

> that adequate precautions are being taken now to safeguard the health of the workers at the Clayton Aniline? I am sure this is not the case and I would like to point out that even now the management of the Clayton Aniline hold the view that alpha naphthylamine is a safe substance. In answer to this I would refer you to the evidence in the recent Dr Trumper v ICI Case.[125]

The legal case referred to above (*Trumper v. Imperial Chemical Industries*), was conducted in 1952. Trumper had started work with ICI in 1946 as a personnel manager at their Wilton Works in Middlesborough. He alleged that he had been victimised as he had openly expressed his concerns that the new plant design failed to give adequate protection to the workers from ά-naphthylamine, a suspected carcinogen. Trumper was warned that continued criticism would lead to his dismissal but he did continue to criticise and was dismissed in 1949. At the hearing it was alleged that ICI had sacked Trumper so as to 'keep the danger of naphthylamine secret and protect the company.'[126] ICI denied that this was the case citing that they, along with the TUC, had 'for a long time been trying to get this particular form of cancer made a scheduled disease.' This particular statement is interesting in that it can be seen that ICI were happy to have the firm publicly associated with the actions of the trade unions. Whilst ICI provided compensation voluntarily there was a cost for this provision. If they could succeed in helping to have the disease scheduled they could not only enhance their claim to be a viable replacement for trade unions but they could also save money. Trumper claimed that the complexity of the language surrounding the efforts for scheduling led to confusion about what was actually being discussed, namely, cancer. ICI then claimed that they paid compensation and were therefore not hiding the truth. Trumper responded to this by stating that he had opposed compensation payments as this prevented many cases from coming out into the open. Certainly Mr Carter's evidence that he had to sign away any further claims for his industrial disease would have given weight to this view. It was even accepted by ICI that Dr Goldblatt had publicly protested against the fact that it was not a

[125] *Ibid*
[126] *The Times*, 1952, p.3

scheduled disease and that the workers should 'not have been left to the generosity of industrialists making *ex gratia* payments.'[127]

The original letter from Mr Carter 'criticising the special scheme' had been passed to the Social Insurance Department of the TUC who in turn had copied it to the TGWU.[128] Having received no reply Mr Carter wrote again on 2nd October wanting to know if any action was being considered by the TUC.[129] On 3rd October this letter was passed on to the TGWU as well as a copy of the reply sent from the TUC to Mr Carter which stated:

> I think I should make it quite clear that both the TUC and the unions concerned have made repeated and vigorous representations to have cancer of the bladder treated as an industrial disease under the Industrial Injuries Act. It is important to stress this as your letter suggests some misunderstanding of the position. Following our representations, detailed medical research has been undertaken but there seems little likelihood of getting what we want until this is completed. However we have been assured that the results are likely to be available before long. As you no doubt know, the disease occurs non-industrially as well as industrially and it is therefore not possible to attribute every case automatically to the employment. Regarding the detailed cases quoted in your correspondence, the right way to get them investigated would be to advise the individuals concerned to pursue the matter through their own unions.[130]

The TUC were clearly of the view that the position they had taken was the correct one and it is difficult to argue against this in light of fact that completed research was a necessary requirement for the scheduling of any industrial disease. The frustration of knowing that people were dying as a result of their work was evident and understandable although what the CWU, the NUGMW or even Mr Carter were not

[127] *Ibid*, p.3
[128] TUC Files, Cancer of the Bladder, Letter from Social Insurance Department TUC to Mr Stillwell, Legal Department TGWU, 10 September 1952, MSS.292/174.47/7
[129] TUC Files, Cancer of the Bladder, Hand written letter from Mr F.W. Carter to Sir Vincent Tewson, TUC General Secretary, 2 October 1952 MSS.292/174.47/7
[130] TUC Files, Cancer of the Bladder, Letter to Mr F.W. Carter from Secretary of the Social Insurance Department, TUC, 3 October 1952, MSS.292/174.47/7

prepared to fully realise or accept was that at this stage the deciding powers within the scientific, medical or legal establishments would not have agreed with them. This tends to support the views that have been expressed by Melling earlier, that is, institutional rules were indeed defining the circumstances over which the trade unions had limited control.

In addition to the risks associated with ά-naphthylamine, β-naphthylamine and benzene new chemical risks appeared in 1953 in the shape of Methyl Ethyl Ketone (MEK) and Vinyl Chloride. These chemicals were produced on both sides of the Atlantic and according to Markowitz and Rosner who studied the US industry:

> After World War II the production of new petrochemical synthetic materials gave rise to a new set of concerns. Unlike lead, many of these chemicals and products were of unknown toxicity. When the chemical industry's own research indicated the possible carcinogenicity of vinyl chloride, the industry embarked on a serious effort to mislead the public and avoid federal regulation.[131]

The true effects of vinyl chloride would only emerge in the late 1970s but in the absence of knowledge in the 1950s all that the TGWU could do was collate the responses they received to the questionnaires they had sent out about these new chemicals. Having done so they passed the information to the factory inspectors and management of the firms. It was discovered that if barrier creams, protective clothing (cleaned after use) and methanol were used as protection then the risks would be minimised and health unaffected.[132] An additional risk associated with the inhalation of MEK would come later but protective clothing has been worn as a sufficient barrier against the toxic properties of MEK since its introduction.[133] Although protective clothing had long been understood to act as a barrier against the penetration of toxins to the skin it was reported by the trade unions in the late 1940s that due to a shortage of materials there had been difficulty in obtaining this. The matter was referred to the

[131] G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003), p.8

[132] Minutes and Reports of TGWU, MIN 933, January 1953, MSS.126/TG/449/E

[133] By 1960 it was reported that inhalation of MEK fumes could lead to drowsiness, stupor and possibly loss of consciousness. It was further reported that the 'systemic toxicity' of this compound was 'not high.' Annual Report of the Chief Inspector of Factories on Industrial Health for the Year 1960, PP 1961 (Cmnd. 1478) HMSO, London, p.59

TUC by the chemical unions who in turn raised it with the Board of Trade and after repeated requests protective wear was made available.[134] Having access to protective wear did not always result in a safer working environment. Sometimes it could be because the protection offered was insufficient as was the case with many of the respirators that were issued.[135] It could also be as a result of the workers themselves deciding not to use it and such a case was discussed in 1953. The TGWU committee noted that some of the workers had been reluctant to put on the protective clothing or masks that had been fought for and won by the unions. The heat associated with many of the processes could perhaps account for some workers refusing to wear these but perhaps machismo also played a part. Commenting on the attitude to risk perception one witness who on occasion was sub-contracted to work at an ICI plant remembered his reaction compared to those who were more habituated to chemical substances.

> This stuff used to come off this pipe, used to come through it like, God, you know, the tears would be running down your face, you know, and the blokes used to say to me 'Oh you'll never have cold while your working here mate.' Terrible it was.[136]

In response to the report made in 1953 the TGWU Committee agreed that in order to emphasise health and safety issues an article on the subject should be placed in '*The Record'*, the TGWU newspaper.[137] On its own, it is unlikely that this would have made any immediate or significant difference but the attempt to increase awareness of health and safety amongst the membership had merit. Committee members were clearly interested in these issues and felt that it was important enough to enter into their minutes that the Clayton Aniline Company were to build a new 'enclosed' plant designed to eliminate contact with potentially health damaging materials.[138]

The TGWU committee changed its name and status in 1954 and became a fully constituted trade group now called the Chemical and Allied Trades National Group Committee representing 40,095 members across the industry.[139] However, by

[134] Minutes and Reports of TGWU, MIN 321, July 1947 and MIN 515, April 1949, MSS.126/TG/449/E
[135] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), p.28
[136] Interview with Derek Rogerson, 21 March 2005
[137] Minutes and Reports of TGWU, MIN 935, January 1953, MSS.126/TG/449/E
[138] Minutes and Reports of TGWU, MIN 940, January 1953, MSS.126/TG/449/E
[139] Minutes and Reports of TGWU, MIN 89, April 1954, MSS.126/TG/449/E

placing this membership in context it may be helpful in understanding how relatively insignificant it was. In 1953, according to the ABCM, there were approximately 160,000 employees in the chemical sector, which meant that the TGWU represented roughly 25 per cent of all chemical workers, other unions represented another 10 per cent and the remaining 65 per cent remained as non-union employees.[140] Despite this fact the TGWU and other unions had been pressing hard on health issues and finally in 1954 they could announce that papilloma of the bladder was to be prescribed as an industrial disease. The long awaited studies undertaken by Case *et al* from the Chester Beattie Cancer Institute analysed the jobs that had been done by the bladder tumour victims and found that the chemical manufacturing industry accounted for most.[141] The latency periods ranged from 16 to 22 years following exposure to benzidine, ά-naphthylamine, β-naphthylamine and that working in the dyestuffs sector of the chemical industry increased the risk of dying from a bladder tumour by thirty-fold.[142] It is interesting to note that Goldblatt had correctly identified the cause of this cancer (although he also included aniline) some 5 years earlier. Nonetheless, following the publication of these results in 1954 the manufacture and use of β-naphthylamine was stopped and precautions intensified for the manufacture of benzidine and ά-naphthylamine.[143] It was perhaps the persistence of the TGWU and the TUC to have this cancerous disease scheduled that led the industry to conclude in 1952 that they would not manufacture 4-aminodiphenyl (xenylamine) as it had been shown in tests to induce bladder tumours in a dog.[144] What was clear was that the presence of the trade unions had meant that the industry had not been allowed a completely free rein over the production of toxic chemicals. Changes had been forced upon the industry and these changes applied to the products as well as how they were to be produced. In 1957 for example, the shop steward at Clayton Aniline reported that the directorate at his plant had received permission to demolish all old buildings so as to make way for new, modern and safer plant to be installed.[145] Although this was a slightly premature announcement (the buildings were not demolished until 1959) it does show that some improvements were being made within the industry that may not have been made

[140] T.I. Williams, *The Chemical Industry*, Pelican, (London 1953), p.91
[141] D.B. Clayson, *Chemical Carcinogenesis*, Churchill, (London 1962), p.43
[142] *Ibid*, pp.42-43
[143] *Ibid*, p.44
[144] *Ibid*, p.44
[145] Minutes and Reports of TGWU, MIN 520, October 1957, MSS.126/TG/449/E

before.[146] Despite these efforts occupational deaths in the dyestuffs industry continued and it was only in 1967 with the introduction of the Carcinogenic Substances Regulations that the 'most suspect' chemicals were finally prohibited from being used or manufactured.[147]

Having contributed towards the banning of one cancer inducing chemical and having another two more intensely scrutinised (and arguably preventing one from ever being produced) the trade unions were now faced by new industrial hazards. Undaunted, the chemical manufacturers had proceeded to expand their range and in October 1955 it was reported that a meeting had been convened with the Medical Officer of the Factory Department at the Ministry of Labour to discuss industrial hazards associated with the plastics industry. Frustration was once again evident when the union delegate to this meeting reported that the risks he thought were inherent in the industry were 'not dealt with by the Medical Officer.'[148] The North Midlands Federation of Trades Councils also wrote to the TUC in March 1958 to ask if they could examine what effect the new manufacturing process were having on the health of the workers manufacturing Terylene, Nylon and other plastics.[149] One month later the TUC replied that they had ensured that the general working conditions met the required standards of ventilation, temperature and cleanliness and that they were 'pressing for increased research into the whole question of the use of potentially harmful chemicals.'[150] By 1959, ICI were stating of plastics such as polyvinyl chloride (PVC) that, 'the polymer is inert and neither toxic effects nor dermatitis have been experienced.'[151] However, in the mid 1960s the industry discovered that vinyl chloride monomer (the basis of PVC) was linked to a degenerative bone disease found in chemical workers and by the early 1970s it was being linked to cancer.[152] As Markowitz and Rosner have shown, the response of the industry was to follow a path of 'deceit' leaving trade unions at that time with no possible opportunity to pursue

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146 Minutes and Reports of TGWU, MIN 190, July 1959, MSS.126/TG/449/E

147 P. Kirby, *Death in the Textile Industry, A Proportional Mortality Study of 952 Dyers, Bleachers and Textile Workers who died between 1976 and 1980*, Transport and General Workers Union, Textile Group, (Bradford 1982), p.5

148 Minutes and Reports of TGWU, MIN 271, October 1955, MSS.126/TG/449/E

149 TUC Files, Poisoning by Fumes and Chemicals, Letter from Nth. Midlands Federation of Trades Councils to General secretary of the TUC, 29 march 1958, MSS.292/174.36/2

150 TUC Files, Poisoning by Fumes and Chemicals, Letter from Secretary, Social Insurance Department TUC to Nth. Midlands Federation of Trades Councils, 10 April 1958, MSS.292/174.36/2

151 D.K. Harris, 'Some Hazards in the Manufacture and Use of Plastics' pp.221-229 in *British Journal of Industrial Medicine*, (16) 1959, p.222

152 G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003), p.168

issues of occupational health. Once again working knowledge and suspicions of health risks had not been enough to establish a campaign and under these circumstances it is difficult to see how the trade unions could have done more. The frustration amongst those seeking information that might help identify health problems was compounded by the attitude shown by some employers' towards this aim. One minor example of this can be seen when, in 1957, ICI turned down a simple trade union request for all accidents to be notified to the shop steward.[153]

Both the TGWU and the NUGMW campaigned on the dangers associated with cadmium fumes and provided 'detailed particulars of cases' to the TUC who in turn presented evidence to the Industrial Injuries Advisory Council (IIAC).[154] As a result of these efforts poisoning from the fumes of cadmium was added to the list of scheduled diseases in 1956.[155] Included in the evidence was the fact that various sums had been won from the employers for injured members. The legal department of the TGWU reported that 41 cases had been dealt with and sums ranging from £1000 to £4,750 had been obtained.[156] Whilst compensation may have helped the victims or dependants of victims this was a reactive response by trade unions to the poisonings or injuries that had already occurred. For the unions to behave in a proactive way there would have to be some anticipation that a process or material was dangerous and this had to be linked to irrefutable evidence. For example, in 1957 the TGWU were able to discuss the new techniques that were being introduced at the ICI explosives plant in Ardeer. It was an uncontested fact that explosives were dangerous and it was felt that the remote controlled machinery to be installed would lead to a safer working environment. This change in the manufacturing process was also identified as leading to a reduction in the numbers of staff required. Prioritising safety ahead of job protection the TGWU supported this change 'as it was a desirable thing that the danger should be taken out of the manufacture of explosives …even though it would require fewer operatives.'[157] In contrast to the above case, where irrefutable evidence existed and recommendations could be made, the Welsh nickel plants came under scrutiny from 1957 and where cancer was suspected as an industrial hazard. Having

[153] Minutes and Reports of TGWU, MIN 479, July 1957, MSS.126/TG/449/E
[154] TUC Annual Report, 1956, pp.146-153
[155] Cadmium Poisoning, Report of the Industrial Injuries Advisory Council in accordance with Section 61 of the National Insurance (Industrial Injuries) Act, 1946 on the question whether cadmium poisoning should be prescribed under the Act, PP 1956 (Cmd. 9674)
[156] TGWU, GEC Representatives Report, March 1956, MSS.126/TG/449/E
[157] Minutes and Reports of TGWU, MIN 429, January 1957, MSS.126/TG/449/E

been investigated in 1948 it was known that 47 cases of nasal cancer and 82 cases of lung cancer had been found amongst the workforce. All of these, except 2 of the lung cancer cases, had worked in the old plant that had been replaced in 1924 and the latency period was identified as being 23 to 25 years.[158] In 1955, another report had made only speculative suggestions as to the cause and therefore no irrefutable evidence existed. It was also known that the inhalation of nickel carbonyl gas could result in headaches, nausea, vomiting, and difficulty in breathing.

The TGWU Committee agreed that contact with the factory inspectorate should be made and that an investigation should be conducted into the safety precautions and manufacturing processes surrounding nickel, the aim being to eliminate any possible causes of work related cancers.[159] The legal department then decided to adopt a two strand approach. The first was to pursue with a tribunal some cases of members who had been gassed. The second part was to write to Canada House to ascertain the Canadian position in relation to health and safety amongst its workers, Canada being the largest producer of nickel. Again no mention was made of withdrawing the members from the workplace something that may have concentrated the minds of the employer on this matter. However, this meeting went on to discuss the high levels of unemployment that were occurring in South Wales due to the closure of collieries.[160] Whilst facing a possible 23 year latency period and living in an area of growing unemployment 'employment and family considerations' possibly superseded the far distant deviations from full health. Having spent just under two years investigating this issue the Committee reported in 1959 that, 'it had not been possible to establish that any better practice obtained either in Canada or in this country.'[161] Discussing the issue of the cases they had taken on behalf of the gassed members the legal department noted that whilst evidence existed of gassing it was extremely difficult to progress with this issue as the firm (Mond Nickel & Co) were not actually in breach of any regulations.[162]

At the firm of Reckitt Coleman (Colours) fears of pneumoconiosis were raised by the TGWU as the dusty atmosphere had led some workers to complain of chest

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[158] D.B. Clayson, *Chemical Carcinogenesis*, Churchill, (London 1962), p.39
[159] Minutes and Reports of TGWU, MIN 490, July 1957, MSS.126/TG/449/E
[160] Minutes and Reports of TGWU, MIN 131, January 1959, MSS.126/TG/449/E
[161] Minutes and Reports of TGWU, MIN 158, April 1959, MSS.126/TG/449/E
[162] Minutes and Reports of TGWU, MIN 158, April 1959, MSS.126/TG/449/E

troubles.[163] The rules and regulations pertaining to chemical works stipulated that the manufacturers had a responsibility to ensure that this was not the case. The union made contact with the Factory Inspectors and the regional office were determined to press the issue until the dust hazard had been eliminated. To help identify potential cases and to move the issue forward they had a list drawn up of all those suffering ill health. A year later, in July 1958, they managed to get the firm to agree to pay 'substantial' compensation to the dependants of any members who had died as a consequence of respiratory disease. More importantly they had managed to secure additional extractor plant to considerably reduce the dust levels that had been present in the atmosphere.[164] It was in the late 1950s that the TUC again criticised the structures that were in place to deal with occupational health issues. Having pressed for a comprehensive occupational health service that would cover all sectors of industry the TUC complained that 'the resources devoted to occupational health are quite insufficient and there is a serious lack of co-ordination.'[165] It was suggested that co-ordination between the general and occupational health services could be improved by choosing the Factory Department to co-ordinate occupational health issues. The TUC expressed their disappointment with the post-war development of industrial health within the Factory Department but felt that with additional resources and some re-organisation the Factory Department would be best placed to become the Department of Occupational Health and Safety.[166]

The dangers associated with the chromate process had been long known although from the 1930s and 1940s studies conducted in Germany and the USA had shown that there was a possible link with cancer in this industry.[167] In order to see where the trade unions fitted in to the structures of occupational health within this industry the following account provides an interesting example. The MRC began a study of the chromate industry in 1948 having noted that there was no mortality data or reliable information in existence even although the process had been ongoing since

[163] Minutes and Reports of TGWU, MIN 496, July 1957, MSS.126/TG/449/E
[164] Minutes and Reports of TGWU, MIN 81, July 1958, MSS.126/TG/449/E
[165] TUC Files, Industrial Health Services, September 1957, p.6, MSS.292C/140/2
[166] Ibid, pp.8-9 For a fuller discussion of the occupational health service issues see R. Johnston and A. McIvor, 'Whatever Happened to the Occupational Health Service?' pp.79-106 in C. Nottingham (ed) *The NHS in Scotland*, *The Legacy of the Past and the Prospect of the Future*, Ashgate, (Aldershot 2000)
[167] D. Hunter, *The Diseases of Occupations, Sixth Edition*, Hodder & Stoughton, (London 1980), p.437

1820.[168] Having concluded her initial three-year long examination Dr Bidstrup showed that there was indeed some evidence to suspect that the process of chrome manufacturing carried with it a risk of cancer.[169] Further research was required so that scientific excellence could be met and in 1956 the results showed that there was indeed 'an excessive mortality from carcinoma of the lung.'[170] Even now this did not mean by medical or legal standards that chromate work caused respiratory cancer and so a programme of annual *x*-ray screening was started. On publication of the 1956 results the Ministry of Pensions and National Insurance were not prepared to schedule lung cancer as an industrial disease for chromate workers.

The manufacturers responded to this news by doing what the manufacturers of naphthylamine and benzene had done, they introduced their own compensation scheme. To do so they arranged to meet the workers representatives and it was at this stage in 1956 that the trade unions were fully informed of the research results and of the fact that the firm had decided to employ Dr Bidstrup as a medical consultant to the company.[171] By July of 1958 the legal department of the TGWU had noted that there was 'an increased authority' for believing that chromate workers were at a greater risk of cancer. They wrote to the TUC informing them that in order to get the required proof 'research and investigation over a long period might be necessary …as we are up against a concealed risk.'[172] The TGWU stated that they had no facilities to search through death certificates but that they would undertake to investigate funeral benefits to see if that would give them any indication of the true levels of cancer amongst the workers. British Chrome and Chemicals Limited wrote to the TGWU informing them of their scheme as well as of the appointment of Dr Bidstrup 'to investigate all causes of sickness and death' to the employees.[173] According to the firm only one *ex-gratia* payment had been made and this was to the widow of a former worker who had died before the scheme was operational. In response to a request made by the TUC's Industrial Disease Sub Committee for more information to carry the issue forward the

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[168] Bidstrup P.L. 'Carcinoma of the Lung in Chromate Workers' pp.302-305 in *British Journal of Industrial Medicine*, (8) 1951, p.302
[169] *Ibid*, p.305
[170] P.L. Bidstrup P.L., R.A.M. Case, 'Carcinoma of the Lung in Workman in the Bichromate Producing Industry in Great Britain', pp.260-264 in *British Journal of Industrial Medicine*, (13) 1956, p262
[171] Letter from NUGMW to TUC General Secretary, 7 November 1958, TUC Files, MSS.292/174.47/6
[172] TUC Files, Cancer 1956-60, British Chrome and Chemicals Ltd, Letter from Legal Department of TGWU to General Secretary of TUC, 20 October 1958, MSS.292/174.47/6
[173] TUC Files, Cancer 1956-60, British Chrome and Chemicals Ltd, Letter from British Chrome and Chemicals Limited to TGWU, MSS.292/174.47/6

NUGMW asked their Branch Secretary at the Rutherglen Works of British Chrome and Chemicals to write a report. This union representative appeared to be less than concerned about the issues being raised and the style of his report was somewhat compliant. He noted that the company had been and still were spending money in an effort to reduce chrome dust levels and having worked there for 26 years he stated that the 'improvements are apparent' and that 'a number of employees or their dependants are now in receipt of benefit … and are grateful for the amount of money.'[174] Whilst most of what the local representative wrote was true he had been asked to inform the union about these matters as there continued to be a fear of industrial cancer. What is apparent is that little, if any, of the national led urgency appeared to be transferring to the local representative where the actual trade union members were at risk. The firm closed down its' chromate manufacturing business in Glasgow nine years later leaving behind a landsite heavily contaminated with Cr(VI)- a known carcinogen of significant mobility.

Local union activity was noted at the Swinton Chemical & General Branch of the NUGMW in 1960 when they sent a letter to their General Secretary about the incidence of tar cancer amongst their membership at Yorkshire Tar Distillers Ltd in Rotherham. The union knew that there was a long latency period for tar cancer, some 10 to 30 years, and recognised that when the condition became apparent it was too late to take any action to save the life of the victim. Having battled and won from the employer a supply of protective clothing, clogs, gloves, goggles and barrier creams for those directly involved in the production process the branch remained concerned that not all workers were protected. The branch made 'repeated applications' to the employer to supply protective clothing to all of those who came into contact with the tar or derivatives but had failed to secure these.[175] Having sought legal advice this was relayed to the branch and they were informed that their complaints could only be dealt with by a change in legislation. What was required was that the Factories Act (1937) Section 46 would have to be amended by having special regulations added or the alternative option was to add the tar distillation process to Regulation 25A of (SR &O 1922, 731) Regulations for Chemical Works. Therefore, once again, what was so simple for the workers to see was not so simple to have put right. The Chief Inspector

[174] TUC Files, Cancer 1956-60, British Chrome and Chemicals Ltd, Copy of letter from R. Gourlay, Branch Secretary NUGMW to TUC Genera Secretary, 7 November 1958, MSS.292/174.47/6
[175] TUC Files, Cancer, 1956-1960, Letter from T. Williamson, NUGMW to Tewson, TUC General Secretary, March 17, 1960, MSS.292/174.47/6

of Factories was contacted and he paid a visit to the factory in question. His advice was that the workers needed to pay closer attention to personal hygiene as, according to this expert, this was as important as protective clothing. The TUC duly responded to the NUGMW with this news noting that, 'legislation had not been considered.'[176] The NUGMW responded to the TUC after having discussions with their National Industrial Officer who had added that personal hygiene was important but so was voluntary medical examination.[177] Finally, the deputy Chief Inspector of Factories wrote to the Social Insurance Department at the TUC arguing that, 'a high standard of personal hygiene and the wearing of suitable protective clothing both play a part in the prevention of skin cancer.'[178] What becomes apparent when viewing this string of opinion is that the original issues raised by the local membership (fear of cancer and lack of protection offered by the employer) had been turned around and if the workers wanted to be protected against a known risk of cancer in the industry it was they who would have to take care of themselves.

The 1960s were to witness a widening of interest in matters of health and safety. This began in December 1961 when the TGWU decided to launch a union wide industrial health and safety campaign accompanied by information leaflets.[179] This was followed in late 1962 by a meeting between the three main trade union representatives for the chemical industry and the Minister of Labour to consider the establishment of a joint standing committee for health and safety. In response to this suggestion from the trade unions the Minister did not feel that this was necessarily the right way to deal with these issues and suggested that 'a voluntary body' be set up in light of the fact that, 'the chemical industry had quite a good record for safety and that the industry itself looked after this problem.'[180] The minister passed on his views to the employers and at the beginning of 1963 the employers agreed that health and safety was something that concerned both the trade unions and the employers. To further discussion on these matters it was also agreed that the appropriate body to deal with the issues should be the Joint Industrial Council (JIC). The employers also

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[176] TUC Files, Cancer, 1956-1960, Letter from Tewson, TUC General Secretary to Williamson, NUGMW to, June 2, 1960, MSS.292/174.47/6

[177] TUC Files, Cancer, 1956-1960, Letter from Williamson, NUGMW to Tewson, TUC General Secretary, July 1, 1960, MSS.292/174.47/6

[178] TUC Files, Cancer, 1956-1960, Letter from K. Crundwell, Deputy Chief Inspector of Factories to J,G, Eames, Social Insurance Department TUC, 16 August, 1960, MSS.292/174.47/6

[179] Minutes and Reports of TGWU, MIN 30, January 1962 and General Secretary's Report, 22 March 1962, MSS.126/TG/449/E

[180] Minutes and Reports of TGWU, General Secretary's Report, November 1962, MSS.126/TG/449/E

agreed to provide the unions with relevant documents and the TGWU representative noted that:

> It is obvious that the employers committee have given serious consideration to the question of safety in the industry and this now gives the trade union side the opportunity of raising on the JIC matters affecting the safety, health and welfare of our members.[181]

This was followed a few months later by an announcement that the employers had agreed to the setting up of a Safety Sub-Committee and that this committee would consider issues pertaining to 'the existing safety measures, the acceptance of safety standards, and promoting the idea of safety conditions throughout the industry.'[182]

Health and safety issues were also backed up by the TGWU's policy of pursuing claims against employers who had failed to take adequate steps to implement preventative measures. In the early 1960s the legal department could report that the sum of £18,000 had been won on behalf of a chemical worker 'the highest amount secured in any industrial case.'[183] The following year the general secretary congratulated the work being done by the legal department with reference to industrial deafness, nitro-glycerine investigations, and the number of cases that they had managed to settle with respect to members within the chemical group.[184] The delegate representing members within the Mond Nickel plant in Wales echoed this view. Although this was one means of attempting to get the employers to consider changing the processes or improve plant maintenance there remained in the minds of some delegates the view that more information should be gathered to better understand what effect the industry was having on their health. This view was contained in a branch resolution that was put before a meeting of the chemical group in July 1965. The branch wanted the research department to find out, a) how long members lived after they had retired at the age of 65, b) what the effect was on the health of a worker who was exposed to 'crude oil smells' and fertiliser dusts and, c) what was the effect on the health of a worker who was consistently breathing in copper liquor and general chemical smells. It was added that, over time, working amongst chemicals must affect

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[181] Minutes and Reports of TGWU, MIN 128, January 1963, MSS.126/TG/449/E
[182] Minutes and Reports of TGWU, MIN 156, April 1963, MSS.126/TG/449/E
[183] Minutes and Reports of TGWU, General Secretary's Report, October 1962, p.4, MSS.126/TG/449/E
[184] Minutes and Reports of TGWU, MIN 153, April 1963, MSS.126/TG/449/E

health and therefore the retiring age should be lowered from 65 to 60.[185] Whilst parts b) and c) were referred to the research department question a) was not. The National Secretary had agreed that whilst it would have been desirable to know the answer to this question the unions research department 'was not in a position to undertake such a mammoth task.'[186] Whilst the task may have been large the answer would have at least provided the union with evidence of the hidden toll of death that was attached to this industry.

In 1967, the National Economic Development Office published a report that compared British and American chemical industries.[187] This study had been undertaken primarily to discover why the US industry appeared to be more efficient than the British and both management and trade unionists from Britain took part.[188] Many areas were under consideration including those pertaining to health and safety. One major difference that was noted was how equipment that was used to produce chemicals was maintained and designed. In comparison to the US designs it was found that 'too many British design engineers appear to forget that the plant will have to be maintained …so that the maintenance workers are exposed to unnecessary danger.'[189] This evidence indicates that those who were not directly exposed to the dangers of the industry had not consulted with those who had to do so on a daily basis. Whilst trade union representatives may have been able to pursue complaints about inadequate design features the design of chemical plant was the preserve of higher ranked workers and it would have been unlikely that the union's complaints would have held much sway amongst the 'experts.' Further, any complaint could only have been about something that already existed and as has been shown when this was the case it was much more problematic to deal with and change. The Ardeer modernisation programme referred to earlier was an example of how, with trade union involvement, health and safety aspects could be built in to the process if they had been consulted at the design stage.[190]

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[185] Minutes and Reports of TGWU, MIN 209, July 1965, MSS.126/TG/449/E
[186] Minutes and Reports of TGWU, MIN 209, July 1965, MSS.126/TG/449/E
[187] Economic Development Committee for the Chemical Industry, *Manpower in the Chemical Industry, A Comparison of British and American Practices*, HMSO, (London 1967)
[188] ICI did not participate in this comparative study.
[189] Economic Development Committee for the Chemical Industry, *Manpower in the Chemical Industry, A Comparison of British and American Practices*, HMSO, (London 1967), pp.20-21
[190] See p.217

In terms of safety provision the study group found that whilst the British paid 'considerable attention to safety …it seemed almost nothing by comparison with the American efforts.'[191] The TGWU delegate who accompanied this study group reported back to the committee and noted that, 'the maximum attention is given to safety; the standard of safety equipment was very high and safety rules were generally strictly enforced.'[192] The delegate was clearly impressed and made further comment on the issue of trade unionism noting that 'there is complete plant bargaining and the local unions are given every facility possible.'[193] It was also noted that in some of the plants there were three times the number of shop stewards as would have been found in comparable works in Britain. Given that the US chemical industry had no less of an interest than the British in making profits it is interesting that the US could do so more 'efficiently' despite spending more time, energy and money on health and safety issues. However, as was the case in Britain, trade union concerns on occupational health and safety could be accommodated to some extent by both the employers and the government. Markowitz and Rosner have persuasively argued that concerns could be neutralised or buried by a process of 'deceit and denial' as indeed the US chemical industry were doing not long after the National Economic Development Office had written their report.[194] However, the US industries decision to deceive and deny was not wholly dependent on the discovery of an occupational disease but was based on a fear that the American public may have linked the occupational risk with a more general public health risk and this would have impacted adversely on sales.[195]

Where the risk was purely occupational and there was little fear that the public would become concerned a different, and arguably less expensive approach could be adopted. For example, in 1973 an ICI chemical plant was visited by a factory inspector. He found that, 'men were working in dust up to 2 ft. deep … there was even fertiliser dust stalactites hanging from the roof …and it took a twelve-day shutdown to clean it up.'[196] Following the discovery of this ICI dust filled plant the firm were taken to court in Middlesborough where they pled guilty to a breach of the

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[191] *Ibid*, p.41
[192] Minutes and Reports of TGWU, MIN 178, April 1967, MSS.126/TG/449/E
[193] *Ibid*
[194] G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003), p.168
[195] *Ibid*, p.168
[196] T. Nichols, and H. Beynon, H. *Living With Capitalism, Class Relations and The Modern Factory*, Routledge & Kegan Paul, (London 1977), p.12.

1961 Factories Act and were fined just £50.[197] What this case illustrates is that all that the trade unions had fought for to ensure that the workplace was safe and healthy had been in place and yet it had proved to be ineffective. That is, the factory legislation had been in place for 12 years, the inspectorate had visited the plant, a prosecution was pursued, the firm were subjected to the legal system, it was proven that the legislation had been breached, a financial penalty was handed down. The cost to the firm for this breach was now known but the cost to the health of those chemical workers who had had to endure these appalling conditions remained unknown. At one level this dust-filled workplace had been a relatively simple issue for the trade unions to deal as the evidence of such obvious and harmful conditions were easy to gather. However, more complicated and insidious risks existed and by the late 1970s only 26 chemicals or chemical processes had a definite determination of the specific chemical initiating the disease at a time when 500 new chemicals and over 120,000 new synthetic compounds were being marketed annually.[198] It would therefore be fair and reasonable to assume, just as the TGWU Legal Department had done, that the trade unions had indeed been 'up against a concealed risk.'[199]

Conclusion

Although the chemical trade unions never managed to recruit more than half the potential membership they did increase their foothold in this sector over the period 1914 to 1974. Various reasons can account for the slow growth of trade unions in this sector but the overwhelming factor that explains the stubbornly low levels of trade union density before the 1940s is that the employers' anti-union strategies were effective. That is, chemical workers generally came to view the employer rather than the trade union as the provider of benefits and it was the employer and not the trade union that was seen as being able to deliver compensation for ill health and injury when workers were affected by their employment. Despite this, trade unions did manage to recruit chemical workers and by responding to issues raised by these members they campaigned with various levels of success on a number of occupational

[197] *Ibid*, p.29
[198] A.W LeServe, C. Vose, and C. Wigley. *Chemicals, Work and Cancer*, Workers' Educational Association, Nelson & Sons, (London 1980), p.43. Scrotal cancer in chimney sweeps was the first occupational cancer to be officially identified.
[199] TUC Files, Cancer 1956-60, British Chrome and Chemicals Ltd, Letter from Legal Department of TGWU to General Secretary of TUC, 20 October 1958, MSS.292/174.47/6

health and safety issues. Given the lack of membership before World War Two, the complexity of the industry, the scale of production, the growth in the number of chemicals being produced, and the need to irrefutably prove the precise cause of an occupational disease, trade unions faced a mammoth task in attempting to improve occupational health and safety standards in the chemical industry.

Although from 1914 some attempts were made to address the dangers within the industry the trade union movement in general was seriously weakened by the consequences of economic depression, the General Strike of 1926 and by the introduction of the Trade Disputes and Trade Unions Act of 1927. It is clear that the chemical trade unions became much more focussed and better organised from 1944 onwards and that major health issues were pursued with more vigour and with more success. Union campaigns sought to minimise or eliminate some of the more insidious dangers associated with chemical production and the complexities involved in these cases have been identified. Dealing with such issues was not an easy or simple task and required tenacity and the use of a wide range of resources that included legal and medical opinion, financial and political clout, and the ability to persevere with campaigns over many years. Yet trade unions had access only to limited resources and these would never be enough to keep them abreast with the enormous growth and development of the chemical industry. Nonetheless, campaigns were fought and won. Certain dye intermediates were banned, some were only allowed to be used restrictively, and some never went into production at all. Undoubtedly, this was as a result of the trade unions efforts to have these chemical substances examined more thoroughly than they would have been had trade unions not existed in the industry. Indeed, as has been shown the agency shown by the trade unions brought many improvements to the chemical workplace and without these chemical workers would have had neither the knowledge nor the equipment to deal effectively with a host of hazards.

The general criticisms that are levelled at the trade unions have to be revised for the chemical sector. To argue, as some historians have done, that trade unions could have done more cannot be substantiated when the context in which the chemical trade unions operated is explained. There is also little evidence to support the view that trade unions prioritised wages over health. Indeed, although historians have offered this point as criticism what they are actually discussing is the limitations of power that existed within the trade union movement in relation to others. Trade unions were not the architects of the waged labour system. Whilst to the worker wages meant a means to life, to the employer wages were a cost that cut into profits. Acting as the body that owned and controlled the means of production it was employers who prioritised wage issues over health and consequently for the most part trade union preferences were shaped by this decision. It was the government and without doubt the chemical employers that introduced compensation schemes for industrial accidents, injuries and diseases. Trade unions had no such power. Nonetheless, trade unions did have a responsibility to the victims to pursue claims and they did so even although the schemes were not of their own making. Drawn into a bureaucratic web the trade unions were manipulated and conflict over death and injury became institutionalised. With the potentially lethal production continuing virtually unabated compensation schemes offered the employers and the state much more than they offered the victims of industry. To criticise the chemical trade unions for not doing enough is rather akin to criticising women for not getting the vote much sooner. Trade unions have always had limited and intermittent powers. What the critics have suggested trade unions should have achieved is based on an illusion of power, and a fallacy of pluralism.

Chapter Six

Chemical Employers and Occupational Health

> *Power and authority are of course excellent things; it all depends on who has them in what circumstances and for which purposes.*[1]
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> *Crimes committed by employers in factories are generally not detected, and when they are detected the criminals are generally not prosecuted and when prosecuted are not punished.*[2]

In 1956, in a preamble to a lengthy discussion on industrial carcinogens Dr Goldblatt, an occupational health scientist with ICI, wrote of the difficulties facing the manufacturer when it became 'probable' or 'demonstrable' that a part of the chemical process was having a 'dangerous effect' upon the workers. He noted, 'the simple formula that the process or substance involved should be eliminated is too facile and would, if applied, rebound more severely on the worker than on his employer.'[3] The implication being made here is quite clear. If the manufacturer were to be prevented from producing a substance that was almost certainly lethal then all of the process workers could lose their livelihood, not just those that succumbed to the toxins. An employer, such as ICI, would be able to absorb the immediate impact of such a decision but the loss of jobs and the consequential impact on families and local businesses would have economic, social and political consequences. The use of an implied threat of closure and the compliant response of the workers can be seen in the testimony of one former chemical process operator who explained why his fellow workers and the trade union failed to have improved health and safety measures fully implemented.

> I mean they knew in the mid seventies that this was affecting us…the unions and that knew about these surveys [showing deterioration of

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[1] T. Eagleton, *The Illusions of Postmodernism*, Blackwell, (Oxford 1997), p.56

[2] W.H. Thompson (Solicitor), Robens Selected Written Evidence, p.661 as cited in T. Nichols and P. Armstrong, *Safety or Profit: Industrial Accidents and the Conventional Wisdom*, Falling Wall Press, (Bristol 1973), p.25

[3] M.W. Goldblatt, and J. Goldblatt, 'Industrial Carcinogenesis and Toxicology', pp.185-562 in E.R.A. Merewether, (ed) *Industrial Medicine and Hygiene, Volume 3*, Butterworth, (London 1956), p.225

> hearing and eyesight] and basically ICI being ICI said well 'if we've got to do all these things [implement improvements] it's not going to be viable so the plants will probably have to shut down'. And you've got young guys in there with mortgages and families…the argument was blown out the water. That happened so many times, so many, many times. It happened as a group and it happened tae individuals.[4]

Employers regularly take decisions that are designed to make profits, gain the confidence of the market and shareholders, and essentially do what is 'good for business.' Many business decisions are justified by reference to 'efficiency' and include those that are designed to control the production process or to increase or lower the numbers employed. Costs are a paramount consideration for business as costs cut into profits. For example, labour costs have to be kept to a minimum and labour is only retained whilst it remains profitable. But costs are also incurred in providing safeguards against occupational accidents and diseases. Just how important it is for business to keep these costs low has been revealed in recent legal cases in the United States of America. There, previously hidden documentary evidence has shown that the heads of both the asbestos and plastic industries continued to expose their workers to levels of toxic substances whilst denying and suppressing information that showed these were lethal.[5] Having hidden these business decisions from public scrutiny the employers concerned must have considered their actions to be, at best, inappropriate.

Markowitz and Rosner have noted that obtaining these types of company records provides 'a window into a world historians are rarely allowed to enter.'[6] Indeed, finding such a 'window' on that side of the Atlantic is very rare but rarer still on this side of the Ocean. Consequently, other evidence has to be used to show the full range of attitudes and strategies that were chosen by British chemical manufacturers in responding to the evidence that their products were damaging the health of their workers. As has already been demonstrated, by casting a very wide net

[4] Interview: D. Walker with Mr KG, 25 November 2005, p.12
[5] For the US chemical industry see: G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003), for the British asbestos industry see G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003)
[6] G. Markowitz, and D. Rosner, *Deceit and Denial,* p.xv

over primary and secondary documentary evidence and combining this with oral testimony, a clearer picture has emerged to show what the conditions of work would have been like for many chemical workers and how the manufacturing processes could cause occupational injury and disease. Employer responses to this knowledge varied but were, in part, responsible for the many hundreds of deaths and injuries that occurred amongst the British chemical workforce.[7]

In the modern chemical industry scientific research and technological development is time consuming, expensive, and constant.[8] Once a decision has been reached to scale up from the laboratory to the chemical plant it is vitally important to the manufacturers that returns are delivered on their capital investment. This can only be achieved by the successful sale of the product and this requires that the product is manufactured without hindrance from any quarter, including the government. According to Grant *et al* the British chemical industry 'enjoyed the confidence of the public authorities and was very largely left to regulate itself'…'legislation was sparse.'[9] For Grant *et al* this can be explained by reference to 'tradition' with neither British nor German states taking much interest in the production or marketing of chemicals.[10] What Grant *et al* do not make clear is why this tradition came about and therefore reasons must be sought to explain this, at least for Britain.

From the end of the nineteenth century the government received evidence of progressive and welfarist measures voluntarily introduced by some of the large chemical manufacturers such as Brunner Mond.[11] When ICI were formed in the mid 1920s most of the welfarist measures operated by Brunner Mond were imported into ICI. It has been argued in Chapter Five that the primary motivation behind the introduction and maintenance of these welfarist measures was to create a loyalty to the company rather than the unions, improve production, and minimise the risk of

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[7] See Chapters Three and Four.
[8] Between 1927 and 1952, ICI alone invested £46.8 million in research and development. Cited in W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.502
[9] W. Grant, W. Paterson, and C. Whitson, *Government and the Chemical Industry, A Comparative Study of Britain and West Germany*, Clarendon Press, (Oxford 1988), p.282
[10] *Ibid*, p.282
[11] Report on the Conditions of Labour in Chemical Works, The Dangers to Life and Health of the Workpeople Employed Therein and the Proposed Remedies, Chemical Works Committee of Inquiry, PP 1893, (C.7235), p.5

strikes.[12] Huge capital investments were made in the research and development of processes and products and to protect these investments chemical employers became much more aware and willing to introduce steps that would reduce the risk of fire, explosion, or any disruption to production. Therefore, protecting capital investment could on occasion help protect the welfare of the chemical worker. Official data on occupational accidents and deaths also showed that by comparison with other large-scale industries, such as coal mining and engineering, there were much fewer of these in the chemical industry.[13] By drawing attention to these aspects of the industry a positive impression could be generated to show that chemical employers had addressed the problems associated with its inherently dangerous processes. However, perhaps the most important reason that explains the lack of government interference with this industry was that the output of industrial and consumer chemicals was vital for the 'success' of much of the rest of the manufacturing and retail trades on which Britain's economy relied.[14] By providing an uninterrupted flow of these materials throughout the period in question in an atmosphere largely bereft of labour unrest the industry demonstrated its importance to Britain in helping it to develop as a modern industrialised nation. The economic, social and political benefits of having a dynamic chemical industry were paramount considerations to all governments at all times between 1914 and 1974 and it was for this reason, above all, that the chemical industry was traditionally allowed to regulate itself.[15]

This chapter will begin by providing an examination of the representative body of the industry, the Association of British Chemical Manufacturers (ABCM). This will show that the ABCM actively sought to enhance the chemical manufacturing industry's image with respect to the government, the Factory

[12] Chapter Five, pp.179-182
[13] Official data was skewed because although occupational diseases were prevalent in the chemical industry they were less obvious and therefore tended not to be reported. This is discussed more fully in Chapter Three.
[14] Chemicals are used in the steel and non-ferrous metals, textiles, leather, rubber, aircraft, car, shipbuilding, paper, and building industries. They are also essential for the production of explosives, fertilisers, coal tar by-products, drugs, medicines, vitamins, oil distilling, artificial silk, nylon, paints, varnishes, plastics, soap, perfumery, and inks.
[15] For a detailed account of the basis of the close relationship between the state and the chemical industry see F. Pearce, and S. Tombs, *Toxic Capitalism: Corporate Crime and the Chemical Industry*, Ashgate, (Hants 1998), pp.43-44 For an example of the relationship between ICI and government see: W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.473

Inspectorate, and other interested parties. Thereafter, there will be an examination of the responses made by both large and small chemical manufacturers to the knowledge that their manufacturing processes were causing cancer amongst their workers. It will be shown that chemical employers such as ICI, and Clayton Aniline Limited maintained production by paying compensation to injured workers, delaying the dissemination of information, and by introducing methods that were aimed at controlling, rather than eliminating, the carcinogenic substances. Following this there will be an examination of an 'announcement' made to a workforce in 1956 by a relatively small Scottish chemical manufacturer. This announcement outlined the formal response made by the company to the fact that its processes were causing lung cancer. What will be demonstrated is that this firm sought to diminish the significance of this lethal threat through a combination of carefully chosen language, a company funded compensation scheme, and a measure of deceit, all of which were used to maintain uninterrupted production.

The Attitude of the Association of British Chemical Manufacturers

As happened in other industries chemical employers formed an organisation that could be used to reduce friction between competing firms and provide a united front against potential adversaries.[16] Formed in 1916, the Association of British Chemical Manufacturers (ABCM) brought together the heads of the largest chemical firms in Britain such as, Crosfields, Brunner Mond, Lever Brothers, Mond Nickel, Chance and Hunt, Castner-Kellner, Albright and Wilson, and the United Alkali Company. Various stated aims sought to enhance the standing of the industry including, 'placing before the government and government officials the views of such manufacturers.'[17] Indeed, according to Grant *et al* the ABCM were, 'primarily concerned with government relations' and, within a year of coming into existence, had persuaded the government that they were 'the most representative association of the chemical trade.'[18] In 1928 the ABCM began producing their own 'Model Safety

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[16] For a fuller examination of how employers acted in unison see, A.J. McIvor, *Organised Capital, Employers' Associations and Industrial Relations in Northern England, 1880-1939*, Cambridge University Press, (Cambridge 1996)

[17] *The Times*, June 23, 1916, p.5

[18] W. Grant, W. Paterson, and C. Whitson, *Government and the Chemical Industry, A Comparative Study of Britain and West Germany*, Clarendon Press, (Oxford 1988), p.23 and Ministry of

Rules' and in 1930 enhanced the public image of the industry by successfully lobbying for the chemical industry to be added to the British Engineering Standards Association (BESA). This resulted in BESA being renamed as the British Standards Institution (BSI), an organisation that became more widely known for their safety 'kite-mark.'[19]

The Model Safety Rules were updated in 1938 by the Works Technical Committee of the ABCM and thereafter dealt with by their Works Safety Committee in 1947 and 1950. According to the ABCM it was 'essential' that a safe working environment was maintained alongside the technical improvements that were introduced so that the industry could provide 'attractive and congenial employment.'[20] As will be discussed below and with reference to the dyestuffs sector this was a strikingly hypocritical statement. Obviously it was important for the ABCM that the appropriate body should endorse their rules and they therefore sought this from the Chief Inspector of Factories who, in the 1950s, stated that the ABCM should be 'commended' for their initiative.[21] The ABCM publications offered a guide to government legislation as it applied to the industry but were also enhanced by safety recommendations to which employers were 'invited' to implement.[22] These publications would have helped any employer who was interested in the rules and regulations to know how, where and why these should be put into operation. For example, Crooks notes that one firm that had been unaware of a particular hazard associated with the use of carbon bisulphide until it had been alerted by the ABCM model rules of 1928.[23]

Apart from the legislative elements, none of what was published by the ABCM was enforceable by law leaving chemical employers to pick and chose from these entirely at their own discretion. Indeed, and as has been argued, the dearth of

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Reconstruction, Committee on the Chemical Trade, Report of Committee Appointed to Advise as to the Procedure which should be adopted for dealing with the Chemical Trade, PP1917, (Cd. 8882) p.4

[19] www.bsieducation.org/Education/about/brief-history This indicated to buyers that the goods being purchased were 'up to standard.'

[20] Association of British Chemical Manufacturers, *Safety Rules for Use in Chemical Works, Part 1, Model Rules, 3rd Edition*, (London, 1951), p.4

[21] Association of British Chemical Manufacturers, *Safety Rules for Use in Chemical Works, Part II, Detailed Instructions*, (London, 1952), 'Foreword', G.P. Barnett, Chief Inspector of Factories, p.iii

[22] Association of British Chemical Manufacturers, *Safety Rules for Use in Chemical Works, Part 1, Model Rules, 3rd Edition*, (London, 1951), p.4

[23] E. Crooks, *The Factory Inspectors, A Legacy of Industrial Revolution*, Tempus, (Gloucestershire 2005), p.146

factory inspection and the paltry fine levels led some employers to deal with the legislative elements in this manner as well.[24] Moreover, having been left largely to regulate the industry that they owned and controlled chemical manufacturers would naturally have done so whilst applying capitalist logic. That is, they would ultimately prioritise the financial health of the business over the physical health of the employees. As noted above this prioritisation could, on occasion, deliver improved safety standards to the workforce. However, where it was perceived that introducing safety measures might restrict profit maximisation then steps could be taken to avoid this happening.[25] Indeed, cabinet documents reveal the pressure applied by 'certain elements within the CBI' (Confederation of British Industry) that sought to dilute the powers of the Health and Safety at Work Act (1974). This was done because these elements 'were worried at the prospect of the stronger powers of the Bill being available to control harmful emissions from heavy industry.'[26] What was meant by 'certain elements' was made clear in documents of a cabinet meeting held the previous year where it was noted that the move to dilute the powers of the HSAWA had been 'strongly urged' by the CBI and the successors of the ABCM, the Chemical Industries Association (CIA).[27] Capitalist logic can also be seen at work in the contents of a speech given to the Society of Occupational Medicine in 1980 by the then Chairman of the CBI Health, Safety and Welfare Committee. The speech made clear which needs industry leaders considered paramount:

> If the cost of health and safety becomes too expensive then companies would simply have to shut down: indeed, there is a feeling beginning to grow that in those industries where the risks are difficult to quantify, e.g. where possible or suspected carcinogens are involved,

[24] Evidence has been provided throughout that the rules and regulations for dust extraction were ignored with impunity in the chromate manufacturing, dyestuffs, soda ash, and fertiliser sectors of the industry.
[25] D. Eva, and R. Oswald, R. *Health and Safety at Work*, Pan, (London 1981), pp.21-22
[26] CAB/129/176/12 Cabinet Meeting, Health and Safety at Work etc Bill, Position of the Alkali Inspectorate, 7 May 1974
[27] CAB/128/52/7 Cabinet Meeting, Conclusions of a meeting of the Cabinet held at 10 Downing Street on Thursday 17 May 1973. The ABCM continued in existence until 1965 when it merged with the Association of Chemical and Allied Employers (AC&AE) to form the Chemical Industries Association (CIA) who, by 1976, represented 90 per cent of all British chemical firms. For a fuller account of the role played by the CIA see: C. Gill, R. Morris, and J. Eaton *Industrial Relations in the Chemical Industry*, Saxon House, (Hants. 1978), pp.3-49

> that if standards continue to get progressively tougher a stage may be reached in the viability of certain processes which may lead to the transfer of production to countries where standards are not so high.[28]

In other words, if British firms were made to comply with controls that had been designed to better protect workers from carcinogenic substances then these employment opportunities would be offered to those whose governments were weaker. Although beyond the period under examination it should be noted that evidence does exist to show that by the 1980s the 'export of hazardous risks' was well under way from the major industrialised capitalist countries to the developing nations. Pearce and Tombs have noted this trend especially in the production of bulk chemicals which has been shifted towards eastern Europe, the Middle East, and Third World countries because this production process is more environmentally damaging, resource intensive, and requires more unskilled or semi skilled labour than speciality chemicals production.[29] Indeed, it was in 1980 that the Union Carbide plant at Bhopal began producing methyl isocyanate and only four years later that its lethal cloud of poison would kill an estimated 16 to 30 thousand people, injuring 500,000 others.[30]

The Response to Occupational Cancer by Large Manufacturers

Having 'become apparent' in the mid 1930s that bladder tumours were an occupational hazard amongst dyestuffs workers the manufacturers, acting through the ABCM, responded in 1938 not by halting production, but by offering compensation payments to those diagnosed with this disease.[31] This way disease and

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[28] R.H. Amis, 'Health and Safety at Work: The Employer's View, pp.98-102 in *Journal of the Society of Occupational Medicine*, (30), 1980, p.99

[29] F. Pearce, and S. Tombs, *Toxic Capitalism: Corporate Crime and the Chemical Industry*, Ashgate, (Hants 1998), p.44 For further discussion on this subject see also: D. Michaels, C. Barrera and M.G. Gachara, 'Economic development and occupational health in Latin America: new directions for public health in less developed countries' pp.536-542 in *American Journal of Public Health*, Volume 75, (5), 1985 and A. Watterson, 'Why We Still Have 'Old' Epidemics and 'Endemics' in Occupational Health: Policy and Practice Failures and Some Possible Solutions', pp.107-126 in N. Daykin and L. Doyal (eds) *Health and Work, Critical Perspectives*, MacMillan, (Hampshire 1999), p.123

[30] A critical analysis of the role played by Union Carbide and the desire of developing nations for First World capital is provided in F. Pearce, and S. Tombs, *Toxic Capitalism: Corporate Crime and the Chemical Industry*, Ashgate, (Hants 1998), pp.194-219

[31] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB,* pp.311-332 in Knights Industrial Reports, Volume XI, October 1971- March 1972, Charles Knight & Co, (London 1972), p.313

death could be calculated and dealt with not as a case of human suffering but as a cost. Unfortunately no 'window' was found to provide details of how the ABCM administered this scheme although it is at least possible to argue that it may not have been dissimilar to that found in the asbestos industry.[32] The timing of the decision to introduce the scheme is interesting, coming as it did just as Britain was preparing for another war and when dyestuffs technology could be applied to explosives, war gases, and pharmaceuticals. Indeed as Reader notes, 'consciousness of the wartime importance of the chemical industry…had influenced government policy from the time of the Great War onwards, particularly in relation to the dyestuffs industry.'[33] The government were aware of the fact that it was the occupation that was causing the deaths but they were having 'great difficulties' defining the cause of the disease and were therefore not prepared to schedule it under the Workmen's Compensation Acts.[34] Although relatively weak, the trade unions had been pursuing this matter but the employers diffused the situation by agreeing to treat the disease as if it were a scheduled disease. By choosing this course of action the employers were in control of the scheme and could therefore determine who qualified for compensation. Nonetheless, assurances were given by the employers that the scheme would be operated in a fair manner and in a letter sent to the Ministry of National Insurance the ABCM claimed that 'workers suffering from papilloma of the bladder would be treated generously.'[35] This was the theory but one former dyestuffs worker wrote in 1952 about how the compensation agreement had actually worked 'in practice.'[36] The former worker, Mr Carter, had been employed by Clayton Aniline Limited up until 1937 and sometime later had to have a growth removed from his bladder. He found out that some of his former work colleagues had died of bladder cancer and

[32] For details of the employer initiated Asbestosis Fund see G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), pp.71-87
[33] W.J. Reader, *Imperial Chemical Industries, A History, Volume II, The First Quarter-Century 1926-1952*, Oxford University Press, (London 1975), p.252
[34] Cited in *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB,* pp.311-332 in Knights Industrial Reports, Volume XI, October 1971- March 1972, Charles Knight & Co, (London 1972), p.313.
[35] MSS.292/174.47/7 (Cancer of the Bladder), Letter from ABCM to the Ministry of National Insurance. The letter was copied by the Ministry of National Insurance and sent on 31 October 1952 to Mr Clunie (Dick) Dale, Head of the TUC Social Insurance Department.
[36] MSS.292/174.47/7 (Cancer of the Bladder) Letter from Mr F.W. Carter to the Trades Union Congress (TUC), August 31, 1952

that the Manchester based, but Swiss owned, Clayton Aniline, had treated both widows and workers with indifference. He noted:

> Mrs Woods…her husband died in 1943 of cancer of the bladder after many years service in the Beta-Naphtol Dept of the Clayton Aniline. When I saw her several months ago she had never received a penny from this firm. She was left with 6 young children. Mrs Young…her husband died of cancer of the bladder in 1948. The Clayton Aniline pay her £2 per week. She has eleven children, ten of these under 14 years of age. She told me she went to the office of this firm once a week for her money and she was frequently insulted. Richard Walker contracted cancer of the bladder while in the employ of the Clayton Aniline. After paying the worker £4-6-0d per week for a period the firm offered him his job back again and stopped payment. I had a malignant growth removed from the bladder. After a great deal of effort the firm paid me £5 per week for a certain amount of weeks, nothing at all like the period I had lost from work due to this complaint. For this paltry sum I had to sign a paper stating I had no further claim against this firm. If I were to die tomorrow my family would be left with almost nothing.[37]

There is little sign here of the manufacturers generosity, either in financial or in moral terms. Indeed, having unearthed the fate that had befallen others affected by this disease Mr Carter's concern and anxiety are obvious in the last sentence where he prophetically reflects on his own, as well as his family's future. What Mr Carter may not have known but the employer most certainly did was that a recurrence of bladder tumours years after the cessation of exposure was a known and characteristic feature of the disease.[38] It would probably have been for this reason that the firm insisted on a signature debarring further claims.

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[37] MSS.292/174.47/7 (Cancer of the Bladder), Letter from Mr F.W. Carter to the Trades Union Congress (TUC), August 31, 1952

[38] M.W. Goldblatt, and J. Goldblatt, 'Industrial Carcinogenesis and Toxicology', pp.185-562 in Merewether, E.R.A. (ed) *Industrial Medicine and Hygiene, Volume 3*, Butterworth, (London 1956), p.276

In the immediate post-war period the ABCM initiated and funded a study into the causes and incidence of bladder cancer in the dyestuffs sector. This study took seven years to complete with the results being published in the *British Journal of Industrial Medicine.* The study showed that one out of every ten men exposed to benzidine, ά-naphthylamine, or β-naphthylamine had developed a bladder tumour and that this was likely to increase to one in every five before all the men were dead.[39] The use and manufacture of β-naphthylamine was stopped although it should be noted that an alternative had been found. The government also recognised papilloma of the bladder as an occupational disease amongst dyestuffs workers. The other named chemicals were dealt with by the ABCM who responded in 1957 by publishing a 'code of working practice' that, by title, aimed at controlling, rather than eradicating, occupational bladder tumours in the dyestuffs industry.[40] The manufacture and use of dye intermediates such as ά-naphthylamine continued although in 1965 ICI finally took the decision to shut down one of their plants that manufactured ά-naphthylamine. According to Castleman this decision was taken as ICI had conceded that even within a well designed and operated plant they could not prevent their workers becoming exposed to the bladder cancer inducing chemicals.[41] However, once the ICI plant stopped production imports of ά-naphthylamine went up. Castleman has argued that following this the 'immorality of the implicit double standard' had to be seriously questioned and that this was done both by the original medical researcher who had conducted the investigation into bladder cancer in the dyestuffs industry and in an editorial in the *Lancet.*[42]

In the course of the ABCM study of the dyestuffs sector Case also found that a disproportionate amount of bladder cancer victims belonged to the rubber industry. The discovery of these deaths led to ICI withdrawing Nonox S from manufacture and sale in 1949 although latterly a legal case would prove that this action should have

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[39] R.A.M. Case, M.E. Hosker, D.B. McDonald, and J.T. Pearson, ' Tumours of the Urinary Bladder in Workmen Engaged in the Manufacture and Use of Certain Dyestuff Intermediates in the British Chemical Industry, Part 1. The Role of Aniline, Benzidine, Alpha-Naphthylamine, and Beta-Naphthylamine' pp.75-104 in *British Journal of Industrial Medicine*, (11) 1954, p.95

[40] T.S. Scott, and M.H.C. Williams, 'The Control of Industrial Bladder Tumours: A Code of Working Practice Recommended by the British Dyestuffs Industry for the Manufacture and Use of Products Causing Tumours of the Bladder' pp.150-163 in *British Journal of Industrial Medicine*, (14) 1957

[41] B.I. Castleman, The Double Standards in Industrial Hazards, September 1984, Volume 5, No. 9 http://multinationalmonitor.org/hyper/issues/1984/09/castleman.html

[42] B.I. Castleman, The Double Standards in Industrial Hazards, September 1984, Volume 5, No. 9 http://multinationalmonitor.org/hyper/issues/1984/09/castleman.html

been taken much sooner.[43] Further, in 1965, the Labour MP, Peter Shore, also alleged that in the late 1940s when the rubber industry workers were first identified by the ABCM study as being in danger part of the evidence was suppressed by the rubber manufacturers.[44] It was noted that:

> The rubber industry agreed to publication but asked that certain amendments should be made, mainly to stress that, on becoming aware of the hazards, rubber manufacturers had discontinued the use of the carcinogenic substances, and also, in view of this discontinuance, to omit references to the need for further investigations, as likely to cause unnecessary anxiety among workers.[45]

Just as the ICI researchers had failed to divulge the true extent of health damage being caused by soda ash dust for fear that it might make their workers 'neurotic' the rubber manufacturers wanted to hide information so that their workers wouldn't become too anxious.[46] To agree to a silence on the need for further investigation was to deny those who had been at risk the opportunity to decide themselves whether they wished to continue working in that occupation. Again, it appears that the ownership and control of scientific and medical knowledge was important to those who owned and controlled industry. Shore pressed the Minister of Labour and asked:

> Would not the Minister agree that the employers association [Rubber Manufacturing Employers' Association, (RMEA)] have behaved in a most deplorable and irresponsible way – first in delaying the publication of their report and all this information when it became available in 1950: and then their attempts, successful it would seem, to suppress material parts of it before it could be published in 1955?[47]

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[43] This is in relation to the Nonox S case as discussed in Chapter Three, pp.122-125
[44] *The Times*, 'Rubber Industry Hazards: Minister Orders Survey', February 16, 1965, p.17
[45] *Ibid*, p.17
[46] See Chapter Four, p.156
[47] *The Times*, 'Rubber Industry Hazards: Minister Orders Survey', February 16, 1965, p.17

Another Labour MP, Edmund Dell, remained puzzled as to why, when Nonox S had been withdrawn in 1949 it had taken until 1965 for 'the facts to be properly publicised and action taken by the government.'[48] The Minister for Labour agreed with these sentiments and replied that 'perhaps other action might have been taken at that time' and that 'it is all very well to be wise after the event.' What the Minister meant is not clear, as there had been no need to be 'wise after the event.' The government, ICI and Dunlop had all understood by 1949 that irrefutable evidence existed to show that exposure to Nonox S could result in bladder cancer and it was for this reason that ICI and Dunlop stopped manufacturing and using the substance. What Dunlop didn't do in 1949 was to inform their workers of the risk that they had faced and they held that information back until the 1960s.[49] Commenting on this decision a judge accepted that a 'large number of men' had left Dunlop between 1949 and 1960 and that these men had no knowledge of the risks they had faced or of the need to be screened for bladder cancer. He stated, 'there came a time when the proper discharge of their duty to their servants called for certain action on the part of Dunlop…it did not call for action to those who were no longer their servants.'[50] According to the judge 1960 was the proper time to discharge this duty and to have done so before this time would have been, in his view:

> A panic measure, quite unjustified by the state of knowledge that Dunlop had in 1949/1950 and I accept that any such publicising of a possible risk of cancer of the bladder might easily have not been in the interests of their employees at that time.[51]

Why having this knowledge would not have been in the interests of the employees can only be explained by the possibility that the judge, like the employers, thought it

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[48] *Ibid*, p.17

[49] A circular was sent out by the Rubber Manufacturers Employers' Association in 1960 recommending that all employees who had been engaged prior to 1949 in a factory that had used Nonox S should have a urine test not less than once a year. However, for some unknown reason this recommendation was not carried out at the largest Dunlop plant in Speke, Liverpool, until 1965. *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB,* pp.311-332 in Knights Industrial Reports, Volume XI, October 1971- March 1972, Charles Knight & Co, (London 1972), p.325

[50] *Wright v. Dunlop Rubber Co Ltd. And Another, Cassidy v. Same, April 20, 1971, QB*, p.328

[51] *Ibid*, p.328

best that workers did not develop a neurosis or anxiety. Nonetheless, ICI, Dunlop, the ABCM, the RMEA and the Industrial Injuries Advisory Council all knew by the early 1950s that workers exposed to benzidine, ά-naphthylamine, or β-naphthylamine ran 'a significantly greater risk of developing tumour of the bladder than the general population.'[52] Once again the 'gap of neglect' had opened up between the time the manufacturer had knowledge that a lethal substance existed in the manufacture of a product and implementing proper steps to limit or eradicate the health risk posed to the worker.

The Response by ICI to Angiosarcoma of the Liver

Private correspondence dated from 1959 shows that scientists knew the existing threshold limit value of 500ppm was an unsafe level for workers to be exposed to in the VCM industry. Indeed, the industries own research had shown that repeated exposure to 200ppm caused liver damage in rabbits with one internal memo from a senior Dow chemical toxicologist stating, 'we feel quite confident…that 500ppm is going to produce rather appreciable injury when inhaled 7 hours a day, five days a week, for an extended period.'[53] This information was not publicly disclosed and no steps were taken at that stage to reduce VCM exposure levels. Markowitz and Rosner, two American public health historians, have presented persuasive evidence to support their thesis that senior officials in both the American and European plastics industry knew not only that 500ppm was excessive in 1959, but also that angiosarcoma of the liver had been identified as an occupational risk in 1972, two years before the chemical manufacturers were forced to reveal this evidence.[54]

When in 1972 it was secretly revealed that American chemical workers were dying of angiosarcoma of the liver ICI officials have been shown to be willing participants in the plastic industry's deception that followed. First, at a meeting of the Manufacturing Chemists' Association (MCA) held in Washington in 1972 a

[52] MSS.292/174.47/7 (Cancer of the Bladder), Industrial Injuries Advisory Council, Concerning the Proposed Prescription of Papilloma of the Bladder, 30 September, 1953
[53] J.B. Saas, B. Castleman, and D. Wallinga, 'Vinyl Chloride: A Case Study of Data Suppression and Misrepresentation' pp.809-812 in *Environmental Health Perspectives*, Vol.113, No.7 July 2005, p.810
[54] G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003), p.174

representative of ICI presented evidence that primary cancers of the liver and kidneys had been discovered in rodents exposed to half the recommended TLV of 500ppm but went along with the decision that this information should not be revealed outside of the MCA.[55] Second, at a meeting held in July 1973 between American representatives of the plastics industry and the National Institute for Occupational Health and Safety (NIOSH) an ICI representative, in collusion with his American counterparts, withheld information that cases of angiosarcoma of the liver were being found at half the recommended levels of exposure.[56] The American plastics industry had deliberately delayed the dissemination of their knowledge to a wider audience and it was only because the deaths caused by exposure to VCM were reported in newspapers that the industry reluctantly revealed their own information in January 1974. In response to this news the British chemical trade association issued a press release, which stated that, the American industry and the responsible government agency (NIOSH) had been told of the 1972 European research findings.[57] Following a challenge by NIOSH the ICI representative had to retract his statement. He then claimed that why NIOSH had not been told was because they had not asked about the research and it was assumed therefore that they were not interested.[58]

In 1974 the Chief Inspector of Factories in Britain was informed of the occupational deaths and stated that the American revelations had pointed to the 'existence of a considerable problem' although somewhat inconsistently he also felt that 'the evidence available hardly justified prohibition of the process.'[59] What this statement essentially meant was that the costs (the existence of an occupational disease) were much lower than the benefits (having things made from PVC). The tried and tested method of dealing with such a cost-benefit analysis was to introduce stricter safeguards and some form of financial compensation package to help the victims. Therefore, as a consequence of the revelations made in January 1974 a Joint Working Group was established in June consisting of the Factory Inspectorate, the Employment Medical Advisory Service, the TUC and the CBI. It was at this meeting

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[55] *Ibid*, p.183 It was in 1972 that the British industry lowered its threshold limit value (TLV) from 500ppm to 200ppm
[56] *Ibid*, pp.188-189
[57] *Ibid*, pp.212-213
[58] *Ibid*, p.213
[59] Annual Report of H.M. Chief Inspector of Factories for the Year 1974, PP1975, (Cmnd. 6322) HMSO, London, pp.48-49

that an interim hygiene standard was agreed and by February 1975 the Vinyl Chloride Code of Practice for Health Precautions was published. The provisions of the code meant that the British plastics industry had to revise down the recommended level for exposure from 200ppm to a 'ceiling value' of 50ppm and that over a whole shift the levels were not to exceed 25ppm.[60] Demonstrating the guesswork involved in establishing TLVs the workers in the USA industry were now to be protected by lowering exposure levels from 500ppm to 1ppm.[61] Nonetheless, whether it was in the USA or Britain what was clear was that it had taken the public exposure of the human suffering and death before the industry was made to reduce exposure levels. Whilst the Chief Inspector of Factories noted that the industry had made the effort to achieve the new lower levels he made no mention of the fact that no difficulties were reported in achieving the new 'safer' levels.

The Chief Inspector of Factories also found space in his report to mention that 'it was the industry's misfortune rather than its fault that vinyl chloride had proved to be carcinogenic, a discovery made as a result of industry's own voluntary research.'[62] Misfortune perhaps, as little could have been done about the fact that VCM was a carcinogen. However, the industry was certainly at fault for failing to take swift preventative action once they knew that exposure to VCM could be lethal rather than injurious. In 1974 the Chief Inspector of Factories remained ignorant of the fact that the industry itself had discovered angiosarcoma of the liver in December 1972. Indeed, the evidence that angiosarcoma of the liver had been discovered in 1972 remained a secret beyond 1974 as seen by the fact that even in 1980 the ICI laboratories continued to publicly claim that angiosarcoma of the liver amongst VCM workers had been 'discovered in 1974.'[63] Even after it had become known that angiosarcoma was a threat to VCM workers the industry maintained a grip over the monitoring of this disease. Watterson *et al* note that in the early 1970s the British plastics industry voluntarily arranged for an angiosarcoma register to be kept and that

[60] *Ibid*, pp.51-52
[61] http://ehp.niehs.nih.gov/members/2005/7716/7716.html
J.B. Saas, B. Castleman, and D. Wallinga, 'Vinyl Chloride: A Case Study of Data Suppression and Misrepresentation' pp.809-812 in *Environmental Health Perspectives*, Vol.113, No.7 July 2005, p.1
[62] *Ibid*, pp.53
[63] C.P. Chivers, C. Lawrence-Jones, and G.M. Paddle, 'Lung function in workers exposed to polyvinyl chloride dust' pp.147-151 in *British Journal of Industrial Medicine*, (37) 1980, p.147

by 1999, when it was closed, they had recorded 196 cases.[64] However, as the latency period for angiosarcoma of the liver could vary between 11 to 40 years this register had been prematurely brought to an end by the industry and was therefore 'incomplete.'

The Response to Occupational Cancer by a Small Manufacturer

In 1948, the Department for Research in Industrial Medicine, a branch of the Medical Research Council (MRC), noted that no mortality data or reliable information existed for any of the chromate-manufacturing factories in Britain.[65] The unreliability of data for this industry has been discussed in Chapter Three but the under-recording of mortality data was not unique to chrome ulceration or the chemical industry. Tweedale, for example, argues that, 'the Factory Inspectorate made no special effort to tally asbestosis deaths and only listed those cases where there was no doubt as to the cause of death.'[66] In response to the dearth of information the MRC conducted a three-year investigation into the chromate-manufacturing industry and concluded that whilst it had not been possible to ascertain the true levels of cancer they did think it possible that there was 'some increase in the incidence of carcinoma of the lung.'[67] A further study was commissioned and for the next five years 723 chromate-manufacturing employees were clinically examined and *x*-rayed. The results of this study were published in 1956 and it concluded that there was 'an excessive mortality from carcinoma of the lung' and that deaths were occurring 'disproportionately early.'[68] Variables such as place of residence, social class and smoking habits were all taken into account but these did not help to explain the high incidence of lung cancer. Whilst it was perfectly true that smoking did cause lung cancer Bidstrup and Case claimed that

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[64] A. Watterson, S. Pickvance, M. Cairns and M. Wingfield, 'Report on a Health Survey of Ex-Vinatex Workers in Derbyshire and Associated Health Issues Surrounding Exposures to Vinyl Chloride Monomer', Chesterfield Trade Union Safety Team, Centre for Occupational and Environmental Health, De Montfort University, (Leicester 2000), p.8
[65] P.L. Bidstrup, 'Carcinoma of the Lung in Chromate Workers', pp.302-305 in *British Journal of Industrial Medicine*, (8), 1951, p.302
[66] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), pp.280-281
[67] P.L. Bidstrup, 'Carcinoma of the Lung in Chromate Workers', pp.302-305 in *British Journal of Industrial Medicine*, (8), 1951, p.305
[68] P.L. Bidstrup and R.A.M. Case, 'Carcinoma of the Lung in Workmen in the Bichromates-Producing Industry in Great Britain' pp.260-264 in *British Journal of Industrial Medicine*, (13), 1956, p.262

even if all of the chromate workers had been categorised as 'heavy smokers' this would not have satisfactorily accounted for the increase in lung cancer found amongst the British chromate workers.[69] What the evidence showed was that carcinoma of the lung was an occupational hazard within the chromate-manufacturing industry and that there was a mean latency period of 21 ± 10 years. Responding to this evidence on the 9th of August 1956, J & J White, a Glasgow based chromate-manufacturing firm, issued an announcement about the introduction of 'special disablement benefits.'[70] By analysing this announcement a unique insight is gained into how this firm dealt with the 'news' that its processes were slowly killing the workforce.

Lung cancer could be an occupational or non-occupational disease and unless a precise causal factor was provided no compensation was awarded under the National Insurance (Industrial Injuries) Acts. In the case of chromate manufacturing the precise causal factor of the lung cancer had not been established.[71] The benefit scheme was therefore deemed 'special' in that it did offer a compensation payment to any employee with lung cancer 'employed on the chrome side long enough for its development as a result of their employment.'[72] The payment of the benefit was also subject to company approval. Even allowing for regional variations the 1950s were a period of low unemployment, something that allowed most workers a little more freedom in choosing where they could sell their labour power. Indeed, in this atmosphere many workers who considered their jobs to be dangerous or unpleasant could find alternatives and this left gaps in some sectors. Bashir Maan recalled that during this period members of his Pakistani community gained employment on the buses, in bakeries and in chemical works because both the buses and bakeries worked unsociable hours and in chemicals, 'because they were very dangerous jobs.'[73] Therefore, instinctively, on hearing the news of the risk of getting lung cancer many of Whites workers may have simply chosen to leave. However, by

[69] *Ibid*, p.263
[70] TOC 161 891008, John & James White, Chemical Manufacturer, Shawfield Chemical Works, Rutherglen, Glasgow, 1851-1968, Internal Memo, 'Special Disablement Benefits,' 9/8/1956, pp.2-4
[71] 'The survey was not designed to determine, and was inherently incapable of determining, the nature of the carcinogenic occupational factor.' *Ibid*, p.263
[72] TOC 161 891008, Internal Memo, 'Special Disablement Benefits,' 9/8/1956, p.3
[73] As cited in, C. G. Brown, A.J. McIvor and N. Rafeek, *The University Experience, 1945-1975, An Oral History of the University of Strathclyde*, Edinburgh University Press, (Edinburgh 2004), p.153

introducing the special benefit scheme the firm introduced into the mind of the worker the concept of gambling for future security.

As things stood, if a worker left the firm and then contracted lung cancer he would receive no compensation. If he stayed at Whites there was a statistically greater chance of contracting lung cancer but he would receive compensation if this occurred. What will be argued here is that Whites anticipated that men may have decided to leave the firm but to avoid this unfavourable reaction they loaded the announcement so as to minimise the real cancer threat and retain as many workers as possible. Therefore, presenting an interpretation of the study prior to its release Whites discussed the need for their special benefit scheme:

> Let me tell you why we think there is such a need. We have been concerned about a number of cases of lung trouble [which have occurred on the chrome side of the works] in our works.[74] Of course we must not form snap judgements in such matters because one or two cases among relatively few people tend to give an exaggerated view, so an assessment over a long period is the only way to form a proper judgement.[75]

It can be seen that Whites had chosen to deliberately play down the seriousness of the findings by carefully selecting words and phrases such as 'one or two' 'few people' and 'exaggerated view.' This has to be read as a deliberate attempt at diminishing the threat that was actually posed. Linking the perception of minimal risk to their magnanimous gesture of financial compensation it is at least possible to argue that Whites were trying to maintain the workers' labour and compliance and thereby maintain uninterrupted production.

The announcement continued by explaining to the workers that the initial short investigation had been 'inconclusive' and that this had necessitated the much longer study that was conducted by the MRC scientist, Dr Bidstrup, 'whom most of

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[74] The words in brackets were scored through and 'in our works' was added as a handwritten correction.

[75] TDC 891008 'Announcement,' Internal memorandum of J & J White Ltd, 9/8/1956, p.2

you know.'[76] Dr Bidstrup would go on to accept a commission from Whites as their 'medical consultant.'[77] Whites noted of this longer study:

> (The) report states that the incidence of lung cancer in our works is greater than the average for the male population of the country as a whole. The Company has decided that it is its duty to make known the results of this investigation. It has therefore given permission for the report to be published but we want you to have the facts in advance. Don't let us get this out of perspective. There has been a great deal of publicity lately about the increase in lung cancer in the general population and its possible causes. Such publicity tends to get the matter out of proportion. Remember that, although the report shows that the incidence is higher than normal it is still a great deal less than similar hazards in other industries such as the oil, dyestuffs and tar industries and very much less than the incidence of other industrial diseases such as silicosis in coal miners and foundrymen and so forth and so on. So you see we have a problem, not on a large scale but one which must be tackled positively and decisively and not getting it out of proportion just as similar problems have been tackled in other industries. Every practicable step so far as is consistent with general medical knowledge has been taken and will be taken to reduce any risk. [78]

Again, Whites had provided a master class on how to use language to minimise the risks and to shape perceptions. By carefully constructing their announcement they argued that although there was a threat of lung cancer the publicity associated with this disease had made things sound worse than they actually were. Whites had then argued that there was a lower risk of getting cancer at their firm than in other industries. This was followed by a claim that whatever problem did exist it would

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[76] TDC 891008 'Announcement,' Internal memorandum of J & J White Ltd, 9/8/1956, p.2
[77] MSS.292/174.47/6. Letter from NUGMW to TUC General Secretary, 7 November 1958
[78] TDC 891008 'Announcement,' Internal memorandum of J & J White Ltd, 9/8/1956, pp.2-3

hardly affect anyone (not on a large scale) and that in any case at Whites everything would be done to minimise the risks.

In addition to the above Whites attempted a further deception. They knew that some of their workforce would have heard that smoking increased their chances of getting lung cancer.[79] It was for this reason that they talked of 'recent publicity' and the matter being 'out of proportion.' But Whites knew that the cancer rates recorded in their works were not connected to cigarette smoking or the general population rates. Indeed the MRC report had *specifically* and *categorically* demonstrated this fact unambiguously stating:

> The possibility that the increase found by us could be due to a non-occupational cause such as diagnostic bias, place of residence, social class, or smoking habits has been examined, discussed, and discarded, and we therefore conclude that carcinoma of the lung must be considered as an occupational hazard in the chromates-producing industry.[80]

Therefore, the rates of lung cancer being reported amongst the Whites workforce were not being distorted or exaggerated but were in fact greater than the average for the male population. However, by introducing to the workers the idea that reports of lung cancer had been exaggerated Whites hoped to give the impression that this also applied to the cancers being reported at Whites. A second deceit is contained in the passage that compares the low incidence of occupational cancer at Whites with the higher incidence in other industries such as oil, dyestuffs, tar, and those contracting silicosis in the coal industry. Bidstrup had already stated in 1948 that no mortality data or reliable information existed at all for the chromate-manufacturing sector prior to this investigation and her figures in the 1956 MRC report only covered the previous six years. The lung cancer risk at Whites was estimated to have a latency period of around 20 years. It would therefore have been impossible for Whites to

[79] In 1950 Professor Doll was the first to show that cigarette smoking was a major cause of lung cancer and in 1954 the government officially accepted this link.
[80] P.L. Bidstrup and R.A.M. Case, 'Carcinoma of the Lung in Workman in the Bichromate Producing Industry in Great Britain', pp.260-264 in *British Journal of Industrial Medicine*, (13) 1956, p.264

truthfully compare the rate of lung cancer at their workplace with any other industry. To have done so, and to give the impression to the workers that Whites was a safer working environment was to act deceitfully.

It is interesting to note that even by 1956 Whites actually had the power to veto or allow publication of this Medical Research Council (MRC) report. The decision by Whites to publish the report may have been taken, as they claimed it was, through a 'sense of duty.' Historically, however, there is little evidence to show that the firm had a great sense of duty.[81] What can be argued therefore is that their decision to publish may have been influenced by events that occurred the previous year. It was then that the asbestos manufacturers, Turner & Newall, attempted to suppress research results showing that their workers had a very high risk of contracting lung cancer. Tweedale notes that following this attempted suppression the report was 'leaked into the national press via the annual report of the researcher's medical institution,' questions were raised in parliament, and the article was published in the *British Journal of Industrial Medicine* that year.[82] Whilst admittedly this is conjecture it is possible that Whites had heard of this turn of events from the press, business associates, or from their own medical expert, Dr Bidstrup. Therefore, in order to avoid bad publicity they allowed the publication of the research but not before attempting to minimise its menace and present a compassionate and caring front by introducing their special disablement benefit scheme.

Whites also reacted to the findings of the report by doing what they said they would do and that was to follow the pattern that had been set by 'other industries.' Following a damning report in the 1950s the dyestuffs industry began to seriously improve plant design to reduce the workers' exposure to carcinogens.[83] The coal and asbestos industries also reacted to unfavourable health reports by taking steps to

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[81] See Chapter Three, pp.110-116 and D. Walker, 'Working in it, through it, and among it all day' Chrome Dust at J&J White of Rutherglen, 1893-1967' pp.50-69 in *Scottish Labour History Journal*, Volume 40, 2005

[82] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), pp.148-150 The article referred to is: R. Doll, 'Mortality from Lung Cancer in Asbestos Workers', pp.81-86 in *British Journal of Industrial Medicine*, (12) 1955

[83] T.S. Scott and M.H.C. Williams, 'The Control of Industrial Bladder Tumours' pp.150-163 in *British Journal of Industrial Medicine*, (14) 1957

reduce harmful dusts within their working environments.[84] Thus, between 1957 and 1959, Whites installed new plant and a new 'low-lime' process. As Davies *et al* have noted:

> In the standard high-lime kiln process…significant amounts of slowly soluble calcium chromate were formed and were present in the dusts to which workers were exposed. Exposures would have been especially high at Bolton and Rutherglen [Whites].'[85]

Having lower levels of toxic dust to contend with demonstrates why installing a low-lime process was of benefit to those working at Whites. However, there had been no technological reason preventing Whites from doing this much sooner as the system had been available since 1928.[86] However, to do so may have reduced the 10 to 15 per cent dividend being paid to their shareholders.[87] Nonetheless, the changes made to the plant in the late 1950s and early 1960s resulted in a reported reduction of chrome ulceration amongst chromate manufacturers.[88] A follow-up study of 1981 also demonstrated that the introduction of these changes had reduced the occupational cancer rates.[89] No documents could be found to indicate how much money was paid out on 'special disablement benefit' and it is therefore impossible to ascertain just how much the firm thought one of their workers lives was worth. A largely uninterrupted production of chromates continued at Whites works until 1967, when for business reasons, manufacturing was moved to the north east of England.

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[84] For the asbestos industries see G. Tweedale, *Magic Mineral to Killer Dust*, Oxford University Press, (Oxford 2003), p.210 and for a Scottish account see R. Johnston and A. McIvor, *Lethal Work*, Tuckwell Press, (East Linton 2000), pp.214-215

[85] J.M. Davies, D.F. Easton, P.L. Bidstrup, 'Mortality from Respiratory Cancer and Other Causes in United Kingdom Chromate Production Workers' pp.299-313 in *British Journal of Industrial Medicine*, (48) 1991, p.300

[86] *Ibid*, p.300

[87] Whites had been a successful firm for over a hundred years. In the 1920s they had the largest chromate works in Britain, during the 1930s their output represented 70 per cent of the total British output and between 1946 and 1950 they made profits of £728,675. *The Times*, November 19, 1951, p11 and D. Walker, 'Working in it, through it, and among it all day' Chrome Dust at J&J White of Rutherglen, 1893-1967' pp.50-69 in *Scottish Labour History Journal*, Volume 40, 2005, p.51

[88] Annual Report of Chief Inspector of Factories on Industrial Health, PP 1966, (Cmnd. 3359), p.31

[89] M.R. Alderson, N.S. Rattan, and L. Bidstrup, 'Health of Workmen in the Chromate-Producing Industry in Britain, pp.117-124 in *British Journal of Industrial Medicine*, (38) 1981

Conclusion

It has been argued that from 1914 to 1974 successive governments took a close interest in the development of the British chemical industry because they understood just how important it had become at an economic, social, and political level. The success of the industry was therefore measured by its ability to supply the necessary substances to the government and other industries and this was done within a largely unfettered regulatory environment. The limited, and often out-of-date government legislation was promoted in the industry's own model safety rules publication with the factory inspectorate endorsing these over a period of decades. This helped to provide a public perception that the chemical industry was concerned about the welfare of its workforce. However, it has been argued that the existence of model safety rules was no guarantee that their legal or voluntary aspects would have been implemented. Indeed, the employer's attitude to employee health and safety is perhaps better measured by the fact that throughout the period the model rules were in print the chemical industry continued to expose thousands of workers to lethal compounds in the dyestuffs sector. Further, it has been argued that 'reputable' employers were complicit in the rubber industry's decision to withhold vital information regarding the carcinogenic properties of Nonox S and that even up to the 1970s were prepared to act deceitfully with regard to the carcinogenic properties of VCM.

Employers did respond to the evidence of occupational deaths and injuries and this was witnessed in three main ways. Firstly, employers introduced some improvements to their processes and these were designed to have an ameliorative effect. This course was followed as controlling a potentially lethal but profitable process was preferable to having it prohibited. However, it has been shown that when the costs of providing proper protection grew the employers threatened to stop production or move it where the legislation was weaker. Second, both large and small chemical firms unilaterally established and administered financial compensation schemes. By doing this they showed that it was acceptable to kill or injure workers and that it was possible to put a price on this loss. Under these circumstances the employers' controlled the budgets for death and injury and these became negotiable costs. For example, the evidence shows that Clayton Aniline Company acted in a grudging, inconsistent, and indifferent manner in response to the human loss sustained in their production processes. Indeed, the evidence demonstrates that this firm made workers sign away future claims even although the firm would have known that bladder tumours were likely to reoccur in the victims. Even in smaller firms, such as at Whites, a compensation scheme was introduced in response to the news that their workers stood a greater risk of contracting lung cancer. It has been argued that this was not an altruistic measure and that the firm set out to deceive its workforce by minimising the risk factor that was inherent in the production process. This took place during a period of low unemployment and it has been argued that the reason the firm followed this line was in an attempt to maintain its workforce and therefore its production. The third response came in the form of epidemiological research projects. These were commissioned to discover if a risk actually did exist although they were not always structured to determine the precise causal factors. The main characteristics of these studies were that they took many years to complete and relied on having dead bodies to count. Yet, even after years of research and where substances were identified as dangerous these substances were not always banned. In the dyestuffs sector β-naphthylamine was banned but by the time research had been commissioned and conducted an alternative substance had been discovered. The other highly dangerous substances remained in manufacture for years thereafter. Only when the manufacturer conceded that it was impossible to manufacture them safely was the process stopped. This could perhaps be viewed as a highly moral act but the manufacturers decision to then have the substances imported tends to tarnish this.

Chapter Seven

Conclusion

Social historians of occupational health have investigated a number of areas of British industry in recent years that have included cotton, coal and the asbestos industries. These have provided important in-depth analyses of the issues that lie at the interface between medical and labour history. Having identified a gap in the literature this research provides an account of occupational health and safety within the British chemical industry covering the period between the outbreak of World War One and the introduction of the Health and Safety at Work Act in 1974. Throughout this period the diverse output of the British chemical industry was important to both the government and to many areas of British industry and retail. Indeed, it has been argued that because of its economic, political and social importance the industry was allowed to develop with only limited regulation.[1] Yet, this was an inherently dangerous industry, one that used high pressures and high temperatures to transform raw materials into a bewildering array of complex chemical substances. Danger to life arose from explosion, fire, and spillage but manufacturing chemicals also generated toxic fumes, gases, and dusts with exposure to these resulting in acute symptoms and chronic illnesses for many. Working in the chemical industry was a hazardous occupation although this was not always immediately or obviously apparent and staying alive whilst trying to earn a living was not always easy. Whilst this may be true for other industries what sets the chemical industry apart is the fact that it experienced a continuous growth not only in its scale of production but more importantly in the number of products that it manufactured. Therefore, the potential areas for injury, disease or death multiplied along with the development of the industry. The consequences of this were that some health hazards associated with established processes and products had yet to be officially identified and dealt with whilst at the same time new processes and products harbouring new dangers were already underway. The evidence has shown that this was an industry where death and injury amongst the workers acted as a

[1] W. Grant, W. Paterson, and C. Whitson, *Government and the Chemical Industry, A Comparative Study of Britain and West Germany*, Clarendon Press, (Oxford 1988), p.282

barometer to show that processes were dangerous rather than the industry proving beforehand that they were safe. Therefore, the cost of the industries' progress was measured by the loss of the workers' health and life.

This research used McIvor's model which asserts that there are three main ways employment can affect health. These are the long hours and the pace of work which induces fatigue, exposure to the possibility of injury and death by industrial accidents, and contact with materials leading to poisoning and occupational disease. Examining each of these areas as well as the roles played by the key players this research was presented thematically. It has been shown that the working week was reduced over the sixty years under investigation from around 70 hours in 1914 to one of 40 hours in 1974. At one level these reductions counter the Marxist interpretation that capitalists sought to exploit labour power by increasing the amount of time worked. However, these reductions were introduced gradually, were subject to reversal, and were mainly the result of concessions made by employers or the state who came to realise that by doing so a more 'efficient' workforce was created. In theory, the reductions in hours should have allowed chemical workers more time to recuperate, to socialise, and to spend time with their family and friends. In practice however this did not *fully* materialise and over the same period that the hours were reduced the main employers, such as ICI, sought to find optimum levels of efficiency by implementing methods that were designed to increase productivity and profits. Therefore, new scientific and technological developments were introduced and by harnessing the workers to rotating shift patterns the manufacturers ensured uninterrupted flows of production. This has been associated with the idea of 'work intensification.' The shiftwork was then linked to scientific management techniques in the 1930s and the labour process was altered with certain tasks being subjected to wage payment schemes. This not only helped to reduce labour costs and extend managerial control over the process but it helped increase productivity. By the 1960s, regular amounts of overtime were being worked and a correlation was found between the long hours being worked and increased accident rates over the same period. Whilst overtime is usually considered to be voluntary the use of oral testimony allowed some insight into the pressures that waged labour experience and this calls into question just how much overtime is truly 'voluntary.' Therefore, many of the health and welfare benefits that should have been delivered to the workers from having a shorter working week were *partially* lost as the owners of the chemical industry implemented changes to the labour process that sought to increase the levels of surplus value.

It has been argued that the stress and strain of working long, physical, and unsociable hours had a damaging effect on the health of the chemical worker. Whilst some of the evidence for this may be considered subjective the official data associated with accidents is generally held to be more objective. Drawing on new archival evidence it has been demonstrated that thousands of UAC workers suffered injuries as a result of ‘accidents’ sustained in the workplace. This source not only allowed the data to be measured quantitatively but also as each accident report contained a brief description of cause then a qualitative assessment was able to be made. What these reports have shown is that many of the reported ‘accidents’ were predictable and preventable. The prediction would have been possible by the very frequency of some whilst the prevention could have been achieved by simple improvements in maintenance or an adherence to the limited legislation. This demonstrated that this employer had a disregard for the health and well-being of the employees although as other historians have identified this was really no different to many other areas of British industry where thousands of workers were killed or injured under similar circumstances. Indeed, this raises the question as to why these incidents are referred to as accidents at all.[2] Perhaps it was the preferred choice of those who owned and controlled industry? By doing so they could convince those forced to sell their labour power that these were indeed just random or unforeseen events and were not in fact caused by neglect. Perhaps it is because by referring to the causes of death and injury as ‘accidental’ a perception could then be generated of worker carelessness? Indeed, McIvor in *A History of Work* has identified the blaming of the victim as something that had a ‘long tradition.’[3] This meshes with the theory espoused by Dwyer who has claimed that as soon as the human factor is considered

[2] This is explored in detail by R. Campbell in ‘Philosophy of the Accident’, pp.17-33 in R. Cooter and B. Luckin (eds) *Accidents in History: Injuries, Fatalities and Social Relations*, Rodopi, (Amsterdam 1997)

[3] A.J. McIvor, *A History of Work in Britain, 1880-1950*, Palgrave, (Hampshire 2001), p.127

as a cause of an accident then nearly all accidents can be attributed to the worker.[4] The evidence that has been presented in this research shows that blaming the worker was not an unknown occurrence although the vast majority of the 'accidents' were not caused by random or unforeseen events and neither were they caused by worker negligence. Accidents generally occurred when the worker was simply involved in a regular and structured activity. An inadequate supply of protective wear, a lack of maintenance, a reluctance to fully implement rules and regulations or, as happened at Flixborough, a reliance on makeshift equipment offers a more plausible range of reasons to explain why it was that occupational 'accidents' continued to happen between 1914 and 1974.

The numbers of chemical workers that were employed increased substantially yet, when compared to those in shipbuilding or engineering the official accident data shows that a relatively low number of them were involved in accidents. Bartrip, Burman, and Fenn have argued that state intervention in the form of factory legislation ultimately had an ameliorative effect on occupational health and safety.[5] Are the very low accident figures in the chemical industry therefore a direct consequence of positive preventative legislation? The simple answer to this question must be no. In terms of industry-specific legislation it has been demonstrated that this was sparse and often failed to address the dynamic changes that occurred in the development of process technology and manufactured products. Whilst the special rules and regulations were supplemented by the more general measures contained in the Factory Acts this cannot account for the comparatively low levels of accidents found in the chemical industry. Nonetheless, evidence has been found to show that some employers gradually improved the design of their chemical plant and installed modern process equipment. As this often reduced the contact that occurred between the product and the process worker this may have lowered accident rates. Undoubtedly accident levels would also have been reduced as a consequence of the efforts made to shield the capital-intensive process technology from leakage, fire,

[4] T. Dwyer, *Life and Death at Work, Industrial Accidents as a Case of Socially Produced Error*, Plenum Press, (New York 1991), p.148

[5] P.W.J. Bartrip, and P.T. Fenn, 'Factory Fatalities and Regulation in Britain, 1873-1913' pp.60-74 in *Explorations in Economic History*, Volume 25, 1988 and P.W.J. Bartrip, and S.B. Burman, *The Wounded Soldiers of Industry, Industrial Compensation Policy, 1833-1897*, Clarendon Press, (Oxford 1983)

and explosion. However, although chemical employers tended to react relatively swiftly in providing protection for their capital investments they were much more short sighted in providing a safer working environment for their workforce which was seen as an avoidable cost. Therefore, other reasons must be found to explain the relatively low accident figures that have been recorded for the chemical industry.

New evidence drawn from the UAC accident books shows that at least until the mid 1920s accident claims were not always made and therefore never actually recorded. It is not unreasonable to suggest that this practice was mirrored across the industry as a whole. The deliberate and successful policies of the employers to keep trade union membership low also meant that fewer workers received assistance in making an accident or compensation claim. This situation would have prevailed until at least the late 1940s when the Industrial Injuries Act made it easier to make a compensation claim. Even when unions did increase their presence the evidence from the TGWU Chemical Group National Committee minute books demonstrate that still in the late 1950s ICI refused to share accident information with union representatives. Data is also missing for large periods during both world wars when production was at its height and when accident levels would have increased. Without overstating its significance there is also evidence to show that during the late 1960s and early 1970s injured workers were transported into chemical plants so that they would not appear on absence records and hence become an injury statistic. However, perhaps the most significant reason that helps explain the relatively low rate of accidents in the chemical industry is dealt with by reference to Sellers 'epistemological dilemma.' That is, 'though much of the havoc that production wrought on workers' bodies was hard to miss, its less obvious manifestations often remained as invisible as the destruction of distant forests or prairies.'[6] For an accident to stand any chance of being recorded there had to have been an incident that resulted in an operative receiving some form of injury (usually immediately) that required treatment and a period of absence for recovery. However, where the incident that occurred involved an 'accidental' escape of dust, fume, gas or liquid and where no physical consequences of this were immediately obvious then no accident would have been recorded. This of course did not mean that an 'accident'

[6] C.C. Sellers, C.C. *Hazards of the Job, From Industrial Disease to Environmental Health Science*, University of North Carolina Press, (London 1997), p.4

had not occurred or that nobody had been injured. Whilst the chemical industry was routinely dangerous to those working within it this has not always been obvious to those who collated the accident data or to those who have perused it. None of this evidence negates the theory that legislation could have an ameliorative effect on occupational health and safety but what it does do is to question the extent to which it did this in the chemical industry.

Evidence of the under reporting effect has also been found for mortality rates in the chemical industry. As noted above, one of the major health hazards associated with the industry was that it used and manufactured substances of varying degrees of toxicity. During the chemical process quantities of dust, fumes and gases were released into the working atmosphere. What has been shown is that many substances were used fully in the production process although their toxicity was never fully tested and decades would pass before the full consequences of this practice were officially recognised. For example, chromates, cadmium, vinyl chloride monomer, dyestuffs intermediates and antioxidants were all produced in vast quantities. Some efforts were made to limit exposure by adhering to the list of threshold limit values (TLVs) although, just as Tweedale has noted of the asbestos industry, these were generally determined by a less than robust methodology.[7] Therefore, exposed to arbitrary levels of dusts, fumes or gases some workers experienced a slow decline in their health although they were not always considered casualties of the chemical industry, even in death. For example, latency periods associated with occupational cancers meant that many workers could have left the source of their demise to start work with other firms. When they eventually succumbed it was the final occupation that was entered on the death certificate. Indeed, long latency periods ensured that many of those who worked in the chromate, dyestuffs, or plastics sectors would most certainly have died from occupational cancers but their deaths would never have been attributed to the chemical industry as they had expired before their particular cancer was acknowledged as occupational. Contemporary private correspondence has also shown that some workers who became too ill to work and desperate for income were rendered invisible on receipt of compensation payments from the culpable company. Further, where a link was officially established between exposure

[7] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003), p.258

and an occupational disease, such as chrome ulceration, the data has been shown to be wholly unreliable. With respect to the more insidious diseases such as occupational cancers the statistical evidence has been shown to be patchy, poor, and often incomplete. Indeed, detailed research undertaken by Markowitz and Rosner has shown that both US and European manufacturers successfully suppressed information on the lethal capabilities of VCM for decades and therefore no data would have been collected for angiosarcoma of the liver until the 1970s.[8] Therefore, although many thousands of chemical workers would almost certainly have died or become incapacitated as a result of contracting an occupational disease the true levels of death and ill health will never be known. Having drawn on a variety of source material it is at least possible to argue that both the accident and mortality data that is available for the chemical industry presents a fictitious and flattering picture rather than a factual and perhaps damaging one.

The state, the factory inspectorate and those with medical knowledge were all identified as agents who were positioned to deliver protection to chemical workers but it has been argued that none of them were as effective as they could, or indeed should have been. At a fundamental level the many workers who were killed, injured or poisoned throughout the period are testaments to this view. As noted above, criticism of the state arises from the fact that few industry-specific safety measures were enacted over the sixty years in question and this laggardly attitude contrasted dramatically with the dynamic development of the new products and processes. If careful research and a comprehensive review of legislation had filled the years between each measure then perhaps quality would have excused the lack of quantity but this was simply not the case. Rules and regulations drawn up in the late nineteenth century remained largely unaltered despite well-known process changes taking place and then only revised in the early 1920s at a point when the industry was undergoing rapid change. Looking backwards whilst the industry advanced was no way to provide effective protection. The evidence also shows that where proof did exist on occupational hazards many decades elapsed before preventative or compensatory measures were enacted. This has been referred to as a ‘gap of neglect’ and is something that Tweedale and Johnston and McIvor have also found in relation

[8] G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003)

to the asbestos industry.[9] This research also confirms the view expressed by Grant *et al* and Pearce and Tombs that this was an industry that received little attention from the government unless it was to smooth its development.

The factory inspectorate were far from successful in policing the workplace although much of this could be blamed on the chronic lack of resources and the imprecision of the legislation both of which weakened their potential. Indeed, these factors led the inspectorate into a policy of encouraging rather than forcing employers to comply with the law and it has been argued, as Johnston and McIvor have done, that this 'softly-softly' approach was never enough to combat those who prioritised productivity and profits over health and safety. Perhaps the inspectorate's approach was a pragmatic reflection of the lack of interest shown in occupational health and safety issues both by the state and in general? After all, Legge had found it difficult to gain support for the teaching of occupational health and even in the mid 1950s the Nuffield Foundation felt that this area of study was being largely ignored. However, the argument that the inspectorate could have acted more effectively if only they had been given more resources should not be overstated. There is evidence that this body were attuned to the employer's interests and this is evidenced by their practice of giving warning to employers that inspections were imminent. Oral testimony has also been provided to show how this practice frustrated the workers who wished to have their working environment properly assessed and put right. It was also the case that by informing employers in advance of visits the inspectorate alienated many trade unionists who were deeply suspicious of this behaviour. However, factory inspector's reports also show that they did help to identify areas where employers were failing to comply with the law and diligently reported on the need for improvement. Indeed, if they had failed to do this then they would have been obviously partial and unjust. However, as Thompson has argued of the legal system if they had failed to do this then they would 'mask nothing, legitimate nothing, and contribute nothing to any class's hegemony.'[10]

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[9] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003) and R. Johnston, and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, (East Lothian 2000)
[10] E.P. Thompson, *Whigs and Hunters*, (London 1980), p.263 as cited in F. Pearce, and S. Tombs, *Toxic Capitalism: Corporate Crime and the Chemical Industry*, Ashgate, (Hants 1998), p.87

Occupational health research conducted by the HMWC during the First World War was primarily aimed at increasing production during a period of full employment. Whilst welcomed during the war by the state and employers the enthusiasm for this particular system of humanising the workplace soon waned during the inter-war period with the return of unemployment and a reserve army of labour. This disinterest in the workers welfare was confirmed by McIvor's detailed analysis of the IHRB and Watterson's examination of the IHES with both studies demonstrating the general lack of employer enthusiasm and interest in occupational health during this inter-war period.[11] Of particular interest to this research study was the fact that the head of ICI became involved with the IHES although his motivation for doing so was unclear and therefore remains open to interpretation. What has been shown is that the IHES organised hundreds of educational talks and amongst those in attendance were many trade unionists. Indeed, the trade unions actually contributed funds to this organisation as a way of helping to educate their members on occupational health issues. However, whilst the IHES sought to expand the knowledge base on issues of health and safety the ICI workforce were actually forbidden to discuss such issues during the managed meetings they were allowed to attend. What has been argued therefore is that ICI may have shown an interest in this organisation as this helped them to placate trade union and employee concerns about the safety of the industry The ICI interest in the IHES was therefore cosmetic and really aimed at enhancing the caring image of the firm that was being nurtured.

That ICI wanted to be seen (as well as act) as a safe employer was witnessed by their decision taken in the 1930s to establish their own medical research laboratory. In creating this ICI also claimed ownership of the medical knowledge associated with their processes. As Navarro has argued this provided the firm with its own 'scientific knowledge' and rendered most of the workers knowledge of the processes 'unscientific.'[12] Evidence of this is seen in the battleground that often existed when official recognition was being sought for occupational diseases and where the workers direct and often painful experience was put to one side whilst

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[11] A. Watterson, 'Occupational health education in the United Kingdom workplace: looking backwards and going forwards? The Industrial Health Education Society at Work 1922-1940, pp.366-371 in *British Journal of Industrial Medicine*, (47) 1990 and A.J. McIvor, 'Manual Work, Technology, and Industrial Health, 1918-1939' pp.160-189 in *Medical History*, (31) 1987

[12] Navarro, V. *Crisis, Health, and Medicine, A Social Critique*, Tavistock, (London 1986), p.163

prominence was given to the 'scientific' research that took many years to conclude. ICI research was conducted and the results published in reputable journals. This delivered kudos to ICI although undoubtedly some improvements were also delivered to the working environment. However, before changes were made to the processes and working environment ICI were generally concerned that these were both affordable and unlikely to hinder production. For example, the ICI laboratories were well aware from the 1930s that intermediate dyestuffs had carcinogenic properties and although some effort was made to reduce dust levels the firm prioritised the finding of replacement substances rather than stopping this deadly production. It was shown that this type of decision making was heavily influenced by economic and political considerations rather than any sense of human morality. This evidence meshes with that found by Tweedale, and Markowitz and Rosner who have uncovered evidence to show that asbestos and chemical employers continued to manufacture their products well beyond the period they knew them to be deadly.[13] Oral testimony has also shown that owning and controlling medical knowledge meant that ICI were able to withhold evidence that demonstrated their plant was causing deterioration in the eyesight and hearing of their workers. Again, in the absence of any 'scientific' evidence being made available to explain this deterioration the 'non-scientific' observations of the workforce were ignored. In parallel with the asbestos industry it was also noted that ICI medical research was used in court to defend the company's actions when accused of not taking sufficient precautions to protect its employees or customers. The use of the epidemiological method has also been criticised. This methodology was first used in 1947 by an ABCM commissioned research project on industrial papilloma of the bladder with the results published seven years later. It has become the most commonly used methodology in the chemical industry but has drawn criticism from those who see its use as a delaying tactic within a wider strategy that seeks to 'manufacture doubt' about the dangerous processes and products associated with the chemical industry.[14]

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[13] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003) and G. Markowitz, and D. Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, University of California Press, (California 2003)

[14] S.R. Bohme, A.J. Zorabedian, and D.S. Egilman, 'Maximising Profit and Endangering Health: Corporate Strategies to Avoid Litigation and Regulation' pp.338-348 in *International Journal of Occupational and Environmental Health*, (11) 2005

ICI, the largest chemical employer, was anti-union although not conventionally so and instead deployed a range of subtle strategies that proved effective at keeping trade union membership figures low. Within this situation the relatively weakened trade unions had to contend with the dangers inherent in a complex industry that manufactured a huge range of potentially hazardous substances using various processes. Drawing on the evidence of the TGWU and TUC archives this research has argued that despite their relatively weak position the trade unions were able to campaign on a variety of occupational health and safety issues. These met with some success such as helping to deliver improved safety equipment and having the manufacture of some substances regulated or banned. It is a simple enough fact but one that is often missing when historians discuss trade unions and that is that trade unions are predominantly voluntary organisations. It is this group, the trade unions, who have been accused by some historians of not doing enough on occupational health issues, of prioritising wages over health and of fighting to safeguard jobs rather than for improved health and safety standards.[15] These general accusations have been examined more closely by other historians who have tended to offer qualified criticisms of the role played by trade unions in combating occupational health issues in the asbestos industry.[16] Further examinations have offered a more sympathetic understanding of the situation trade unions faced in the cotton and coal industries.[17] However, this research has argued that to criticise the trade unions for not doing enough or of prioritising wages over health is to perpetuate the false premise that an equality of power existed between the trade unions, the state, and the employers. The evidence of this research shows that no such equality of power existed and therefore trade unions were constantly engaged in

[15] See P. Weindling, (ed) *The Social History of Occupational Health*, Croom Helm, (London 1985), p.10; P.W.J. Bartrip, *The Home Office and the Dangerous Trades, Regulating Occupational Disease in Victorian and Edwardian Britain*, Rodopi, (Amsterdam 2002), p.9

[16] G. Tweedale, *Magic Mineral to Killer Dust, Turner & Newall and the Asbestos Hazard*, Oxford University Press, (Oxford 2003); R. Johnston, and A. McIvor, *Lethal Work, A History of the Asbestos Tragedy in Scotland*, Tuckwell Press, (East Lothian 2000)

[17] S. Bowden, and G. Tweedale, 'Mondays Without Dread: The Trade Union Response to Byssinosis in the Lancashire Cotton Industry in the Twentieth Century' pp.79-95 in *Social History of Medicine*, Volume 16, No.1, 2003; A. McIvor and R. Johnston, *Miners' Lung, A History of Dust Disease in British Coal Mining*, Ashgate, (Hampshire 2007); J. Melling, 'The Risks of Working and the Risks of Not Working: Trade Unions, Employers and Responses to the Risk of Occupational Illness in British Industry, c.1890-1940' *ESRC Centre for Analysis of Risk and Regulation, Discussion Paper No.12*, December 2003, pp.14-34; A. Higginson, 'Asbestos and British Trade Unions' pp.70-86 in *Scottish Labour History Journal*, Volume 40, 2005

campaigns to overcome the inherent inequalities of a system that forced people to sell their labour power in conditions that were not of their own making. Clearly trade unions did have intermittent periods where they could express their agency. This is evident in the campaigns they led for improved working conditions, for reductions in hours, for paid holidays, for pension entitlements and for sickness absence. It was also clearly evident when they were campaigning against anti-union laws, wage cuts, unemployment, lock-outs, the intensification of workloads, or even to be recognised by the employer and state as having a right to exist. Yes, trade unions did campaign for more wages – who else would? However, as has been argued wages were a means to life for trade unionists whereas to employers they were a cost and it was the employer and state that prioritised wages. Thereafter trade unions preferences were shaped by those decisions. As has already been stated, but is worth repeating, to criticise the trade unions for not doing enough is rather like criticising women for not getting the vote much sooner. This is not what historians have done but have instead produced analyses to show that women lived and worked in a society that discriminated, subordinated, and exploited them and that this explains the delays in women gaining equalities.

This research has demonstrated that the British chemical industry operated in a relatively unfettered regulatory environment and that for decades the employers knowingly operated processes that exposed their workers to a variety of toxic and carcinogenic substances. This had the inevitable effect of causing injury and death to an untold number of chemical workers who were simply trying to earn a living. One of the main employer responses to disease or injury was to offer financial compensation, an act that emphasised that the values they possessed placed productivity and profit over life. By owning and controlling their own compensation schemes the employers managed to diffuse any potential antagonism, they sometimes avoided payment, and were also able to hide the numbers being killed or injured because the victim’s silence was required before the release of payment. The state knew from the outset why these private compensation schemes were being operated and having taken no action to prevent them have to be seen as willing partners. When eventually the scientific evidence revealed the precise deadly danger of the process the employer responses varied but self-regulation and the introduction of further improvements to the working conditions usually followed rather than their processes being banned outright. When the regulations for certain processes were finally tightened in the 1970s employers threatened to export the risk to more compliant countries rather than spending money making these safer. Clearly up to that point paying compensation had been cost effective. What this research has demonstrated is that chemical employers were prepared to operate processes even when there was no doubt at all that the workers were being injured or killed. This requires no academic hindsight. In the dyestuffs industry, for example, employers had known from the late 1920s that exposure to the process could result in bladder cancer. When the precise causes of the cancer were identified in the 1950s only one substance was banned and production continued unabated under an industry-led safety control programme that was shown to be less than effective. Meanwhile, a government department rather than the industries own scheme made the compensation payments. Chromate manufacturers also knew from the late nineteenth century that chrome ulcerations were associated with high dust levels. Nonetheless, they continued to use equipment that produced high dust levels through to the 1950s when plant had been available from the late 1920s that produced much lower levels of harmful dust. Only when lung cancer became associated with the process were steps taken to reduce dust levels alongside yet another company-led compensation scheme. What this research has confirmed is that the British chemical employers did not differ from their counterparts in other industries and that productivity and profit was always placed ahead of the workers health and safety.

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Oral Testimonies

These interviews were conducted and transcribed by David Walker. The transcripts will be stored in the Scottish Oral History Centre Archive (SOHCA), Department of History, University of Strathclyde. Two of the respondents are identified by initials as anonymity was assured at the time of the interview.

University of Strathclyde, Department of History

Richard Fitzpatrick

Born 24.02.1917

Process worker (chromates) Rutherglen, near Glasgow

Interviewed on 13 and 26 August 2004

Derek Rogerson

Born 14.06.1934

Plant electrician, Cheshire area (son-in-law of chemical process worker)

Interviewed on 21 March 2005

Gladys Rogerson

Born 03.09.1937

Shop assistant and housewife, Cheshire area, (daughter of chemical worker)

Interviewed on 21 March 2005

Hilda Langley

Born 26.01.1926

Housewife and carer, Cheshire area, (daughter and wife of chemical workers)

Interviewed on 21 March 2005

Doug May

Born 14.12.1942

Chemical process worker, (fertilisers) Bristol

Interviewed on 06 September 2005

Brian J. Watson

Born 11.06.1934

Chemical plant manager (explosives) Dumfries

Interviewed on 08 October 2005

Peter Dodds

Born 15.05.1943

Chemical process worker (plastics) Dumfries

Interviewed on 25 November 2005

MP

Born 08.07.1922

Chemical worker during World War Two (explosives) Dumfries

Interviewed 08 October 2005

Interviewed by D. Walker

KG

09.04.1945

Chemical process worker (plastics) Dumfries

Interviewed on 25 November 2005

Interviewed by D. Walker

The interviews below were conducted by Patricia Williams and formed part of her BA Honours dissertation in 1998. The transcripts are stored in the Scottish Oral History Centre Archive (SOHCA), Department of History, University of Strathclyde.

SOHCA/015/01, I. Henderson, Process worker (explosives) Ayrshire

SOHCA/015/02, Z. Logue, Process worker (explosives) Ayrshire

East Midlands Oral History Archive
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DIC/BM20/201/1-6 Chance and Hunt Limited, Children and Young Persons Register March 1907 to May 1916

DIC/UA8/5/11-22. Accident Books of United Alkali Company Limited 1914-1928

DIC/UA16/18/1 Accident Report Book No.1 Fleetwood Ammonia Soda, 1918-1920

DIC/UA16/18/2 Accident Report Book No.3 Fleetwood Ammonia Soda, 1924-1927

LOU 6 Federation of Trade Unions of Salt Workers, Alkali Workers, Mechanics and General Labourers 1853-1969

Mitchell Library Archives, Glasgow

TOC 161 891008/1-12, 13, 14-17 John & James White, Chemical Manufacturer, Shawfield Chemical Works, Rutherglen, Glasgow, 1851-1968

Modern Records Office, University of Warwick

<u>*Papers of the Transport & General Workers Union*</u>

MSS.126/TG/449/E (Minutes & Reports of the Chemical and Allied Trades National Committee of the Transport & General Workers Union)

<u>*Papers of the Trades Union Congress*</u>

MSS.292C/140/1 (Industrial Health 1921-52)

MSS.292C/140.2/2 (Medical Research Council Committee on Industrial Solvents)

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MSS.292C/140/6 (TUC Deputations)

MSS.292C/144.2/6 (Chrome Ulceration 1929-31)

MSS.292/144.33/1 (Miscellaneous, Occupational Dusts)

MSS.292/174.36/2 (Poisoning by Fumes and Chemicals 1951- 1960)

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