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Country Report

Occupational Safety and Health in Japan: Current Situations and the Future

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Abstract: The Industrial Safety and Health Law enacted in 1972 has contributed much to the progress of occupational safety and health (OSH) activities. Many indicators including death and illness statistics show continued improvement up to date. The establishment of OSH organization within enterprises and 5-yr administrative programs formulated by the Ministry of Health, Labour, and Welfare (MHLW) were important factors for satisfactory management. The past programs indicate that the weight of self regulation in comparison to legal control gradually increased since late 1990s. In spite of the past achievement, many hazards such as overwork, mental stress, chemical agents and others still remain to be prevented. The systematic risk assessment of unregulated chemicals by the MHLW proved to be an effective scheme for risk-based management and to deserve continued implementation. The size of human resources for OSH was estimated at 1.5 million. In view of the adverse effect on OSH by economic, social and political environment in the future, the importance of the efficiency of OSH management was indicated. Since the efficiency depends on the competence of OSH personnel and the level of scientific basis, it was concluded that the fundamental policy for the future should give high priority to education and research.

Key words: Occupational safety and health, Regulation, Chemical substance, Indium, Mental health, Human resources, Education, Research, Risk-based management

Brief Review of the Past

Administrative and technical measures to prevent occupational injury and illness in Japan appear to have made a marked progress by the enactment of the Industrial Safety and Health Law in 1972.

Historically, the Factory Law enforced in 1916 was the first product of nation-wide legislative effort to protect the health of workers, although the degree of protection did not reach a satisfactory level. In 1947, the Labour Standard Law, that included occupational safety and health (OSH) regulations, was promulgated. It provided employed workers with the basis of acquiring working conditions of a reasonable standard.

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Subsequently, many regulations such as Ordinance on OSH (1947), the Pneumoconiosis Law (1960), Ordinance on Prevention of Organic Solvent Poisoning (1960), Ordinance on Safety and Health at Work under High Pressure (1961), Ordinance on Prevention of Lead Poisoning (1967), Ordinance on Prevention of Hazards due to Specified Chemical Substances (1971) and others were put in force. However, the incidences of occupational injury and illness stayed high throughout the 1950s and 60s.

These situations prompted the enactment of the Industrial Safety and Health Law (1972) that was the expanded version of related provisions of the Labour Standard Law (1947). All the above-mentioned ordinances were simultaneously amended in conformity with the new law.

As one of the representative statistical data reflecting the general standard of OSH, the trend of annual deaths of employed workers due to work related accident is shown

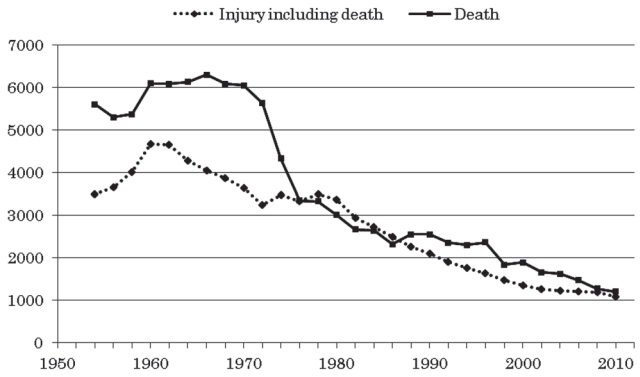

Fig. 1. Number of deaths and injuries including deaths (1/100) caused by work related accident in Japan.

Fig. 2. Number of total population and employed workers in Japan.

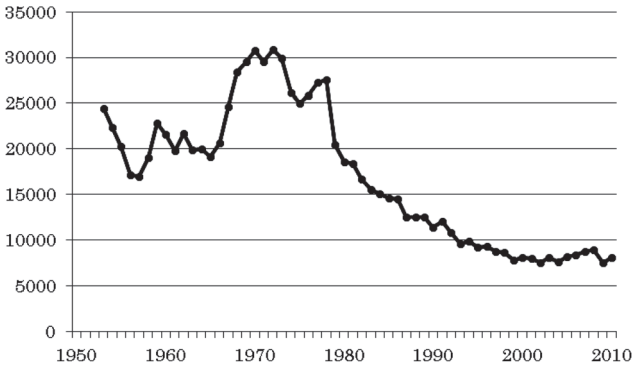

Fig. 3. Number of diseases attributed to work related causes in Japan.

in Fig. 1[1, 2]. It is clearly seen that the numbers of deaths were high before around 1970, but turned to sharply decrease thereafter. They were reduced approximately by half in 10 yr since the Industrial Safety and Health Law (1972) was enforced and continued to decrease up to 2010.

There are some arguments that the reduction of fatalities in the first half of 1970s was caused by the economic recession that was named Oil Crisis at that period. However, the annual indices of industrial production[3] (value added weight) by comparison with 1970 changed as follows: 100 (1970), 103 (1971), 110 (1972), 127 (1973), 126 (1974), 110 (1975), and 125 (1976). A slight set back was seen in 1975, but it may not sufficiently explain the reduction of fatalities around that period.

Also considering the fact that the number of employed workers increased throughout the latter half of the 20th century as shown in Fig. 2[4, 5], the notion that the main cause of the reduction of occupational fatalities may be attributed to the Industrial Safety and Health Law (1972) seems valid.

Figure 1 also shows a similarly decreasing trend of work related injury including death since the beginning of 1960s. Although the marked reduction of fatalities was observed in the first half of 1970s as stated above, there was no such characteristic change in the trend of injury/death. It is interesting to note that both trend lines are fairly consistent with each other since 1976, indicating that the incidences of injury/death have been approximately 100 times more reported than those of death. On the other hand, the incidences of injury/death were clearly less reported in proportion to death before 1976. It may be reasonably estimated that unrecognized cases of work related injury decreased as a result of improved compliance with regulations due to a favorable effect of the Industrial Safety and Health Law. Caution must be taken to the fact that plotted numbers of injury were confined to those requiring the absence of 8 or more days up to 1972, while they were those requiring 4 or more days off since 1973. It is known, however, that the difference caused by this classification gap can explain only minor part of the proportionate difference in the number of reported cases.

Figure 3 shows the trend of illness attributed to work related causes[6, 7]. The decrease in the incidences appears to have started several years later than that of fatality, but the rates of reduction in both indicators of occupational burden to employed workers seem similar.

The effectiveness of the Industrial Safety and Health Law (1972) is considered to have depended substantially on the enforcement of constructing the organization for OSH management within each place of employment such as factory, plant, office or other establishment. The organization is composed of such personnel as General Safety and Health Manager, Safety Officer, Health Officer, Industrial Physician and Operations Chief, and most importantly, a committee (Safety Committee, Health Com-

mittee, or Safety and Health Committee) composed of above-mentioned personnel and workers who are recommended by trade union or the majority of workers where trade union does not exist. The worker representatives must occupy more than half of the total members except for the chairman. It is considered that this committee composed of experienced worker representatives and educated persons such as Safety or Health Officers and Industrial Physicians, who had received legally stipulated trainings on OSH, has played an important role for improving the workplace environment.

Another administrative measure which merits attention is the OSH program named Industrial Accident Prevention Plan formulated by the Ministry of Health, Labour, and Welfare (MHLW) every 5 yr. The planning of the program started in 1958 by the decision of the Cabinet, and from 1972 on, it has been executed as the duty of the Minister of HLW prescribed by the Industrial Safety and Health Law. The series of programs have served not only as guidelines for the related government officials and the public, but also as the bases for the formulation of budget.

A review of the past programs indicates that the weight of self regulation in comparison to legal control gradually increased since late 1990s. In the current 11th program that started in 2008, the promotion of employers' voluntary efforts to systematically evaluate and manage the health risks at workplaces is listed as one of the most important targets.

Current Situations

Rapidly changing economic, social and political environments in domestic and international settings have certainly made adverse effects on the current state of OSH in this country.

Although a significant improvement in workplace environment has been achieved so far, many risk factors such as overwork, mental stress, chemical agents and others are still continuously imposing heavy burden on the health of workers.

Injury and illness statistics

Injury statistics show that work related injuries are still prevalent in several types of industries. The industries in which recent incidence rates remain at higher levels in spite of the past considerable reduction are listed in Table 1. In addition, it is reported that the average incidence rate in workplaces with less than 50 employees is about twice higher than that in larger enterprises.

Table 1. Number and incidence rate (1/1000) of injury/death in selected industries with higher rates in 2010

Industry	Number	Rate
Forestry	2,149	28.6
Fishery	436	14.0
Mining	322	13.9
Land transportation	13,040	7.0
Construction	21,398	4.9
Harbor loading/unloading	219	4.7
Manufacturing		
Molded product	162	7.6
Timber and wood product	1,668	7.4
Ship	556	7.1
Metal product	3,475	4.8
Earthen and stone product	356	4.7
Manufacturing, total	23,028	2.6
Total of all industries	107,757	2.1

One of the matters of recent concern is the slight increase of injury/death rate in tertiary industry. Although the rate is less than the average, the number of workers in this sector is steadily increasing and the number of injuries/deaths amounted to more than 40% of the total in 2010.

Considering the incidence rates and the actual numbers of injured workers, the MHLW listed the following industries as more important objects of preventive effort in the 11th Industrial Accident Prevention Plan (2008–2012): manufacturing, construction, land transportation, forestry, tertiary industry, harbor loading/unloading, and mining.

The number of newly compensated occupational illnesses in 2010 was 8,111 of which 61.2% were low back pain due to accidental load. Others include heat disorders (10.1%), pneumoconiosis and its complications (6.4%), illnesses due to chemical substances (2.9%), upper limb disorders (1.7%), illnesses due to biological agents (1.6%) and others occupying less than 1% each[6, 7]. It must be mentioned that the number of newly diagnosed cases of asbestos related malignancies (cancer and mesothelioma) due to past heavy exposure rapidly increased since the beginning of this century and amounted to 1,784 in 2006[6]. About 1,000 new cases have been recognized and compensated every year since 2007[6, 7]. These numbers are not included in Fig. 3, the purpose of which is to show the long-term change in general quality of workplace environment. Since the morbidity statistics of occupational illnesses are prone to underestimation, the data used in Fig.3 need to be cautiously interpreted anyway.

On the basis of similar information as of 2007, the

Table 2. Administrative priorities in Industrial Accident Prevention Plan (2008–2012)

a. Promote risk-based management of work related risk factors in general
b. Promote risk-based management of chemical substances
c. Prevent accidental injuries due to machines
d. Prevent injuries due to slips and falls
e. Prevent pneumoconiosis due to tunnel construction, arc welding and metal abrasion
f. Promote better compliance with regulatory measures to prevent chemical hazards
g. Promote health management by making good use of obligatory medical examinations
h. Protect mental health of workers in addition to preventing illnesses due to overwork

MHLW selected eight areas of high priority as the targets of administrative activities for the current 5-yr Plan (2008–2012) (Table 2).

Chemical substances

According to the report by the MHLW, the number of occupational illnesses due to chemical substances was 235 in 2010[6, 7]. Majority of these cases were acute intoxication by accidental exposure to gases, vapors or caustic liquids. Carbon monoxide and organic solvents are two distinct causes of these cases. Evident cases of occupational illness caused by repeated exposure to chemical substances are rather rarely found these days. Workers' exposure to chemicals has been greatly reduced since around 1970.

Employers are forced to comply with the related ordinances in which fairly precise measures to control work environment and work practices are prescribed for about 100 chemicals. Compulsory measurement of workplace concentration of these specified chemicals is certainly one of the important factors that have contributed to the past improvement. This regulation was based on the Working Environment Measurement Law (1975). However, there are several reasons to believe that excessive exposures judged by the comparison with occupational exposure limits or their derived indices still exist in many workplaces even though degrees of exposure may not often reach clearly hazardous levels. According to a report by Japan Association for Working Environment Measurement, established on the basis of the Working Environment Measurement Law, the proportion of unit work area classified as the category that needs prompt improvement was 5.7% on the average in 2009[6].

Reports on the compulsory health examinations of workers exposed to those specified chemicals also suggest the presence of exposure that cannot be disregarded. For example, 69,617 lead exposed workers in 3,949 workplaces received the special health examination prescribed by Ordinance on Prevention of Lead Poisoning that includes the quantitative analysis of blood lead of all workers in 2010. Out of them, Industrial Physicians classified 1,032 workers (1.5%) in the category that requires the reduction of exposure or the follow-up[6]. These and other similar data at present cannot be rated significantly better than those in 2007 when the MHLW listed two items concerning chemical risk control as important targets in the Accident Prevention Plan (2008–2012).

Furthermore, great numbers of chemical substances other than the above-mentioned regulated chemicals are used at workplaces and are inevitably under the voluntary management by employers. In order to ensure appropriate protection of every worker from chemical hazard, the Industrial Safety and Health Law was amended in 2006 by adding a new provision that compels all employers to make effort to practice risk-based prevention of health impairment due to chemical substances.

With the same intention the MHLW has been conducting a systematic risk assessment operation of hazardous unregulated chemicals since 2006 on the basis of Ordinance on Industrial Safety and Health that was amended for this purpose. Several tens of chemicals are selected annually by priority of the type of toxicity and officially announced as the subjects of risk assessment for the year. All employers who produce or use 500 kg or more of any of the announced substances in their workplaces per year are assigned the duty to report pertinent information to the Labour Standard Inspection Office. After combining all the information, the MHLW selects workplaces where workers are estimated to be exposed to higher concentration, and evaluate the workers' exposure in those workplaces mainly by personal exposure measurements. Health risk of workers is evaluated by the comparisons between individual exposure concentrations and occupational exposure limit. The question whether a regulatory action is needed or not is studied by a specified committee. Public comments and opinions from related industries are considered in study procedure to reach the conclusion that will be reasonably balanced between regulatory and voluntary controls.

In 6 yr from the start, 115 substances were submitted to the survey and 9 substances (formaldehyde, 1,3-butadiene, diethyl sulfate, nickel compounds, arsenic and its compounds, propylene oxide, 1,4-dichloro-2-butene, 1,1-dimethylhydrazine, 1,3-propanesultone) have been

newly put into regulation by adding to the list in Ordinance on Prevention of Hazards due to Specified Chemical Substances. Although the types and degree of hazards inherent to nano-materials are not fully elucidated so far, these materials are given priority to be assessed in this project within several years. In view of the results hitherto obtained, it is considered that this operation is a very effective scheme for the risk-based management of chemical substances and deserves continued implementation.

The formerly unknown toxicities of chemical substances occasionally pose a serious problem to which we should be alert. A typical example that occurred recently in Japan is the health impairment caused by the intense lung toxicity of indium, a metal element used in large quantities for the production of liquid crystal displays and other display devices. The toxicity of indium had been poorly investigated and its hazard underestimated. A worker who had been exposed to indium-tin oxide (ITO) dust, a sintered material containing 90% indium oxide and 10% tin oxide, for four years since 1994 was admitted to a hospital in 1998 with the complaint of increasing dry cough and breathlessness and died of bilateral pneumothorax[8]. The underlying pathological finding of this first reported case of indium lung disease was mainly the interstitial pneumonia.

Up to 2010, 10 cases of lung disease attributed to indium had been reported: 7 cases of interstitial pneumonia from Japan, 2 cases of pulmonary alveolar proteinosis from US and one case of pulmonary alveolar proteinosis from China[9]. Epidemiological studies on Japanese workers demonstrated that the serum concentrations of the markers of interstitial pneumonia (KL-6 and others) were significantly elevated in high proportion of exposed workers[8, 9]. Chest HRCT also indicated the presence of interstitial changes in workers with higher exposure histories[10].

Soon after the first case was reported in 2003[8], the MHLW recognized the severe pulmonary toxicity of ITO and issued a notification that requested related employers to reduce workers' exposure. Subsequently, long-term inhalation toxicity studies in rats and mice had been performed by the Japan Bioassay Research Center on the initiative of major manufacturers[11].

The remarkable findings in the 104-wk carcinogenic and chronic toxicity study were the significant excess of lung cancer in rats and varieties of pathological changes in the lung of rats and mice at the lowest exposure level (10 μg/m^3). NOAEL (no-observed adverse effect level) could not be decided[11]. In addition, hardly soluble indium compounds have been shown in other studies to possess a marked tendency to accumulate in the lung[9, 10]. Although the excess risk of lung cancer has not been observed in humans yet, the extraordinarily potent carcinogenicity and toxicity found in these animal studies make this metal element an object of serious concern.

In view of these aspects, the MHLW issued a technical guideline for preventing health impairment of workers engaged in the ITO handling processes in Dec. 2011. Furthermore, indium is to be added shortly into the list of substances regulated by Ordinance on Prevention of Hazards due to Specified Chemical Substances. This case exemplifies the difficult task of risk management of a substance for which a very low 'Acceptable Exposure Concentration Limit' (0.3 μg/m^3) has been assigned by an expert committee of the MHLW. In addition to the best effort to reduce workplace concentration, employers are required to control the personal exposure of workers to less than 0.3 μg/m^3 by using high performance respiratory protective devices.

Overwork and mental stress

Overwork and mental stress are the outstanding risk factors in modern occupational environment. It is known that overwork can aggravate cerebrovascular disease and ischemic heart disease. The number of these diseases reported as attributable to overwork has been around 300–400 in the past 10 yr, among which fatal cases occupied 45% on the average[6, 7]. Since it is often difficult to achieve sufficient reduction of workload by the primary prevention strategy in current competitive society, organized efforts are being given to early diagnosis of these diseases and prevention of worsening by the change of life style in addition to the amelioration of work environment on the individual basis.

Mental health impairment is closely associated with mental stress owing to socioeconomic difficulties and overwork. Since suicide statistics are sensitive indicators of mental health of population, trends of suicide in whole population and employed workers in Japan are shown in Fig. 4[12]. The annual incidence of death by suicide suddenly increased in both populations in 1998, and continued to stay high except for slightly decreased incidences in 2009 and 2010. The mean of death rates in whole population through previous 10 years (1988–1997) was 18.0/100,000, while that in later 10 yr (1998–2007) was 25.6/100,000, the excess risk being 42%. In employed workers, the death rates were consistently about 40% lower than in whole population, but the excess risk in later 10 yr (1998–2007) compared to previous 10 yr was 38% (10.9 versus 15.0), almost the same value as in whole population.

Fig. 4. Number of death by suicide in Japan.

A review of past incidences of suicide indicates the marked association with socioeconomic conditions. In Fig. 4, the peak around 1985 may have been associated with Oil Crisis, and the extraordinarily sustaining peak after 1998 may certainly be associated with the current socioeconomic difficulty that resulted from the collapse of bubble economy.

Although these data do not necessarily indicate that the risk factors in occupational environment are dominant causes of suicide and underlying depressive disorders in workers, the high incidences of these illnesses themselves are surely the problem that must be tackled. The MHLW listed the protection of workers from illnesses caused by mental stress and overwork as one of the eight priority areas of administrative effort in the Industrial Accident Prevention Plan (Table 2). Several preventive measures strongly advanced by the MHLW include the restriction of excessive overtime work, the education of psychiatrists and Industrial Physicians to develop their competency in occupational mental health practice, and the establishment and the promotion of mental health service facilities. However, the evidence of significant improvement has not been obtained yet.

Other risk factors

Health impairments due to physical hazards are still the important targets of prevention. Heat disorders appear to be increasing in accordance with the recent climatic change. In 2010, when the summer was exceptionally hot, the number of deaths caused by work related heat stress was 47, more than twice as many as that in the average year. Considerable numbers of outdoor workers are conveyed to emergency hospitals because of heat disorders in these years. The MHLW recently issued a revised guideline for the prevention of heat disorders in workers.

In order to further promote the risk-based management of hand-arm vibration, the MHLW issued a revised guideline in 2009 to facilitate employers to assess and manage the exposure on the basis of ISO standard.

The ionizing radiation exposure of workers engaged in emergency operations at the Fukushima Nuclear Power Plant is a matter of grave concern. The unusual risk suddenly occurred on March 11, 2011 and will continue to exist to the future. The best efforts are being made for the risk management of those workers in addition to the construction of the system of follow-up health examination, in which possible latent effects of ionizing radiation will be monitored and cared for.

Another risk factor that has attracted attention is the passive smoking of workers. The MHLW issued a guideline in 2005, requiring the employers to practice the total or spatial restriction of smoking. However, in view of the large number of workers at risk, especially those in service industries in which spatial restriction may not be effective enough, the amendment of the Industrial Safety and Health Law was proposed recently by the Labour Policy Council for the purpose of strengthening the control of passive smoking. It will be deliberated at the Diet by due process.

Table 3. Approximate number of personnel with prescribed expertise in occupational safety and health in Japan

Enterprise manager	Safety Officer*	116,000
	Health Officer*	145,000
	Safety and Health Promoter*	423,000
Industrial Physician*		83,000
Consultant	Industrial Safety Consultant*	4,800
	Industrial Health Consultant*	3,900
Working Environment Measurement Expert*		28,000
Enforcement	Labour Inspector*	3,100
	Government official	8,600
Occupational health nurse		9,500
Industrial counselor		48,000

* Legally prescribed job category.

Human resources and research

Table 3 shows the number of main personnel categories engaged in OSH. The number of enterprise managers was estimated using two governmental statistics[13, 14], in which the number of enterprises by size of employees[13] and appointment rates of related personnel[14] were reported. For example, the mean appointment rate of Health Officer in enterprises with 50 or more employees was 86.0%, and that in 1,000 or more employee category was 98.8% in 2010. The rate for Safety and Health Promoters in

enterprises with 10–49 employees was 43.0%. These appointment rates have steadily increased to date, suggesting the gradual advancement of employers' positive attitude toward OSH.

The total of the numbers in Table 3 is 0.87 million. If the other personnel such as Operations Chief and worker representatives attending Safety and/or Health Committee are added to the sum, the estimated human resources may amount to 1.5 million, because the number of enterprises with 50 or more employees was about 150,000 and the mean establishment rate for the committee was 84.7% in 2010.

The Industrial Physician in Japanese OSH system is assigned for a role that is as prominent as in other countries. The University of Occupational and Environmental Health was established in 1978 for the purpose of training occupational physicians and other professionals such as occupational health nurses and hygienists. Many of the graduates of this university have been positively engaged in occupational health with qualified expertise.

Researches on occupational health have long been actively conducted by investigators in medical colleges or medical schools of universities and a few selected institutes. The National Institute of Occupational Safety and Health (JNIOSH) is a national research institute first established in 1942 and its research activities have been making a substantial contribution to research promotion specialized in OSH since then. It publishes the Industrial Health, the oldest international journal on OSH in Japan. Besides the main traditional research forces, occupational physicians and nurses also have contributed significantly to research outcomes recently.

The leading academic organization engaged in occupational health research is the Japan Society of Occupational Health with 7,500 members. It publishes the Journal of Occupational Health, an international journal. Other academic organizations that mainly concern OSH include the Japanese Society of Occupational Medicine and Traumatology, the Japan Occupational Hygiene Association and several associations specialized in mental health.

Challenges for the Future

The past activities of improving the level of OSH have been generally fruitful in Japan. As a result, we have acquired fairly well developed management organizations for OSH in middle and large scale enterprises, human resources of considerable mass, useful experiences, and more positive attitude of employers to OSH. On the other hand, there is no doubt that many problems exemplified by overwork and mental stress remain to be solved.

Furthermore, the economic, social and political environment foreseen for the near future is considered to adversely affect OSH rather than to influence favorably. The anticipated negative factors include the increasing intensification of work due to competitive environment, the breakdown of large business units into smaller ones with resultant weakening of OSH management, the increasing importance of non-standard forms of employment such as part-time working, increased use of agency work, and subcontracting, the increasing proportion of aged workers, the decline in trade union membership, and greater job insecurity. The proportion of smaller enterprises in the future will be as large as ever. These are common situations nowadays among industrially matured countries and do not specifically characterize Japan. However, the rapid decrease of population in the coming several decades and concurrent reduction of the size of economy are the matters of serious concern because Japan will be one of the earliest countries to encounter such situation.

In order to cope with those difficulties and to maintain the similar pace of progress that has been achieved to date, it is strongly hoped that the faithful efforts will be made by everyone who constitutes the human resources in OSH. Considering the probable decline of economical resources in the future, the increase in the efficiency of OSH management seems indispensable. The level of efficiency is highly associated with the competence of related personnel and the level of scientific basis. A point that stimulates our interest is the merit of human resources in comparison with others. Willingness and competency of individuals may be able to counterbalance or even exceed the amount of deficiency in economical resources. Thus, it seems well-founded to conclude that high priorities should be given to education and research as the fundamental policy for the future.

Concerning the strategy for pursuing the efficiency of OSH management, the merit of risk-based management is evident. From the standpoint of legislative administration, the adequate balance between enforcement and self regulation surely contributes to the efficiency of management. It may also foster understanding and favorable attitude of employers toward OSH. Therefore, it is considered that the judicious judgment and the active implementation by regulatory authorities on general and particular policies are the necessary conditions for the future success even though the tendency toward budget reduction may exert some undesirable influence on OSH.

References

1) Ministry of Health, Labour and Welfare (2011) Report of the survey on industrial accident. http://anzeninfo.mhlw.go.jp/user/anzen/tok/anst00.htm. Accessed April 24, 2012.
2) Japan Industrial Safety and Health Association. Trends of death and injury due to industrial accident (2010) http://www.jisha.or.jp/info/suii.html. Accessed April 26, 2012.
3) Ministry of Economy, Trade and Industry. Indices of industrial production. http://www.meti.go.jp/english/statistics/tyo/iip/index.html. Accessed April 26, 2012.
4) Ministry of Internal Affairs and Communications, Statistical Bureau, Director-General for Policy Planning & Statistical Research and Training Institute. Results of the population estimates. http://www.stat.go.jp/english/data/jinsui/2.htm. Accessed April 28, 2012.
5) Ministry of Internal Affairs and Communications, Statistical Bureau, Director-General for Policy Planning & Statistical Research and Training Institute. Historical data 6. Employed person by occupation—Whole Japan. http://www.stat.go.jp/data/roudou/longtime/zuhyou/lt06.xls. Accessed April 28, 2012.
6) Japan Industrial Safety and Health Association (2012) General Guidebook on Industrial Health.
7) Ministry of Health, Labour and Welfare (2011) Survey of diseases due to work related causes. http://www.mhlw.go.jp/bunya/roudoukijun/anzeneisei11/h22.html. Accessed April 30, 2012.
8) Homma T, Ueno T, Sekizawa K, Tanaka A, Hirata M (2003) Interstitial pneumonia developed in a worker dealing with particles containing indium-tin oxide. J Occup Health **45**, 137–9.
9) Omae K, Nakano M, Tanaka A, Hirata M, Hamaguchi T, Chonan T (2011) Indium lung-case reports and epidemiology. Int Arch Occup Environ Health **84**, 471–7.
10) Nakano M, Omae K, Tanaka A, Hirata M, Michikawa T, Kikuchi Y, Yoshioka N, Nishiwaki Y, Chonan T (2009) Causal relationship between indium compound inhalation and effects on the lung. J Occup Health **51**, 513–21.
11) Nagano K, Nishizawa T, Umeda Y, Kasai T, Noguchi T, Gotoh K, Ikawa N, Eitaki Y, Kawasumi Y, Yamauchi T, Arito H, Fukushima S (2011) Inhalation carcinogenicity and chronic toxicity of indium-tin oxide in rats and mice. J Occup Health **53**, 175–87.
12) National Police Agency 2010. Suicide statistics. http://www.npa.go.jp/safelife/seianki/220513H21/jisatsunogaiyou.pdf. Accessed May 3, 2012.
13) Ministry of Internal Affairs and Communications, Statistical Bureau, Director-General for Policy Planning & Statistical Research and Training Institute. Economic Census, Establishment and Enterprises Census. http://www.e-stat.go.jp/SGI/estat/NewList.do?tid=000001034755&cycode=0. Accessed May 6, 2012.
14) Ministry of Health, Labour and Welfare (2010) Basic survey on industrial safety and health. http://www.mhlw.go.jp/toukei/list/49-22.html. Accessed May 6, 2012.