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#### Abstract

This paper explores the history of occupational safety and health in Japan during the 20<sup>th</sup> century, and then provides an overview of trends in this particular field since the 1970s. In addition, current and future issues in regard to occupational safety and health during the 21<sup>st</sup> century are examined.

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*Keywords:* Occupational safety and health; Labor; Hygiene.

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#### 1. Introduction

Occupational safety and health is a cross-disciplinary area that focuses on the safety and health of workers. The working environment and overall conditions in current society are in a constant state of change, even though the importance of this particular field of occupational safety and health has remained the same. However, a wide array of new issues have been created due to the rapid development of science and technology in industries. Therefore, this paper explores the history of occupational safety and health in Japan during the 20<sup>th</sup> century and then provides an overview of trends in this particular field since the 1970s. In addition, current and future issues in regard to occupational safety and health during the 21<sup>st</sup> century are examined.

#### 2. 20<sup>th</sup>-century trends in labor health and occupational safety and health

##### 2.1. Harmful factors in labor health

Harmful factors in labor health are generally classified into three overall categories: chemical, physical, and psychological. Chemical harmful factors includes new hazardous materials as well as conventional substances that influence oncogenesis or carcinogenesis [1,2]. In addition, harmful allergens may be increased even in circumstances where acceptable concentrations have been improved such as formaldehyde at 5->0.5 parts-per-million (ppm) and vinyl chloride monomer (VCM) at 500->2.5 ppm. In Japan, even if the determinants are a recognized asbestine carcinogenicity, measures are sometimes neglected. As a result, the development of symptoms are unable to be prevented, which was seen in a number of carcinogenesis studies of 1, 2-dichloropropan. In addition, it is indispensable to establish risk assessments of carcinogen exposure through quantitative relative evaluations in order to prevent the onset of major health problems in the workforce.

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However, such measures have not been taken, especially in regard to the harmful impurities of materials.

On the other hand, environmental management of toxic substances (on a larger level) in Japan has been performed in regard to emission control, ventilation, and concentration management due to the enforcement of the Industrial Safety and Health Act of 1972 and Working Environment Measurement Law of 1975. Although some reviewers believe that the minute contents of each regulation brought about of the “tenet-ization” of management and superfluous regulation, there is no doubt that the measurements led toward remarkable improvement in the work environment.

In addition, measures for toxic substance exposure control have been seen in overall improvements to ventilation and respiratory protection equipment such as gas masks. In general, gas masks consist of an absorber can, air-line apparatus, and a cylinder mask. After the 1970s, the disposable-type mask was created, which was not only light in weight but the respiratory protection element included an electric fan with no air-flow resistance. As a result, the design offered high-efficiency performance and a high protection for the person utilizing the gear. Perhaps the only issue arising from this new design is that the mask can be difficult to wear during the hotter summer months, which in fact, could also be said for the previous design.

Although the original goal of the previous gas masks were to protect individuals from larger biohazards or other harmful biological factors, the bio-industry has been utilizing the newer masks for protection against aerosol exposure to more minute harmful contaminants such as enzymes and microbes, especially in regard to overall labor health. In this case, since many of these bio-substances are non-sensitivity pollutants, detection and response must occur within 30 minutes in order to offer optimum protection for individuals.

Physical harmful factors include conditions where high temperatures and pressures are involved (e.g., those who work in cryogenic research or deep underground). Under these conditions, the standards and improvements for accident prevention due to long-term exposure are of particular concern. In addition, other harmful factors such as exposure to small levels of radiation in cellular telephones to ultraviolet and infrared rays in the electromagnetic spectrum from the use of excimer lasers have been examined. Such lasers (more specifically known as “exciplex lasers”) are a form of ultraviolet laser generally used in the production of electronic devices such as semiconductors.

In regard to such production of microelectronics, the health of workers in this particular production field is of particular interest. Due to the long work hours and rapid production pressures, many workers experienced problems that ranged nerve fatigue and lumbago to cervicobrachial syndrome. However, due to technical innovations beginning in the late 1970s, the design and utilization of robots replaced these workers and therefore greatly reduced the physical consequences from such repetitive and detailed work.

Harmful psychological factors, especially those due to work-related stress problems, have dramatically increased after the turn of the 21<sup>st</sup> century. According to an investigation on middle-age and elderly workers, psychological issues due to stress encompassed approximately two-thirds of the participants. On the other hand, due to the increase in so-called technostress (or stress due to the introduction of new technologies) the Ministry of Health, Labor and Welfare have performed impact investigations that focused on the tendency of such aggravation from technological advancements (1985-95). The process of such measures is described in Section 4.4.

## *2.2. Environmental protection and occupational safety and health*

The process of waste disposal has become more important, especially in regard to environmental protection and occupational safety and health. Although improvements for the environment such as recycling have shown substantial positive results, more catastrophic accidents still occur in waste disposal. These include the disposal of chemicals such as hydrogen sulfide and needle handling of medical waste. For example, workers engaged at municipal solid waste incinerators (MSWIs) were shown to have substantial risks of exposure to dioxin emissions, which is one of the major sources of environmental dioxins that has been linked to cancer. Therefore, more measures should be created to prevent exposure during such employment [3].

## *2.3 Computerization*

Computerization and related technologies have made substantial positive impact on society in general. Examples include the use of computers for basic processing in the home and office to more advanced uses such as the video dilution technique (VDT) in the medical field, which evaluates patients with peripheral vascular disease. However, beginning in the mid-1980s, it has been argued that such technological advancements have had an increasing number of negative effects ranging from simple information overload to the dilution of interpersonal relationships at a societal level. In fact, an increasing number of studies have begun to focus on mental health problems due to technology, especially in regard to the addition of computers.

## 2.4 Office environment

Indoor air pollution, such as formaldehyde in laboratories and volatile organic compounds generated from building materials, has become a growing problem in the work environment. This was seen in a number of research studies on office buildings where human chemical hypersensitivity was still significant even though the concentration levels of the individual components were relatively low [4]. In 1971, the Sanitation Management Act Bill was created in Japan, which was the world's first law that helped to maintain the on-site air environment of relatively large office buildings. Since then, measures such as the addition of ventilation equipment and the removal of designated smoking areas in the building have greatly improved the working environment of such buildings in Japan.

## 2.5 Non-stationary work environment

The so-called steady working environment in factories has improved substantially since the enforcement of the Industrial Safety and Health Act of 1972 and the Working Environment Measurement Law of 1975. Previously, according to the statistics after 1965, acute intoxication affected many workers who were exposed to organic solvents in factory working conditions. These hydrocarbons were particularly high in factories that included metalwork and cleaning as well as larger construction sites. Since 2000, administrative measures such as those to improve solvents have been established. In addition, research that focused on aspects ranging from welding work and tunnel construction to refuse incineration equipment also occurred for the advancement of healthy working conditions. Although the accidents from such work-related factors have greatly decreased, the overall goal is to have no significant statistics on issues such as organic solvent poisoning or oxygen shortage in the work environment.

## 3. The issues of occupational safety and health

### 3.1 Problems in small-and-medium-sized-enterprises

99.7% of Japanese companies are either small- or medium-sized enterprises. Small corporations count for 87% of this number and its full-time employees include 70% of the total workforce. During the past decade, measures such as safety and hygiene movements and the management of safety and sanitation and risk assessments have been introduced. Moreover, due to productive labor administration and effective safety and health education, labor statistics show that the accidents and health problems have begun to decrease.

However, these numbers are far from zero and the gap based on the type of industry, business condition, and a size of the enterprise is still relatively large. In addition, these values were in inverse proportion to the size of the business. For example, the frequency rate and severity rate of companies with 30-39 employees were 7 compared to 6 for those of 1,000 or more employees. In regard to the statistics of non-chlorine systems, organic-solvent-poisoning accidents totaled 50% of the total number of accidents for businesses with less than 10 employees while the rate was 80% for companies with up to 50 employees.

In addition, the results of Survey 67 show that the implementation rates of working environment measurements and special health examinations were 0-13% and 0-27%, respectively. According to the survey, the reasons why the entrepreneurs were able to perform the measures mentioned in the survey included the following four statements: 1) "the law was unknown"; 2) "my original work was too busy"; 3) "there are no proposed measures"; and 4) "the expense is high." Furthermore, small-and-medium-sized-enterprises were the focus of a 1968 journal by the Ministry of Welfare and Labor, which included Prevention Plan 51 that covered several orders and the "guidance of safety and hygiene for managers." Since 2001, an Occupational Safety and Health Consultant System was enforced and as of 2012, the number of registered consultants is approximately 2,500. Perhaps such concerns have begun to be taken seriously at the societal level. However, more financial support and low-cost methods should be considered at the governmental level in order to continue making a positive change in the future.

### 3.2 Problems of dispatch and contract

Currently, the idea of dispatch exists in all fields including the manufacturing industry, especially after the Temporary Staffing Services Law was revised in 2003. On the other hand, although the contract work system has been established, it has taken the form of subcontracts, which has spread throughout many of the industries. Therefore, it cannot be overemphasized that, although the notions of dispatch and contract work have become convenient for managers, it has

produced negative effects on workers, especially in regard to their overall safety and health. In fact, the industrial accident rates of contract workers to principal contractors were 11.32 and 5.09 in a 2004 investigation, respectively. In this case, the former rate was more than twice the latter. In more recent years, the disasters at the Mizushima oil refinery and the Minami-Ounuma tunnel show that the design construction companies were in fact major companies that specialized in such work. However, the operators (disaster victims) of the accidents were employees of the respective sub-contracting companies. In this case, the following four points can be considered as the possible cause:

- Management of overall safety and sanitation, and information exchange lacked effective communication.
- Initial evaluation of the danger of equipment or work carried out, and possible disaster prevention measures was insufficient. For example, at the former site, the precursor of water mixing was overlooked and work had begun without the necessary gas concentration.
- Cost reductions and the time necessary for completion were shortened.
- Insufficiency of safety control activities of which management was in charge.

The above causes (especially Nos. 1 and 2) were pointed out to the Ministry of Health, Labor and Welfare in 2004, which was subsequently considered in the revised Industrial Safety and Health Act of 2006. Since then, special measures to prevent future disasters have included the education of management for safety and sanitation as well as the monitoring of such sub-contract procedures in similar large-scale projects. Moreover, the necessity for safety and hygiene management or risk assessment is now recognized as an implemented measure for major companies. However, the workplace where temporary workers (sub-contract workers) intermingle with full-time workers is still increasing and recently as 2008, the dispatch population has increased to 0.14. Perhaps more research can focus on sub-contract or temporary workers in order to study long-term, company-wide effects.

### *3.3 Crushing labor*

According to the revised Industrial Safety and Health Act, “crushing labor” is the type of labor where the amount of overtime work exceeds 100 hours in a single month or it average 80 hours per month over a six-month period. As a result of prolonged overtime work, one can create major health problems ranging from short-term ailments to even death. Statistically, the majority of these effected workers are males ranging from 20 to 50 years of age. In addition, the ratio of annual accident applications to accident authorizations by the Labor Standards Inspection Office in 2006 and 2010 was 802 to 938 and 96 to 856, respectively.

Although the Ministry of Health, Labor and Welfare also established special investigative commissions that focused on “crushing labor for occupational physicians,” the current situation has not been improved nor does it appear that it will change anytime in the near future.

### *3.4 Mental health*

The workers who agreed with the statement of “strong insecurities about work due to work-related problems and stress” in a questionnaire by the Ministry of Health, Labor and Welfare in 1982, 1992, 2002, and 2007 were 50.6, 57, 3, 61.5, and 58.0%, respectively. Such problems included human relations in the workplace, problems due to the overall quality and quantity of work, and the possibilities of advancement within the company. Particularly, the problem of the quantity of work suggests that crushing labor has influenced the overall mental health of workers.

Therefore, the practical use of occupational physicians in order to measure or examine the “indicators for the production of heart problems in a place of business” and the results of medical examinations regarding such results were initiated in 2008. However, it cannot be said that it has not necessarily improved the overall situation, especially in regard to fatigue and mental disorders.

### *3.5 Focus on carcinogens*

The use and management of harmful chemical substances (such as carcinogens) in the industrial world is substantial and such management and prevention is the one of the subjects in the Japanese government’s 11<sup>th</sup> Industrial Accident Prevention Plan, which has been formulated pursuant to Article 6 of the Industrial Safety and Health Act of 1972. Typical examples of harmful carcinogens included asbestos-influenced mesothelioma and bile-duct cancer due to 1,2-dichloropropan. Due to the former’s having been specified as a primary carcinogen by the World Health Organization (WHO), full-scale investigations were conducted that resulted in an overall improvement of regulations in regard to this disease. However, the general awareness of the disease and its causes are still inadequate.

### 3.6 *The tertiary sector and other factors*

In Japan, the population ratio of the tertiary sector (or service sector) increased from primary/secondary sector as a result of recent economic developments. This is especially prevalent in fields such as mining and manufacturing as well as extraneous service positions (e.g. late-night convenience store workers, taxi drivers, etc.). Despite the increase in work, the resulting effect was an overall decline in health and safety due to psychological stress and long working hours.

In addition, the problem of the aging workforce is increasing, especially in Japan. In this case, the elderly people include a variety of physiological functions due to age in general. However, with the additional stress created by such unhealthy work environments, future problems may be on the horizon.

In terms of safety and health in the workplace, the insufficiency of management and ineffective regulations has created problems that have only resulted in disaster. Ironically, such disasters have influenced administrators and government officials to enforce effective changes that have resulted in overall advancements in the workplace. Perhaps more research on such positive effects in addition to the prevention against psychological and physical issues in the workplace should be considered in the future.

### References

- [1] Tetsuo Amano, 1996. "History of safety and health movement," Japan Industrial Safety and Health Association, pp.24-26.
- [2] Ryuichi Fuse, 1995. Hazardous Physical Factors. *Occupational Health Engineering* 29, p. 111.
- [3] Shinya Yamada, 2000. 100 Years of Change and Health Problems of the Labor Aspect. *Science of Labor* 55, p. 702.
- [4] Tetsuo Mori, 1995. Hazardous Chemical Factors. *Occupational Health Engineering* 29, p.133.