

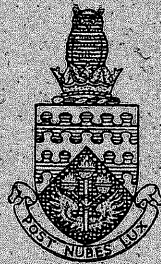
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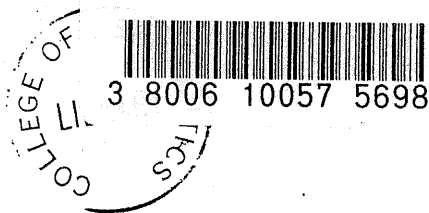
THE COLLEGE OF AERONAUTICS  
CRANFIELD



PROCEEDINGS OF THE SECOND WORK  
STUDY SCHOOL CONFERENCE  
CRANFIELD 1955

Edited by  
L.J. HARPER

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THE COLLEGE OF AERONAUTICS

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Proceedings of the Second Work Study School Conference  
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INTRODUCTION

The second Annual Reunion Conference of students who had attended courses at the Work Study School, Cranfield, was held on the 1st., 2nd. and 3rd. of April, 1955.

These conferences are intended to provide an opportunity to ex-students to revisit Cranfield and meet old and new friends with a mutual interest in Work Study developments. In order that full benefit is derived from such contacts a limit of approximately forty reservations is imposed.

The papers presented are compiled and delivered by ex-students and are contained herein in almost verbatim form. Only minor editing has been carried out as this report is intended to be a record of the major formal proceedings and not a dissertation on The Work Study School's thinking.

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## The Human Problems of Modernisation

(G. J. Moorehead)

It was recently stated that the example of technological development in the U. S. A. shows that the resultant displacement of labour, where it occurs, leads to stresses and strains both in the Company concerned and its social surroundings.

This is no less true of any other country in the world and it is with some of these human, as opposed to the engineering or scientific problems, that I want to concern myself in this paper.

The problems have been with us particularly since the industrialisation of our country but despite, or perhaps because of, their age so often they are glossed over or ignored. And yet, however far we progress, however many new and faster machines and better or more scientific processes we develop we cannot for one moment lose sight of the fact that man is not a machine and must not be treated as such.

Some realisation of the emotions and reactions underlying people's behaviour is essential if we are to meet with any success in our handling of them and our dealings with them - especially in times of stress. "No man," said Dostoevsky, "ever acts from only one single motive". This merely underlines the complexity of the creature we have to deal with.

Modern industry is constantly undergoing change. Changes always create stresses and it is our understanding of these stresses which affects the satisfactory introduction of these changes.

Modernisation will normally give rise to four basic changes. It will involve changes in Equipment, Methods, Labour Utilisation and Labour Requirements. Let us consider the last two. The number of people who work just for the joy of working is extremely small. I know the idealist will tell us that people work for the satisfaction they get from their jobs, they work for the joy of working, they work even to satisfy a social conscience, some will tell us. Maybe they work for some of these reasons, but by and large I think there is one big basic reason why everyone of us here and every man who works does so - he works for money. Money not necessarily for money's sake, but money to provide the necessities and at least some of the luxuries of life.



### The Human Problems of Modernisation (Contd.)

Now, were this problem of providing the necessities of life confined to the individual it would not be too severe a one, but, that is not really the case, and very seldom is so. How many of us here today are in the happy position of saying "I have only got myself to fend for", "I have only myself to look after". Very few. You know this is just the same whether we are thinking in terms of people in offices or people on the shop floor. The vast majority of people working today are working not only to provide for themselves but for one or two more dependents as well. Now the circumstances under which we can live without money even in these days of a welfare state, are few. It follows from that that the absence of an opportunity to earn money, in this case the absence of work, must constitute a serious threat to the existence of the man and his dependents. This being so then any threat to, shall we say, the continuity or security of a man's employment, is likely to have grave repercussions. Now if that threat is confined to one man it is bad enough, but if you enlarge that threat of continuity of employment and extend it to a department within a factory or at worse to a complete factory or complete industrial unit, it becomes very severe and very important indeed, and we have got a major problem on our hands. What bearing, you may ask, has all this got on our problem today. It has been said that modernisation does give rise to social stresses and strains. It is my opinion, and I am prepared to defend it at some length, that you can trace the root cause of all those stresses and strains back to one cause, and that cause can be summed up in one word, and the word is 'insecurity'. Insecurity leading to unhappiness, leading to speculation and false rumour, and from there to a lowering and a losing of morale, and unless it is checked it may lead ultimately to the disintegration of the working force as a social group.

In order to see our problem more clearly let us examine now the impact of the introduction of new techniques or modern technique on the working force. In the first place anything new in industry is destined from the outset to a very rough passage. In most factories in this country anything new is still something to be regarded with the very gravest suspicion. In fact in my own experience I have seen places where newness, whether it be new machinery, new ideas, or new methods, has been met with an unofficial but highly organised form of opposition, which, for its effectiveness of organisation can only be compared with the bush telegraph. So we first of all then get this inherent or almost automatic reaction to newness. One of the effects of modernisation has undoubtedly been to reduce the degree of skill and craftsmanship required to do many jobs, and to carry out many processes. That from managements point of

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view is undoubtedly very beneficial in that firstly it probably will allow them to employ a lower grade, or lower paid grade, of labour to produce the same goods or product than heretofore. If it does not do that it will certainly help them in that it will allow them to dispense with some of the very lengthy training periods previously necessary to produce your skilled craftsman. All very beneficial. But what of the other side of the picture. What of the skilled craftsman who now finds that his skill and experience, once something to be proud of, now little more than a quaint link with the past. What must his feelings be when he sees a family tradition, of generations perhaps, being replaced by a machine which not only does the job as well as he could ever do it, but does it in a fraction of the time. Not a very happy situation. At the best, that man can very often only see, as a future, a period of employment earning considerably less money than he has done to date, or at worst, if things really go wrong, stark unemployment. However he feels, I put it to you, he must on his displacement be beset by the very gravest insecurity feelings. In essence, his craftsmanship, which was once probably at a premium, and could guarantee him a life long employment, more or less where or when he liked to move, has now lost its market value. Not only that, but his pride in his trade and his satisfaction in his craft have been removed. This problem of the displaced craftsman in industry is by no means insuperable, but it must stand as a very great challenge to all who manage, or even purport to manage, man. It is one that not nearly enough has been done about to date. The time to tackle that problem is not when the damage has been done, the time to tackle it is before the damage ever occurs.

What of our second change, the change in labour requirements. Well, of course, here we are coming right face to face with one of the big traditional problems of industry, the problem of redundancy, or to state it more precisely, the problem of the threat of redundancy, whether it be real or imaginary. To most work people, the introduction of new machinery or modern methods straight away will conjure up the prospect of wholesale sackings and unemployment. In fact, one can go so far as to say that often the terms 'modernisation' and 'redundancy' are quite synonymous on the shop floor. I have known cases myself where even a written guarantee, negotiated through the normal channels, that positively no redundancy would occur from the introduction of modern techniques, has not been enough to allay these fears and suspicions. The traditional fears of unemployment and short time working are far too deeply rooted in the minds of the working people to be dispelled just like that overnight. They have had that stark experience of hard

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times and unemployment earlier this century, it is still too near the front of their minds. If it is not the employee of today it is his aged relative sitting at home who has gone through that experience. Look at the age group we have in our factories today. Most of them, if they have not tasted unemployment themselves have in their youth failed to taste the butter on their bread during a certain period. Today the picture is different. The British working man has tasted the fruits of full employment, and he is not going to let them go very easily. Why should he? As I said, even in cases where a written guarantee was given it has not been sufficient to allay suspicion. I put it to you, that when that sort of situation arises there can only be one solution to it, and that is the creation of an atmosphere of mutual trust and mutual respect between management and worker, and believe me, that is not a thing which you build overnight. If your human relations have been bad you can start today to put them right, but it is going to be a long, long time before you see the full results.

Now I think you can probably see on reflection that both those problems I have outlined have as their root cause security, or the lack of security. On the one hand change has caused an interruption in the complete tenor of a man's life, and we have seen that what was once the very corner stone of the security of existence has been discounted as almost nought. Not only has the craftsman seen his market value lowered, but he has also had his belief in the satisfaction of his craftsmanship drastically undermined. The second case, although less complex, is probably even more severe. The threat of unemployment, if not a threat to the existence of a man and his dependents, is certainly a very, very severe and straight threat to his ability to maintain those standards of living which he has developed for himself. Now all of you here are sufficiently familiar with the old problem of keeping up with the Joneses. We have not only got that problem but today also we have got this frightful commercial millstone round the working man's neck, a long string of hire purchase payments to be met each Friday and, let's face it, the average working man has got two wage packets between himself and being broke. The one he draws next week when he gets the sack and the one he draws the week after when he comes back to the factory for the last time. He has not got a bank balance. He has not got something he can mortgage. He has exactly a fortnight to find himself another job and as good a job as the one he has left. Now given these circumstances, I think it is quite obvious that the problems created by modernisation are really those of alleviating or dispelling these feelings of uncertainty and of helping the affected people to adjust to new conditions and new environment. The question 'how can we do that?' or 'what can be done about it?', is not an awfully easy one to answer, but nonetheless we have got to face it. Given that modernisation must proceed, which surely

### The Human Problems of Modernisation (Contd.)

it must, then our energies as part of the management team must be devoted to our handling of people and our dealings with them during these periods of stress.

Since the war, in this country we have seen, I think, a very marked growth in the interest taken in a subject called "Human Relations". In fact there are some people now who will tell you that they regard good human relations as an absolute prerequisite to the successful operation of any enterprise. But that is by no means general yet. There is an awful tendency, I feel, for this phrase "human relations" to become just another well worn cliché in the book of management jargon. Unfortunately the wear that the cliché has taken is far more from trite lip service of the phrase than from any practical implementation of the policies it stands for. Most industrialists I know, if you challenge them today, will profess a sincere belief and absolute support for a policy of good human relations, but how much in many cases are they really doing about it? It is not sufficient to go out in the labour market and buy yourself a chap called a Personnel Officer, put him in an office and set up a thing called a Personnel Department. That is not going to solve your human relations problems for you. No Personnel Department however strong, however shiny, however welfare conscious it is, can replace something else, and that something else is the personal touch. I would go so far as this, to say that every member of the management team must be prepared to be his own ambassador to the shop floor. Now the problems of implementing such a policy, especially in the larger concern, are difficult. Still that is the ideal to be aimed at, and unless we aim at an ideal we are never likely to get even half way to it. I know what you are going to say, everybody says this to me when I put this up "But we haven't got time". I attended a lecture some months ago, and I heard what to me was an awfully impressive story. It was the story of the Vice-President of a very large corporation in America whose factories or units were spread right throughout America - that man found time to take two days a fortnight and get in an aeroplane and go and visit his factories in turn, and when he got there he did not go and see the Accountant, he did not go and see the Board of Directors and discuss the order book for next week. He went there for one thing, he went there to supply the personal touch. He went in and saw his manager or whoever was top of the shop, paid his compliments there but primarily he spent those two days talking to foremen on the shop floor about their problems, which must have been very small problems to that Vice-President but he had been doing it for several years and as he is still in business, it must have been paying a dividend. This emphasis on the personal touch is especially



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essential when we are thinking in terms of emotional stress, times of change, and times of insecurity. I am convinced myself that the whole key to avoiding these difficult inter personal situations and human situations lies in a policy of good human relations. Now in itself the term human relations is probably rather too intangible a thing to define, but we can, I think, get more of an insight into it perhaps, if we think of the conditions and causes which give rise to good human relations. Though essentially they must be bipartite in nature, good human relations like so many other aspects of management must spring from the top. I should say that in industry human relations must be a product of a good sound humanitarian policy of man management, carried out right from the top of the management tree down to the lowest grade of supervisor on the shop floor. There is an old saying, and a very true one in the Army, that there are no bad soldiers, only bad officers. It is not so very untrue to industry either. Given that management is sincerely motivated and competent to fulfil it's role, then I think labour today can be relied upon to co-operate and reciprocate. But unless management is behind a policy of human relations, and sincerely and actively behind it, however much shop floor labour wish for better relations their efforts cannot get them very far. What, we may ask, are these signs and symptoms of good human relations. I like to summarise them myself as the four 'C's, Competence, Communications, Common Sense and the Common Touch. Given that those four factors are apparent in any organisation then you have very little to worry about with regard to your human relations situation.

Let us have a look at them and see what I mean. In the first place let us take Competence, as meaning particularly competence in the technical sense of the word. The man who does not know his job is sooner or later going to be found out, and the most likely place he is going to be exposed is on the shop floor. Now nothing, to my mind, is more likely and more certain to undermine morale than the exposure of an incompetent bluffer, and that exposure and its resultant effects will not likely to be confined to the individual alone. The man is a member of a management team. He has been promoted by someone, he has been appointed by someone. He has worked and been accepted as a colleague by other members of the management team, so any reflection on him must to some degree be a reflection on the rest of the management team. Now you could probably get away with that when everything is running alright in the factory, but in a time of gross insecurity, of big change and major development that sort of thing can have very big repercussions.

### The Human Problems of Modernisation (Contd.)

The second point, Communications, is perhaps the most vital one of the four, I think. I do not think anyone here is likely to argue that one of the ways, and one of the major ways of fostering a happy atmosphere and an atmosphere of good morale, is this practice of keeping people in the picture, keeping the shop floor labour force in the picture. One must realise that the days of "Theirs not to reason why" are gone long ago, if in fact they ever existed. In this era of more and better education it is quite fatuous to expect the men on the shop floor to obey orders blindly without having some knowledge of the policy behind them. I think this is probably one of the biggest points of difference between the old traditional school of management and the younger school of trained managers emerging today. Perhaps one of the greatest examples in modern times of the benefits of good communications was seen when General Montgomery went out on the desert and took over command of the Eighth Army. When he went out there he faced an extraordinarily difficult situation - not only tactically in that he had an army short of supplies that had been beaten back across the desert, whose lines of communications were long, and the submarine war was going against him, but also he had one other big problem. The human problem. In those days it was a very demoralised Army. Something very subtle but very difficult and very dangerous was happening there. There was a sort of new God of War being elected tacitly among the troops, and his name was Rommel. He was a man who was all powerful, he could do no wrong. It wasn't the regiment across the line they were afraid of - it wasn't that they thought of when they went in to attack. It was this nebulous figure called Rommel. There is a very serious undermining of morale when you get that sort of thing. I do not have to dwell here on what is now Monty's world famous policy of keeping people in the picture. Suffice it to say that when he arrived and took command he straight away issued an order that every man down to the private soldier behind his rifle, before he took part in any operation, would be briefed as to his place and purpose in the bigger scheme of things - where he was going, why he was going there and who was on his right and who was on his left, what he had in support and so on. The only bar to the amount of information to be given to them was not that which every officer puts up, lack of time, it was insecurity. Time had to be made. The benefits of that policy, of course, are now world famous. Suffice it to say, that never in the history of modern war has an army belonged so personally to its commander as did the Desert Rats to Monty. And, coming forward to more recent times, we are reminded again of this problem of communications in the recent reports of the Productivity Teams who went to America. Almost without exception these reports have laid stress on the importance that American industrialists attach to good communications. Certainly in this respect at least, we cannot be very different from the U. S. A. It is fatuous, as I have

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said before, to expect to have a happy and contented labour force, unless each individual is kept aware of his place in the bigger scheme of things. Communications in industry in this country have, I think, improved enormously recently, but there is still an awful lot to be done and we could improve them a lot more. When I think of communications I do not think of just a method of passing information down the line. There are two other aspects we must consider, first of all that communication must be up the line as well as down, and it can be equally useful that way. Secondly that other, and very neglected branch of communications, the dissemination, not of information but of knowledge, education if you like to call it that. The day to day education which is every manager's responsibility, and which ninety-nine per cent of managers duck continually. So much for communications.

Common Sense - that wonderfully misnamed commodity. Even the most modest men in the world claim they have got common sense. It is the one thing we have all got isn't it? Its rarity is only that of gold and diamonds, and yet, if we are to deal successfully with people it is of prime importance. In handling any situation which obeys no given set of laws, what else have we got to fall back on, only our common sense. If only managers would pause just occasionally and try to put themselves in the other persons place, what a lot of heart burnings could be saved, what an awful lot of petty grudges could be eradicated before they grew into the nasty big things they are apt to grow into if they are left. Now I do not want for a moment to appear to advocate a policy of maudlin subservience to personal prejudices and preferences. On the other hand the implementation of decisions, especially unpopular decisions, can be eased enormously by a word of explanation in the right quarter, as to why it must be done and why that man should do it. Surely it is only common sense to realise that the sort of treatment which we ourselves would appreciate is likely to be appreciated by other people as well. After all, to think otherwise is tantamount to considering ourselves unique, and few of us are unique.

Finally, the Common Touch. Now this to my mind anyway is probably the hall mark of the true leader. Call it what you will, it has been called many names - leadership, man management, personality. Whatever we call it, it comprises a blend of respect for, interest in, and understanding of our fellow men. Now in the main I believe that leaders are born not made, but on the other hand I believe we can do an awful lot to develop ourselves or to develop the leader trait in others by constantly thinking, wondering about and examining other people's reactions and other people's motivations, by trying to develop this insight into and interest in people. I do it constantly myself.

### The Human Problems of Modernisation (Contd.)

Almost whenever I have faced any inter-personal situation of difficulty on the shop floor or with management - and in my position I have got to face both of them - I like to find time while it is fairly fresh in my mind, to go over the handling of that situation from the point of view of the result. Did I get what I wanted? If I got it, did I get it the easy way, or did I have to go the hard way about it? If I didn't get what I wanted, why didn't I? In that way I build up a sort of mental library of experience in handling people which can be of enormous help when I come to meet the same or similar situations again.

Now if we accept these four points as a sort of framework for good human relations, the next thing we have got to do is to consider their application especially in a time of major change. One of the times of emotional stress and strain in a factory is the time of the initial application or of the initial introduction of Work Study into that industrial unit. That is not very surprising because after all Work Study is going to effect the two big basic things that matter to industrial men. How much work am I going to be asked to do, and how much money am I going to be given for doing it? Apart from the usual resistance to something new which we have talked about already - this introduction of Work Study, and the Work Study man, gives rise to a very definite series of emotional stresses and strains. I think we might have a look at them and see if we can examine and get any benefit out of them. There is the classic and traditional sign of emotional stress, the eternal triangle - woman, woman, man or man, man, woman, which way you will.

You know it is not awfully different to draw the emotional diagram at the introduction of Work Study into a factory. It is going to be just the same shape. Worker, Management, Work Study. Now that I think represents broadly, if you think of those lines as flowing both ways, a series of emotional stresses and strains, flowing either way, backwards and forwards, you have got a pretty fair representation in that diagram of the position at the introduction of work study. Let us look at it and see what I mean. You have got first of all the stress of the Worker-Management. The traditional one attendant on any effort, on any move, to change either the work load or the wage packet. A very obvious one. It is the product of a lack of complete confidence. Its severity will vary with the lack of confidence, it is traditional. I do not think we can ever completely eradicate it. You have got secondly the Work Study-Worker stress. This is a blend of about three things, I think. You have got first of all the fact that Work Study is new. You have got secondly the fact that the Work Study man is probably a new face. He is not only a new face, but he is a new concept and a concept which is not really properly recognised yet. Where does he fit into this set up? Is he a new manager, is he the new progress chaser or is he

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the new order clerk? and, you have got thirdly, and probably most important of all, the most wonderful rumours, opinions and quotations as to what exactly Work Study is and what it is likely to do. It is all tied up with a long tradition of rate fixing with which it is now associated. Not particularly rate fixing but rate cutting gives it this bad odour.

Then finally, of course, you have got probably the most subtle relationship of all, the Work Study-Management stress, and I underline here the word stress. I have gone into factories, many factories where we have been invited in, where people have agreed to pay our fees, under those circumstances you would expect to be accepted by management - but you are not. Why should you be. Perhaps this is the most highly emotional relationship of the three. Picture the foreman, the departmental head, any member of the management team you like. What is his position? Here is a man who has been fifteen, twenty, twenty-five years in the same trade, knows his job inside out, and now he is having a complete outsider who has probably never been in the trade before, being superimposed on him to teach him what he has been doing wrong for all those years. Nobody's Grandmother likes to be taught to suck eggs, and not only that, it is a continuing stress and one which it is most difficult to dispel, because the more successful you are in your work study the more intense is that stress going to be. What must that man's feelings be when you bring in your first week's savings, and you then run a cumulative savings chart, and you show an efficiency in the department thirty to forty per cent higher than he has ever achieved. I put it to you that there is only one explanation that that man must be given. "How the heck could he have done it beforehand - he did not have the tools". I am talking now particularly of the foreman strata, the middle strata of management, because they it is who bear the biggest brunt of the emotional disturbances at the introduction of Work Study, in that on one hand he has got the final implementation of whatever decisions have been arrived at. He has to go on the shop floor and tell the operatives what to do. He is the man at nine o'clock on the morning of application who has to go and tell ten other operatives that they are not wanted in the department any more. On the other hand he has to live with these operatives. He is the nearest man to them to take the come back. He is in a very difficult situation and you know these types of emotional stress and strain are not peculiar to the introduction of work study by any means. I think you can associate them broadly with any type of modernisation. Go into your office and find your Cost Specialist putting in standard costing or something like that. You can pick out the characters again - there is the office manager or chief clerk, instead of the foreman and all the rest of it. In any form of major change where improvement is implied the criticism is thought to be of the existing regime and therefore of the men who have been responsible for it - it is a



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very narrow minded point of view, but it does exist, and therefore we must be aware of it. It is one we must be able to counter.

Having recognised our problem then the next question is, what are we going to do about it. How can we help to eliminate, or at least alleviate some of these human problems which arise. I said before that I think the key to it must be the establishment of an atmosphere of mutual trust and confidence within the factory. To my mind the way to establish that atmosphere, or the way to start establishing it, because it is a long term policy, lies in these four 'C's of human relations. The first one, Confidence, I hardly need bother to mention again, suffice it to say that however good your ideas may be, however sound your new inventions, however sound your new process, unless the man who has got to implement them is competent to do so you are going to founder from the start. And I would say this, that the necessity for confidence applies equally whether that modernisation has been conducted internal to the factory or by hired experts from outside.

Now the second one, Communication, here we have talked about resistance to change, that automatic instinctive resistance to change. I think basically underlying that is the old tag of "The devil you know is better than the devil you don't know". That is probably the nearest you can get to having a sensible cause for that reaction. If that is true surely the answer to the problem is absolutely clear. What we must do is introduce as many people as possible, as early as possible, to the new devil, and the way to introduce them to the new devil is face to face and not at long range, and by that I mean that it is not sufficient and not a very clever idea to put a notice on the board at eleven o'clock in the morning to tell people about it. Have you ever seen what happens to a notice going on the board at eleven in the morning when the hooter goes at twelve thirty. There is a rush to the clock, and the notice is on the board by the clocking station. The first six can get round, the next sixty-six crane their necks and shout to the lucky six to ask them what it is. No one hears very well because the bell of the clock is going all the time and because they are in a hurry and want to get off to lunch anyway. They then go to the canteen and the garbled version goes around. By the time lunch is over everybody is so satisfied with the version that they have been given that they don't bother to read the notice again - and that is about the average life of a notice. It is probably the most two-edged weapon for disseminating any vital information. In my view there is only one way to communicate anything worthwhile to people, anything that is going to have vital significance in their futures, and that is face to face with them. If you have not already, in an organisation, got an established

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method of communication, your works council, or some form of committee where management meet picked representatives from the shop floor with a view of spreading information, then if you are going to go into any period of major change, it is essential that such an organisation or such a set up is established.

The ideal would be to see everybody individually, which is not a practical solution. So we have got to strike a compromise - but one word of warning - do not expect to be able to draw one or two percent of the labour force into a committee, put them round a table and give them some information and expect them automatically to go out and spread the right tale. It is asking a bit too much. You have got to be prepared to educate in the early stage, as well as communicate. The plea that there is not sufficient time must not be allowed to stand.

Now our third point, Common Sense. Well it must always apply, must always be a vital factor. In these times of modernisation, change and emotional stress, managers, however experienced they are beforehand are meeting problems which are unique to them. In these cases primarily common sense will be evidenced by the ability to see the other man's point of view, and predict the reactions and emotions of other people to the circumstances before they arise. It is only by knowing what the other man is likely to do that you have got any hope of coping with the situation when it arises or that you have got any hope of doing the even more important thing, taking some preventive action or curative action before the situation gets too difficult. Even given a fund of common sense, the manager still must have the fourth one if he is to get anywhere, the Common Touch. It was Kipling who summed that up so well in the last verse of his poem 'If'. I think it has a very great message to all of us who manage men, who are mainly concerned with the human as opposed to the inanimate side of industry. It goes like this "If you can talk with crowds and keep your virtue, or walk with kings nor lose the common touch, if neither loving friends nor foes can hurt you, if all men count with you but none too much. If you can fill the unforgiving minute with sixty seconds worth of distance run, Yours is the earth and everything that's in it, and, what is more, you'll be a man, my son". I think, gentlemen, with no disrespect to the author, we might add "You will also be a manager of men".

## EXHIBITING WORK STUDY

(W. Shurlock)

The theme of this Conference is "Putting it Across" but there are many ways of putting Work Study across just as there are many types and classes of people whose interest it is desired to gain. There has been a great deal written and said about the principles and techniques of Work Study, so much so that almost every employer and worker must be more than familiar with such terms as "Increased Productivity", "Work Measurement", "Method Study" and the like. To the average executive or manager, however, who wishes to know more about this aid to management which has received such prominence in recent years, "seeing is believing" and he wants a much more concrete idea of what Work Study can do in his particular industry, factory or department. Again, published results of Work Study applications afford some information to management but figures and reports and even appreciation courses do not necessarily convince the man at the bench. That is why this paper is concerned with Exhibiting Work Study which is the expression of this Conference theme in demonstration and factual example.

The British Productivity Council, a government sponsored body supported by industry and organised labour alike, exists "to stimulate the improvement of productivity in every sector of the national economy by every possible means". Promoting productivity exhibitions is one way in which it seeks to put this policy into effect, and many of us must have visited that most successful presentation "Production for Plenty" at Olympia in July of last year. Since that time local exhibitions have been held at Hull, Brighton, Glasgow, and other industrial centres, and preparations are being made for further exhibitions at Plymouth, Leeds, Luton, Edinburgh, Warrington and Burnley. As industrial firms are being asked to co-operate it can be readily seen that the Work Study Officer is likely to be called upon to advise on or even to manage his firm's contribution. My firm, Burroughs Wellcome and Company have taken part in such an exhibition and this paper is intended to outline the preparations needed and to discuss the results which may be expected.

In late October of last year the B. P. C. working with the Woolwich Polytechnic put forward a proposal to hold a local exhibition at Woolwich. A committee was formed which included representatives of local firms and sufficient support was obtained to go ahead. The Polytechnic placed a large hall at the disposal of the Committee and Mr. L. E. Glover of the Polytechnic Department of Commerce and Management Studies took a leading part in the general arrangements for the Exhibition.

## Exhibiting Work Study (Contd.)

### Planning the Exhibition

My firm had been among those approached and the Joint Managing Directors agreed to exhibit, the Head of our Work Study Section being appointed to the Exhibition Committee. It remained to determine the scale and scope of our exhibit and to obtain sanction for the expenditure involved. As there was only about four weeks to prepare the stand these matters had to be decided quickly and the Head of the Work Study Section consulted with all concerned to prepare a rough plan of what we intended to show.

The purpose of the Exhibition was to show local industry - management and workers alike - how the use of Work Study could assist higher productivity, and the Exhibition Theme was "Working for Better Living". In our own case we wished to stress the importance of making the whole organisation Work Study minded and to show how both manager, employee and Work Study Officer could contribute. To this end we amended the general theme of "Working Together for Better Living" and based our plan on this.

Obviously, we wished our stand to attract attention, and remembering the attraction of "Danger - Men at Work" (and better still "Women at Work"! ) our first thought was to give a demonstration of a job before and after it had been work-studied. We are still of the opinion that this is the ideal but in our case we met difficulties. The work we had studied is carried out by teams of operatives and our stand was not large enough, nor would the installation of the necessary equipment be easy. Furthermore, many of the materials used in the pharmaceutical industry are highly poisonous and the handling of all our products is subject to the strictest control. Finally we had to bear in mind our existing factory commitments and for these reasons we abandoned this idea, although with reluctance, turning to the use of photographs, diagrams and displays of jigs and components.

Our final plan was to show two main applications of Work Study using drawings, photographs and pictorial diagrams. One was of a production department packing a very diverse range of products and the other dealt with some problems of clerical procedures. In addition we included a display of ideas supplied by managers and employees as a result of the practical application from Work Study Appreciation Courses and of the firm's Suggestion Scheme. We also had a small section showing how the longer term Simplification and Standardisation of packing materials

### Exhibiting Work Study (Contd.)

were being used to increase our productivity. The savings of labour and materials were shown as percentages and we realised that we might well be asked what happened to the money saved. Here we hit upon the idea of using as a background a large photograph (about 10' x 8') of our new factory under construction together with a panel showing the aims and purpose of our Company. The latter showed how our profits are distributed solely for the advancement of medical knowledge, while the completion of the new factory will provide yet higher productivity and improved working conditions. The whole, we felt, gave a balanced picture of how we were using Work Study and was of sufficient general interest to management from all types of industry.

The next step was to draw up an approximate programme of the preparation needed. Our Company has a small but very efficient Exhibition Unit which is responsible for designing our stands at the various medical exhibitions. In our general planning we had already obtained invaluable help from the Manager of this Unit and now we sought his professional help in assessing the resources at our disposal and in particular the exhibition material already in existence which could be converted to our needs. We chose our site in the hall and our Exhibition Unit designed a suitable stand. An expense budget was prepared and colour sketches made of the proposed stand. All this was approved by Management who showed a keen interest in the project which ensured the priority necessitated by the short preparation time at our disposal.

### Preparing the Stand

Detailed preparation followed. Information, material, and rough ideas were passed to the Exhibition Manager who, with his staff, translated these into display form adding the touches of colour and the artistic flare of the professional. Full copy was supplied for every item shown but the Exhibition Unit suggested the appropriate presentation. "Before and after" photographs were taken of a number of jobs and the opportunity taken of pressing home our theme of "Working Together for Better Living" by explaining to the operatives the combined effort we wished to bring out in our exhibit. (It should be mentioned that our operatives are mostly women and so the photography was generally enjoyed, particularly as we made a point of spreading the operations over a number of sections of the Department). Scale drawings were made, jigs and components assembled and charts and diagrams prepared. Proofs of display material were checked carefully to make certain that they would stand the keen scrutiny of Work Study Officers and executives from other companies and we made a point of ensuring against misrepresentation in any form savings being expressed



### Exhibiting Work Study (Contd.)

conservatively. Finally, lists were prepared of the items required for assembling the stand.

The actual construction, transportation and assembly of the stand was undertaken by a professional firm who usually handled our exhibitions. The site had been inspected and measured at an early date so that service facilities (in this case only electricity) were known well in advance. Because the hall was needed immediately prior to the Exhibition the assembly of the stand was done during the weekend before the opening day. It was thoroughly checked well before the opening time and a small replacement stock was supplied of items likely to become soiled or damaged, together with a "first aid" kit to effect repairs. The stand included seating accomodation so that problems could be discussed with visitors.

Advance publicity of the Exhibition was weak and later when the B. P. C. asked for our criticisms this matter was raised. However, we made a point of advertising the Exhibition among our own employees, particularly among management. Additional publicity was given by the B. P. C. through a paragraph in their Bulletin and by the Polytechnic who provided a catalogue showing a brief description of each stand. The Exhibition featured in Radio News Reel and one of our exhibits was mentioned.

### The Exhibition

We had realised at an early stage that it was not sufficient to have a stand and to expect people to just look at it, especially as we had no demonstrations. An attendance rota was arranged so that at least one, and at peak periods, three Work Study Officers were present to conduct visitors round and to supply technical information.

In the event our arrangements were barely sufficient as our stand attracted considerable attention particularly from people interested in Work Study although less so from casual visitors. Some of the interest sprang from the fact that we were the only non-engineering firm exhibiting and it was surprising how many people had imagined that Work Study was confined to the engineering industries. To our pleasure, at the conclusion of the Exhibition, the Management of our Company decided to re-erect the stand first at the Factory where it was shown for a week and then at Head Office where it was shown for a similar period. At the Factory the stand was placed in the Main Canteen, and a number of employees visited it. Here we used an attendant who issued a short descriptive guide to all visitors, but we were able to conduct members of the Works Council and Trainee employees round the stand.

## Exhibiting Work Study (Contd.)

### The Results Achieved

Most of the expectations of the Exhibition were realised but a few unexpected results turned up as well. A great deal of interest was shown by managers and employees of visiting firms, and we also made contact with a number of Work Study Officers of firms who already use this management aid. The B. P. C., the Work Study School, and I. C. I. Ltd., were very interested in our efforts, and as a result the first named are planning to show some of our methods in a new Productivity Film they are about to prepare and the latter two have asked for parts of the stand for permanent exhibition. A further point of interest was the number of engineering students who enquired about the value of a course in Work Study as an adjunct to their training.

The cost of the Exhibition Stand including transportation and erection was about £500 excluding the time spent in preparation and attendance by the Work Study and Exhibition Unit Staff. The cost of one of our stands at a Medical Exhibition for example, might be almost twice as much, but in this case we made as much use as possible of existing equipment and resources and so reduced the cost to a minimum. Rightly one may ask if such an expenditure was justified, and it must be freely admitted that a direct justification in terms of £. s. d. cannot be made. Participation in such exhibitions undoubtedly has an advertisement value and adds to the prestige of a firm's name but the value of these things is hard to determine. Again, the main purpose of the Exhibition was to show other firms how the use of Work Study could improve their productivity and this may be of little help to the exhibitor, although we should never forget the assistance so freely granted when we commenced Work Study ourselves.

We gained our return in other directions. In the first place we were able to obtain the interest of many of our employees who had not already come into contact with Work Study or who had not been in a position to see its effects. This brings me back to the point I made at the beginning of my paper - "Seeing is believing". Participation in this Exhibition enabled us to put across the results that the combined efforts of management, employees and the Work Study Section can achieve and in a way that is most easily understood, especially by the person on the shop floor. From our own point the Exhibition forced us to step aside from the pre-occupation of routine affairs and review very critically the work that we had done over the previous twelve to eighteen months, which is a good thing. We believe that this appraisal will help us a great deal in our future application of Work Study. Successfully applied, Work Study is a blend of many things which will vary widely from business to business and the selection of the methods to be used is not easy.

### Exhibiting Work Study (Contd.)

We have not practised Work Study in our Organisation for long - a bare two years in all - but looking back we can see now a pattern emerging of the way in which Work Study can best be applied to our particular problems and difficulties - and we can safely say that the future is not without promise.

## WORK STUDY APPLICATIONS IN THE CLERICAL FIELD

(E. W. Ivey)

I must say gentlemen, that I approach this talk with some trepidation. I feel that most of you are much more interested in Production rather than Office Procedures. I can only tell you, however, that I was assured by Mr. Walker and Mr. Harper, that an efficient factory more often than not depends upon an efficient office. I can only hope, therefore, that what I have to say will, at any rate, be of interest to you and some of it perhaps of use.

I think I had better start by giving you some background to Work Study in the Offices of the Wellcome Foundation. At our Head Office in Euston Road, in London, we employ some four hundred people and for many years there has been one person responsible for initiating and implementing procedures used in our Offices. For six years prior to January 1954, I held the post of Methods Officer, and at the beginning of last year my company decided to send me on the course here at Cranfield. They realised, of course, that the Lectures would be dealing primarily with Production, but they felt that it would nevertheless, be useful to me.

Before I came to Cranfield a series of meetings were held (attended by our Directors to underline the fact that Work Study in our Offices was to have backing at top level) and at these meetings short Work Study Appreciation talks were given. They were attended by all levels of staff down to Section Heads who were asked to pass on the information to those members of the staff under their control. It was also carefully explained, and I believe this to be particularly important, that any redundancies which might occur as a result of Work Study investigations, would not mean that these surplus members of the staff would be out of a job, but that they would in fact be invited to fill vacancies in other departments arising through natural staff turnover. I would like to say how useful I have found these preliminary talks.

I would like to tell you something of what happened when I returned from Cranfield. My first task (following the advice, which no doubt you will all remember, is given towards the end of each course) was to select for my first investigation, a project which I was fairly sure would yield really good results - not merely marginal ones. I must say that I found this particularly difficult, probably due to a certain extent to the fact that I knew quite a lot about most of the routines operating in our London Offices and certainly not made easier in that many of these routines had been instituted by me. However, eventually a programme emerged and I would like to tell you something of my first two projects.

## Work Study Applications in the Clerical Field (CONTD.)

My first investigation concerned the Overseas Order Routine. So far I have completed two sections. I must confess that I found it somewhat difficult to force myself to prepare an extremely complicated and long Flow Process Chart of this Routine, but I felt that since this was the first project, I must in all fair ness "follow the book" rigidly and adopt all suitable techniques. I must now also confess that I was surprised, indeed I was amazed, at the factors that this flow-chart brought to light, many of which I am quite certain I would never have spotted had I gone about the job some four months earlier. As you can imagine the chart I prepared was an impressively large document. I studied it very closely, ruthlessly forced myself to be completely devoid of new ideas at this first stage but merely considered the facts as they existed, I then started on the first part of what I hoped would be an improvement, by seeking to eliminate the unnecessary.

The result of this, in the first section at any rate, I found quite surprising. I finished up with a saving by elimination alone of no less than one hundred and eighty-four hours per month. The Section consisted of less than 20 people and the initial elimination gives a saving of about  $1\frac{1}{2}$  people working full-time. The difficulty, however, was that these savings were spread over the entire staff and it was therefore necessary to consolidate the savings and re-arrange the work. But before getting to that stage I started on the Method Study part of the job, investigating procedures as they existed, seeking to improve them, finding new ways, cutting out movement as far as possible and, and I think this is particularly important, re-designing many of the forms that were used in the section. I would just like to mention two of these because I think they are rather interesting.

Firstly, a form called a Shipping Outwards Record was prepared on three different coloured forms. Each part was used by a different person in the department and to their own copy each added certain information. At first sight it looked as though it was necessary that these three people should each have their own copy, because in many cases there is considerable urgency regarding shipments and it is desirable that work should be done concurrently. Here I got my first lesson in not accepting things too easily, because really close investigation showed that the second person could not in fact add his information to his copy until the first person had done his job, and similarly the third person could not do his until both the first and the second had done theirs. So clearly it would be just as simple for a single form to pass between those three people, without in fact any loss of time. The form was re-designed and not only was it reduced to one copy, but in addition something like half the original information was all that was found to be necessary.



## Work Study Applications in the Clerical Field. (Contd.)

The second form I would like to mention was a Packers' Note. Originally there were three varieties, one for composite orders, a second for large orders consisting of one product only, and a third for Post orders. The first two each consisted of four copies and the last mentioned of two copies. Investigation showed that one single form could be designed suitable for all three purposes and in fact this has now been produced and consists of two copies only.

It will not, of course, be possible to describe to you in detail the re-designed Overseas Order Routine, since it would be necessary to spend a good deal of time in giving you a general background to the operations and indeed I think this would fulfil no useful purpose from your point of view. I will therefore summarise the savings achieved so far on this first project.

Staff savings - 28% i. e. 7 people full-time, 1 part-time  
Stationery - approximately £200 per annum

My second project was Filing and here I make no apology for the subject because I feel that it is one that would merit attention in almost any organisation. Having spent some little time on a preliminary survey, I reached the perhaps somewhat surprising conclusion that the best place to start would be at the finish. The finish in our case was the Record Store, situated at that time at Beckenham, about twelve miles from London. Into this store flowed documents whose current life had finished but which were to be retained for periods varying from two to seven years. I felt, and indeed this proved to be the case, that by starting in the Record Store, the final pool for all documents, I would be enabled to get a general picture of all types of filing and, having completed my work there, make my way up the streams which fed into it. I chose three main headings for my investigations in the Record Store. The first, Period of Retention, the second Layout, and the third Methods.

Now to deal with the first, perhaps the most important of all, Period of Retention, I would first of all say that, in my opinion, this is a subject which could be investigated with considerable advantage in almost any large organisation. I am fairly sure that a great many big companies do not adopt a realistic approach and in fact keep records very much longer than is really necessary. This was certainly true in our case. I found that a very large number of documents were being kept "just in case", or perhaps it would be more correct in our particular organisation to say "just in 3,800 cases", for indeed that was the number of filing cases in the Record Store when I first went into it. (You may be interested to know that my work in the Record Store was completed in two weeks and, that I had no assistance).

## Work Study Applications in the Clerical Field (Contd.)

First, I called for a list of the various types of document in the Record Store, subdivided into the various departments responsible for them, noting the existing period of retention. A list was also prepared of the number of occasions and dates on which documents had been referred to in the last five years. The list of occasions on which they had been referred to, gentlemen, was not very long. I next visited Managers of departments and discussed with them the various documents under their control, and sought their opinions on the periods of retention. In almost every case they quite readily agreed to a reduction of period, generally by one half.

As a result of the reductions in Period of Retention, an immediate clear-out was possible and at the end of the first week no less than thirteen and a half tons of paper had gone to salvage. This, as a matter of interest, represents something like four million quarto pieces of paper. The effect of this was to reduce the number of filing boxes required by some forty per cent, in fact, one thousand, five hundred and eighty-four were released. It so happened that at this time another of our units were requisitioning one thousand five hundred cases. Owing to the fact that I had advised the Buying Department that I should have these cases available in the near future, they were able to inform the unit concerned. They came to look at them and found that they were exactly what they wanted. This resulted, in fact, in a saving of £1,000 capital expenditure. I claim no credit for this of course, since it was purely fortuitous. It is, however, a striking example of the importance of letting the left-hand know what the right-hand is doing, especially in large organisations. It would have been all too easy for the Buying Department to have purchased 1,500 new cases for the outside unit, and, a short time afterwards to have disposed of the cases I had released.

Another interesting point is this. I found that the top drawer in each of these filing cabinets - they were eight feet high - was out of use because when pulled out loaded it became dangerous. This meant that no less than four hundred and eighty drawers were not in use. Discussions followed with the manufacturers of a well-known maker of ladders and a special portable ladder was designed with a platform at the top to receive the case. This cost less than £25 and brought back into use all the top cases in the entire set-up.

After a fortnight's work, the Record Store was considerably reduced in size and the lay-out was changed, releasing nearly fifty per cent of the original space. As a result of Method Study, the staff was reduced by forty per cent, the five people being cut to three. Very shortly after all this work was completed, I was informed that the entire space occupied by the

### Work Study Applications in the Clerical Field (Contd.)

Record Store must be vacated as rapidly as possible owing to urgent production demands at Beckenham and in fact, it was eventually decided that the Store should be moved to London. This new move would have been almost impossible without the reductions in the Store which I have already described. Having the Record Store at Head Office offered, I found, certain natural advantages, since most of the papers in the store emanated from London, and executives would, therefore, have an opportunity of obtaining papers they required much more quickly. Furthermore, the transfer of documents to the Record Store could now be made direct into the Record Store filing cases instead of a double move via wooden boxes. Further Method Study in fact ultimately made it possible for the staff to be further reduced and there is now only one person operating the entire store.

Following this investigation I moved to the General Files, our main current files for the Home Market, and found that certain advantages would accrue from the fact that the Record Store had been moved to London. The Period of Retention in the current files could now be reduced, since the users of this section now had 'on the spot' reference papers which had moved to the Record Store. I should perhaps explain that there are very urgent demands for space in our offices in London and there was considerable satisfaction when I was able to reduce the size of the section by about forty per cent. The General Files section as it was originally, consisted of eighty-eight four-drawer filing cabinets and a heterogeneous collection of furniture and equipment. In the new lay-out, eighty-eight cabinets have been reduced to forty-six. Four frames were constructed to hold forty-eight metal filing cases transferred from the Record Store. Five desks have been eliminated and, in their place, special filing-trolley-cum-desks installed. This is perhaps in itself a subject of particular interest.

I found that the girls using the Sortograf units had some difficulty in operating them owing to the unsuitability of the desks at which they sat. In addition, when they moved away from their desks to put away the papers, the desks were a nuisance because they got in the way. Clearly, therefore, it would have been a very good thing if every day at about 11.30 a. m. the desks could have been hoisted up to the ceiling. This was obviously impracticable. After some study we were able to produce the special trolley-desks. The flap of the desk lets down, so that when the sorting has been completed the desk can be wheeled away to the filing cabinets, giving clear working space.

## Work Study Application in the Clerical Field (Contd.)

The total savings to date in project two is -

## Record Store.

Staff saving - 80 % 4 people  
Equipment - 1580 filing drawers  
Space - 50 % 1140 square feet.

## General Files.

Equipment - 42 four-drawer filing cabinets.  
- 5 desks  
Space - 40 % 350 square feet.

And that, Gentlemen, is all I have to report on my work to date. You will, I think, agree that the results have been most heartening.

## THE INTRODUCTION OF MATERIALS HANDLING SCHEMES

(E. C. Cameron)

I wonder if you realise that like most of industry you are probably spending too much on materials handling; perhaps not in capital expenditure, but certainly in day to day running costs. It is often said that materials handling adds nothing to the value of the product but only to the cost, and the triteness of this remark does not detract from its truth.

Method Study must be largely concerned with materials handling problems, whether it be in the sense of the large unit load handled by mechanical means or the steady flow of materials along a conveyor, or even just the picking up of a part and placing it into a jig or fixture. All the transport symbols of your Method Study Chart are directly concerned with materials handling in one of its many aspects.

According to investigations carried out in America the cost of handling materials in various forms of industrial activity varies from fifteen to 85 per cent of the total manufacturing cost. The total wage bill for American industry in 1948 has been estimated at thirty five thousand million dollars, and of this twenty-five per cent is alleged to have been expended on materials handling, that is to say, nine thousand million dollars. On the basis of these figures it is claimed that American industry by further improvements in the techniques of handling could cut costs by not less than two thousand million dollars in a year. Now my company is not in the six million dollar region, but I think twenty-five per cent of our total labour bill would be quite a nice target to aim at, and a further, say, twenty-five per cent of that figure would still produce a nice item of saving. We have in fact estimated that our handling costs are twenty per cent of the total wages bill.

In examining our problem of handling we attempted to calculate the number of handlings in a process from receipt of raw material to final despatch. We found that although we are working in light chemicals, with very simple mixing or emulsification processes, containing very few steps indeed, in one case we were handling forty-one tons per ton delivered, in a second case thirty-seven tons, and in a third case thirty-one tons. Having surveyed this position we decided it would be well worth while having a go at it.

One of our first steps was to find out what the cost of materials handling was in fact, rather than accept a general percentage figure from cost accounts. That is something we have not entirely cleared up, and we are finding it extremely difficult to record adequately.



### The Introduction of Materials Handling Schemes (Contd.)

Most of this costing is completely immersed in the total factory overheads, for instance, raw materials stores, warehouse and despatch department costs. Even more difficult, of course, is to trace the in-process costing for handling, and this could only be done by actual observation and much recording of the activities of the people in the factory. Having found some of those costs, or at least started to locate them, it so happened that we were rapidly filling up on the present site, and it became urgent to decide what the materials handling plan for the site should be in the future, because if we did not get our claim in we would find the whole area filled up with offices, manufacturing buildings and so on, and we would have no space left in which to provide for material movement. So we broke the problem down into three basic groups:-

- 1) Receipt of material
- 2) In production (split into inter-departmental, intra-departmental, and the handling involved in engineering maintenance and work of that description.
- 3) Warehousing, package and despatch.

I would like to deal here with one case study on part of our despatch problem. We do not claim to have got anything particularly spectacular, but it is interesting to see the steps we took as we went along. Our business is roughly split into two sides, inflammable goods, where we deal with solvents with high flash points, and water based products or solids where inflammability is not a problem. After investigation we decided to build a warehouse to handle these products. I was called in to decide the materials handling scheme to move the products from four departments to this new warehouse. At present our handling is quite archaic. A man with a hand truck usually takes care of such problems, on his truck would be a stillage loaded with the necessary tins to make up the orders. We are supplying the shoe trade from this department, and so the orders are often quite small, two gallons of this, three quarts of something else, a five gallon tin perhaps or a three ounce bottle. This collection would then be wheeled down to the despatch section, and that was the extent of our handling scheme.

The proposed new warehouse was rather further away from the manufacturing site than had been the case before. It was in fact a distance of two hundred and fifty yards on average from any one department, and included a ramp of one in ten into the building. Clearly the man and his truck were uneconomic for the new proposals - walking backwards and forward, moving a load of five hundred pounds the two hundred and fifty yards on the outward journey and an empty truck on the return, was expensive of man hours.

### The Introduction of Materials Handling Schemes (Contd.)

The load up the ramp was another problem. It is calculated that for this degree of slope for a load of five hundred pounds an additional fifty-six pound draw bar pull is required. This, we felt, would create added fatigue, which would again tend to slow the man down on the job of delivering goods.

Elsewhere we were using Douglas trucks and high lift stillages. When we looked into the number we would require to cope with the new programme we had in mind, we found we would require sixty new stillages which would cost about £20 each. In addition this type of stillage was wasteful of space for our purpose, as they could not be stacked and did not justify the area they occupied. So we decided we would have to palletise, and our variagated loads clearly indicated that we should need post pallets or pallets with solid or wire-mesh sides. After some experimentation we found that a post pallet with a single tie bar along each side was sufficient to give required support when carrying such things as five gallon tins.

Then we had to look at the problem of pallet sizes in relation to our many and various sizes of package and after some jig-sawing about settled for a couple of sizes of pallet that looked the most suitable, bearing in mind that we wanted to carry a load of about one thousand pounds. Eventually we decided upon a single size, 40" x 36", which is in fact one of the sizes recommended by the British Standards Institute, who have been studying this problem. This was particularly important in view of the fact that we supply large quantities of material to the motor car industry, and we are hoping to deliver pallet loads.

The standard clearance on the pallets is four inches, but we found we had eight of nine stillage trucks which required a higher clearance. It meant we would either have to replace these trucks with a similar number of hand pallet trucks at a cost of about £100 each, or alternatively increase the clearance under the pallet to six and a half inches to enable our existing equipment to be used. We finally decided upon the latter alternative, and sent out pallet specifications to nine suppliers. It is worth noting that the range in price for wire-mesh sided pallets was from £6 to £11. 10s. each for the same quantity, and on tie-bar pallets from £5 to £8. 5s. each. The lowest price in each case was from one large manufacturing concern of repute, and they got our order.

When we looked into the economics on type of truck to move the pallets, a lift truck was clearly the best, as it could handle two pallets at a time. We selected the type which is steered by a pedestrian rather than a rider, as this has a slightly smaller turning circle, and we also felt that it would be safer in our particular factory as there is always the difficulty of the driver seeing round a load carried in front of the fork lift truck.

## The Introduction of Materials Handling Schemes (Contd.)

The wheel diameter of the Stacatruck we found would not cope with the surfaces we had to use, the tilting carriage type of truck we discarded because we would have fouled the mast with a tilt of about  $2^{\circ}$  on a 7' 6" load, and so we had to settle for the stacking type of truck.

On the choice of motive power we were limited. There was no diesel or petrol truck of the type we had in mind, and so we had to have electrically powered trucks. (In another case we did have some degree of choice, but even so we decided upon electrically operated vehicles, for despite the slightly higher cost initially, the lower maintenance when compared with petrol driven trucks would have swung the balance, apart from the aspect of fumes and noise. Comparing electric with diesel we found there was only a matter of shillings difference in the cost over the years running, but we retained our prejudice in favour of the electric truck).

Incidentally there is a rather unsatisfactory position when comparing costs at the moment, as the only information available comes from the equipment suppliers. We learn now that the Institute of Materials Handling is compiling information from various sources, and hopes to publish this eventually to give an independent check on costs.

Having made all our decisions about palletisation and trucking, we also became involved in the question of building details. Here we ran into one or two snags. Firstly our doorways were not of the right height, and we had to arrange to raise two or three of them. Luckily we were able to rush to the building plans for the new warehouse in time to have them amended to give seven feet six inch doorways with the necessary increase in width. The aisles and gangways we are increasing by about two to three feet to give a  $90^{\circ}$  turning circle for the truck. This also means that it will be possible for two vehicles to pass on the same aisle and still leave a little room for any stray pedestrians we might have left. We have put in some rubber outside doors which can be opened by the truck without the driver having to park his vehicle and open them, but we have found them fairly expensive and only justified where there is a considerable movement of traffic.

We also looked at the question of the surfaces on which the trucks would operate as there is a considerable difference in the power consumption over different surfaces. In calculating surface resistance, we found that good smooth concrete gives the best picture having only thirty six pounds resistance per ton moved, against forty-seven pounds per ton for macadam, seventy-five pounds per ton for gravel, and if you must move through sand or snow two or three hundred pounds per ton surface resistance is present.

## The Introduction of Materials Handling Schemes (Contd.)

To help sell this idea of palletisation and block pallet stacking, we were able to get hold of what I consider is the best film I have seen so far to show to a very mixed audience. This was the Unilever film "Time, Space and Effort". We were also able to give demonstrations of available types of equipment, and this gave us the opportunity to check our calculations about aisles, doors, ramps etc. Another important aspect of the presentation of the scheme is the economics likely to be involved. We used a formula derived by the Materials Handling Division of the American Society of Mechanical Engineers, which looks like this -

$$Z = \frac{(S + T + U - E) X}{A + B + C + D}$$

$$Y = I (A + B + C + D)$$

where

Z =	Max. investment justified
Y =	Annual cost of maintenance of mechanical equipment
A =	Percentage allowance on investment
B =	" " for insurances, taxes etc.
C =	" " " upkeep
D =	" " " depreciation and obsolescence
S =	Annual savings in direct labour cost
T =	" " " fixed charges
U =	" " through increased production
X =	Percentage of the year during which the equipment will be used.
I =	Initial cost of mechanical equipment

Some of these percentages were difficult to assess, particularly such things as A-Percentage allowance on investment. I feel myself that since the money which is being spent on equipment would have a value to the firm if it was not used for this purpose but was invested in industrial securities, for instance, as then it would bring in five to six per cent on average over the year. There was some argument within my company that we really ought to use only the Bank rate of roughly two per cent, which was all we were getting before we used it for this purpose, but I still feel we should use the rate which could be obtained in the investment market.

### The Introduction of Materials Handling Schemes (Contd.)

For the factor D we agreed to settle for a depreciation rate of fifteen per cent for the first six years and the remaining ten per cent on the seventh. This had the advantage of depreciating the equipment fairly quickly, and in the case of obsolescence with the development of new equipment this would be of some value.

Now although I have said that we set out to evaluate the costs by using this formula, we found it very difficult to work out savings as we have no present method to compare it with. We knew that we needed the warehouse. We knew that we had the problem of getting the goods there, but to relate it to actual savings was more than our formula could manage, and in fact after all our searchings we did not satisfactorily make a comparison. Nevertheless, we did manage to present an impressive case to Management, at least they must have thought so as they agreed to spend the money.

When we came to the actual installation of this scheme we found that the training of operators in the use of the trucks was extremely important. We started with the film previously mentioned to sell them the idea of what fork lift trucks could do. That started to get them enthused, and then on the delivery of the trucks, before we started the training itself we gave them a talk on safety, the general nature of the truck, and all those aspects which should be brought home to the drivers before they are turned loose with what is almost a lethal weapon.

We followed with a period of driving the truck when we were particularly concerned to get over to them the idea that it is a one handed job steering the truck, and the other hand must be free for the tilting or the hydraulic controls. We also gave them steering practice by laying out a group of barrels and making them do manoeuvres through the barrels in forward and reverse, going from one full lock to the other. By this means we eventually got them down to the absolute minimum manoeuvring space. Then, and only then, we actually gave them loads, first with pallets with simulated loads in order to train them in placing pallets squarely in line, and to get the knack of proper stacking, particularly with post-pallets.

Now, I have just summarised some of the steps we have gone through, and these things fall in line very well with the procedures for Method Study. The scheme is still in process of being installed, and so there are no working results to present to you. Just to show that we are not completely won over by the argument that goes on in some materials handling circles of trucks versus conveyors - we have just finished another layout for a new production section where we are using a Monorail Hoist for handling heavy bales of cloth through various stages of processing.

### The Introduction of Materials Handling Schemes (Contd.)

Besides these materials handling points, there are some ancillaries to materials handling, and like the previous speaker, we found there were considerable savings to be made in container simplification. During the War, like so many other people, we found ourselves in the position of filling into whatever containers we could get, and that condition obtained until about a year ago. The position is still not completely satisfactory, but it is a lot easier, and by looking into this container problem we did manage to achieve savings of over £2,000 per year, and in one department have reduced eleven sizes of tins down to four.

Other investigations which we have carried out have been on paper work, and in the receipt of raw materials we were able to reduce paper control by a third, with a very considerable improvement in the relaying of information.

We make no claim to be spectacular or original, lots of other people have already gone over similar ground, but I hope that by going over some of these points I may have said something which will be useful in the introduction of materials handling schemes.

## STORES CODIFICATION AS AN AID TO A MAINTENANCE INCENTIVE SCHEME

(M. J. Moriarty)

Some time last year our Company made the decision to install an incentive bonus scheme in the Engineering Maintenance Department. The scheme was based on Time Study and the use of analytical estimators. However, before any thought was given to the selection and training of estimators we undertook a Method Study investigation of the maintenance set-up. The study covered the following main aspects of the organisation -

1. Long-term siting of the engineering stores
2. Layout of plant within shops
3. Alterations to administration structure to give better supervision
4. Installation of planned maintenance
5. Improvements to paperwork procedure
6. Provision of more and better machine and hand tools
7. Re-organisation of the stores

It is one aspect of the stores re-organisation which this paper deals with, namely codification.

A committee consisting of members of the Engineering, Buying and Work Study Departments held a detailed investigation into the engineering stocks - item by item - with the object of eliminating all redundant items and standardising as far as possible those remaining. By applying the usual questioning technique to each item, the stock was reduced from 9731 to 6358 items, a total of approximately 35%. In order to ensure standardisation of description of the remaining 6000 odd items, it was essential that a Commodity Code Book be available. The system of coding had to provide for the identification and recording of each item in a precise and clear manner, and be sufficiently comprehensive to cover the entire range of stock items.

A system of decimal classification has been adopted by our Company, made up of eight digits and everything to be used (or likely to be used) in the maintenance department has been classified under twenty six general headings, given overleaf.



## Stores Codification as an aid to a Maintenance Incentive Scheme (Contd.)

A	Raw Materials	N	Welding, Brazing, Metalising
B	Safety and Communication	O	SPARE
C	Valves and Cocks	P	Instruments
D	Fastenings	Q	SPARE
E	Filtering	R	Fittings: Steam, Gas etc.
F	Transmission and Handling	S	Lighting, Heating, Ventilation
G	Tools	T	Motor and Starter Spares
H	Lubrication and Lubricated Fittings	U	Power Distribution
I	Spare	V	Sanitation, Drainage, Cleaning
J	Jointing and Packing	W	Fuel
K	Glass Plant and Fittings	X	SPARE
L	Clothing	Y	SPARE
M	Insulation and Covering	Z	SPARE

Each main class is sub-divided into 99 sub-classes to describe the article, each sub-class into 99 groups indicating the material and each group into 999 sections to indicate size. For example the number A0101.109 would be analysed as follows -

A++++.+++	Raw Materials
+01++.+++	Rolled Steel Joist
+++01.+++	Mild Steel
++++.109	6" x 3" x 12 lbs. BSB108

A0101.109 - 6" x 3" x 12 lbs. R. S. J. BSB108

In practice, the storemen using the code soon learn to recognise the meaning of each digit and appreciate the pattern of classification.

Although the immediate advantage of the system shows in the elimination of redundant stock, the system leads to an improved stores arrangement and it is possible to use unskilled personnel instead of relying on a storkeeper's memory. The effect on a maintenance incentive scheme lies in the elimination of -

- a. Waiting time at the stores counter
- b. Estimators are able to write out requisitions before the job commences
- c. Estimates are more accurate due to catalogues giving exact size and description of available material.

I would conclude by citing an actual case of a paper manufacturing firm in Kent, which installed an Incentive Scheme in its maintenance department without first investigating the stores. The result was eighteen months of arbitration and negotiation over waiting time claims and constant revision of estimates due to non-availability of material.

## THE 100% STANDARD

(R. Eastwood)

Gentlemen, I wish to put to you a few thoughts on what we believe to be a step forward in the field of rating and performance indices.

The 60 - 80 rating scale with which we are all familiar has as its basis 60 normal minutes to the hour. The 80 or Standard rate is therefore established as 1/3rd. faster than the 60 or Normal rate.

However, it will be generally accepted that when incentives are introduced it is the aim of management to raise the tempo of the factory to Standard. This being so it would seem psychologically bad to admit that Normal is an acceptable rate of work. Far better to omit all mention of Normal, to erase it from the minds of the operators and ourselves.

Let us think in terms of Standard, i. e. the 100% Standard performance. In this way 75% performance would replace 60 performance and the inference that this is below standard should encourage greater effort.

Formerly the 60 performance was bonus base in most incentive schemes for repetitive manufacture whereas the present application of incentive schemes to a very wide variety of work frequently leads to the adoption of some lower performance as bonus base. Here again the foundation of the 60 Normal is becoming less significant.

Furthermore in most cases planning and estimating times are assessed at Standard and in many cases are issued to operators at Standard in place of the work unit system.

Having adopted a new scale for performance, logically the next step is to change the rating scale and bring it into line. Thus the old 60 - 80 becomes 75 - 100 etc. i. e. all ratings on the 60 - 80 scale are multiplied by 5/4 to convert them to the new.

It might be argued that for a man trained to the 60 - 80, this conversion would be difficult. We have not found it so, even the use of conversion charts has not been necessary and our ratings are now made directly in the new scale.

## The 100% Standard (Contd.)

We were, however, particularly fortunate in that we adopted the 100 scale when we first designed paper-work for an incentive scheme and in consequence had the minimum of upset in the change over.

In working up time studies rated in the new way there is a slight difference of procedure. Since Normal has no significance now, there is no point in Normalising, but for the purpose of reducing time studies to a common time basis some similar process is necessary. The logical time basis is of course the Standard. The term Standardising, however, is not quite suitable since it does not give rise to a Standard time, taking no account of C. R. and other allowances. The term we use is 'Levelling', giving a 'Levelled Time' to which all allowances are added to form a 'Standard Time'.

Levelling is a rather simpler operation than was Normalising. For example an observed time of 8 seconds at the new 90 rate when levelled to the 100 Standard is

$$8 \times \frac{90}{100}$$

$$\text{i. e. Observed time} \times \frac{\text{rating}}{100}$$

Hence the rating figure is itself the factor by which the time is multiplied involving one operation instead of two for Normalising. In all other ways the working up does not differ.

We believe that in a small way the concept of a 100% Standard coupled with the abolition of Normal and the adoption of a corresponding metric rating scale represents an advance on the 60 - 80 work unit system.