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Special Issue

Occupational Health and Safety in Korea

Risks and Safety of Korean Society

Research Trend

The 1st Korean Working Conditions Survey

Asbestos Exposure and its Health Effects in Korea

Policy · Law

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OCCUPATIONAL SAFETY & HEALTH RESEARCH INSTITUTE

Illustrator Jeong-In Cha

A big tree grows from a tiny sprout,
and a sky-high building starts from single brick.
This means that fundamental is essential in every work.

- From Taoism -

Activities for promotion of safety and health in workplaces
can be only achieved by complying with basic rules and principles fully.
Safety and health professionals all over the world
get together to make it come true.

- Celebration on the 18th World Congress
on Safety and Health at Work -

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Special Issue

Occupational Health and Safety in Korea

What has happened and what's going on?

Introduction

Republic of Korea has achieved a great economic growth and industrial developments for a brief time span. National policies in the various areas have been set primarily to pursue the goal of economic development during last four decades. Rapid economic growth and industrialization resulted in both good and bad sides. Environmental impaction and occupational safety and health problems are apparently adverse effects. In the early stage, these problems were considered as unavoidable side effects and necessary cost for the economic growth. Therefore, the occupational safety and health was given relatively little attention in the early stage of industrial development.

There was relatively little of regulation on occupational safety and health and no substantial enforcement was made before the 1960s. Although the National Workers Compensation Insurance Scheme has been introduced in 1964, the field of prevention has been quiescent until the 1970s. Safety and health regulations and provisions had been set as a part of the Labor Standard Act until the first separate the Occupational Safety and Health Act was enacted in 1981. A series of historical occupational diseases have been disclosed and they played as a driving force to innovate the OHS legal and management systems.

In 1987, it was established the Korea Industrial Safety Corporation (KISCO, now it became the Korea Occupational Safety and Health Agency; KOSHA), a governmental subsidiary organization funded from the Workers Compensation Insurance Fund. As a result, the 1990s saw unprecedented expansion in both quantitative and qualitative terms. The Occupational Safety and Health Act was fully revised in 1990. Four separate Enforcement Decrees (that are equivalent to National Regulations) were newly promulgated to set specific safety and health regulations. Apparently workplace safety and health has been greatly improved due to these efforts. Dramatic reduction of occupational injury and illness rate was achieved until we faced the economic crisis of 1997.

For last 10 years, the priority matter was economic restoration. The OSH area has been shrunken by budget-cutting and deregulations. No more observation was made for occupational injury and illness reduction.

During recent 10 years after the 1997 economic crisis, Korean society has been dramatically changed in virtually every aspect including political, economic, social, technical and cultural systems. However, the fundamental OSH regulatory scheme set in two decades ago remains. It has been argued on the effectiveness, efficiency, appropriateness of the OSH regulatory systems upon the current circumstances.

Neo-liberalists counter with the claim that much safety regulation infringes on business freedom and it hurts business competitive advantages. On the other hand, OSH professionals and union insist that deregulation has imposed unacceptable risks on the workers. They also have regularly asserted a "right to safety" and argued that the privatization of OSH services, left to private market's own devices, will deteriorate workers' safety and health conditions.

During last few years, there has been considerable discussion to explore the best way to move forward. While many of the problems that confronted in the 1980s and 1990s have remained yet, new challenges, particularly relating to occupational health, have risen up the agenda. The rapidly changing economic, political, social and cultural environment has thrown up new challenges in the form of new responsibilities and new demands.

Currently, the Korean OSH Act, which largely relied on the command-control regulation model, is on the table to introduce a broad goal setting, non-prescriptive model, based on the "new risk assessment approach" that has widely been adopted as a general principle in the OSH regulation framework in the EU.

Historical Brief on Occupational Safety and Health

Legislation and administrative bodies for OSH have changed over time with the economic and social developments. The major transitions are briefly described.

● Start of Modern OSH Regulation (1945 ~ 1960)

The first regulation pertaining to occupational safety and health was stipulated in the Labor Standard Act enacted in 1953 in the midst of Korean War. Some specific standards were set for machines, equipment, facilities, and environments in workplaces, and ten articles on safety and health were introduced, including articles on appointing safety and health managers. This was the first modern OSH regulation in Korea. However, there were virtually no industries to be regulated since its enforcement ordinance was not prepared until 1961. During this period, Labor Bureau a part of Ministry of Health and Social Affairs was the enforcement


Seoul in ruin after the Korean War

body and there was no separate department to deal with occupational health and safety issues.

● Minimum Intervention during the Economic Development (1961 ~ 1979)

The governmental intervention for OSH was prepared as a part of economic development plans in this period. The Industrial Accident Compensation Act was enacted in 1964 and a separate Labor Agency was established outside of the Ministry of Health and Social Affairs together with its local branches to carry out accident compensation program. Annual workers health examination was introduced to screen compensable cases with definite occupational diseases. This practice of annual examination has been maintained up to now.

● Starting with the Separate OSH Act (1980 ~ 1987)

In 1981, the Ministry of Labor and Industrial Safety was established and the separate OSH Act was enacted. This was basically to address the rapidly changing industrial society of the 1980s. Occupational injury and illness had been getting serious due to scale up and speed up of the machinery, manufacturing, chemical plant and construction projects. The number of occupational diseases increased due to the massive use of hazardous chemicals. However, except the introduction of workplace environmental monitoring program in 1983, no substantive change was made in the early of 1980s.

The world' s best shipbuilding industry

● Development of OSH regulation and Institutions (1988 ~ 1997)

In 1988, a big change was made by the long series of people's demonstration. The constitution was revised to introduce the direct vote for the president election (previously it was an indirect vote in the assembly). This change of political institutes into a more democratic system was accompanied by profound changes in occupational safety and health field. Series of disclosure of hitherto undiscovered occupational diseases were made including mercury, cadmium, and carbon disulfide poisonings. The democratic mood and a series of disclosure of serious occupational diseases led to three remarkable changes. One was the establishment of the Industrial Accident Prevention Fund supported by the Workers' Compensation Insurance Fund. With this fund, the Korea Industrial Safety Corporation (KISCO), later its name was changed to the Korea Occupational Safety and Health Agency (KOSHA) was established. Lastly, the full revision of OSH Act was made in 1990.

One thing to note in this explosion of health and safety awareness is the inertia of existing health and safety professionals. Most of the new discoveries were made by young activists who were against the

opinion of the old authorities in the safety and health fields. Still the shortage of competent professionals, not just those in the established positions, is a challenge in Korea.


Pro-democracy movement

Since 1990s, faced with a heightened health and safety awareness both from labors and employers, attempts have been made for a search for the meaningful participation of those interested parties in the health and safety policies. The progress has been slow with a piecemeal introduction of various measures such as preparation of material safety data sheet, and participation of labor union in the selection of occupational service agencies for medical examination and workplace exposure measurements.

The pro-regulation mood from late 1980s lasted until middle of 1990s. This period was an era of an enormous expansion of the OSH regulation in Korea. However, the heyday ended with the serious economic recession in 1997.

● Economic Crisis and Chaos (1998 ~ 2007)

The 1997 economic crisis leaded to significant changes to the Korean society. It was unavoidable to re-structure economic and social systems as well as industrial structure. Government pursued de-regulation policies and OHS fields were suffered from cut-offs and low priority.

Economic crisis in 1997

Neo-liberalism and anti-regulation ethos was overwhelmed. It was opened a private interest era that resulted in a powerful drive to press for reduction of the scope of government regulation. Some regulations were turned over to the invisible hand of the market with the good name of self-regulation.

Ironically, the Democratic Party, which is relatively in amity with the OSH protection, grasped political power in this period. Although it was unable to strengthen the OSH regulation since the highest priority of political agenda was set to economic restoration, the basic frame of OSH regulation and institutions remained without noticeable changes. Some argue that this is stagnation since there was a little advance in the OSH area comparing with other area.

● Current and Future (2008 ~)

As previously stated, Korean society has greatly changed in the virtually every aspect such as political, economical, social, technical and cultural systems. However, the main frameworks and

regulations remain as set in 1990s. Therefore, it has argued that it is necessary to revise and restructure the legal and institutional systems. It seems apparent that current legal and institutional system has limit to deal with the current problems and new issues emerging with new technology and new economic and social systems.


Miracle of the Han River

However, the general consensus how to make it is still far away. Labor union insists to strengthen the OSH regulation, on the other hand, management side persist to put more stress on de-regulation. Nevertheless, it seems to be generally agreed that we need a paradigm shift from the traditional command-control regulation model to performance based regulation model. It looks nice. However, we need to carefully think about what the performance based regulation means. It could be understood both as a tool for strengthen enforcement and as a self-regulation, the way heading to de-regulation. I believe most professionals and government officials have been eagerly trying to upgrade our OSH systems by raising this issue on the table for recent years.

Recently, OSH area is facing another challenge as new government, highly conservative and advocate of neo-liberalism started to sail with the announcement of "de-regulation policy". We are, however, optimistic to be able to improve the OSH systems although new government set the priority agenda in the economic development and de-regulation. Since a number of research and discussion have been made so far and currently it keeps actively going on in the government, research institutions and academia to make a consensus.

During discussion, we have been setting some criteria and developing several principles and golden rules such as the principle of risker payment (management by risker), 4R & 4W duties for riskers and limitation of immunity right to risker. Risker is a new word conceptually developed to indicate those who create, distribute, expose to risks. Thus, principle of risk payment implies that risks shall be managed by those who create, distribute and expose to.

The 4R stands for risk identification (RI), risk evaluation (RE), risk control (RC) and risk notice (RN). These four duties shall be imposed to riskers as a basic legal obligation. In the workplace, 4W shall be also the principle obligation that must be implemented and managed by employer. The 4W indicates workers consultation (WC), workers training (WT), workers participation (WP) and Workers representative (WR). These 4R and 4W duties are components of 'risk assessment concept' that is widely accepted in the EU with the OSH framework directive EC89/391. The concept of limiting the immunity right is that riskers shall make the proof that they manage the risks (created, distributed and exposed to by them) appropriately with reasonable basis as well as legal aspect.

These theories and concepts are being studied and discussed to publish a paper(s) in the journals so that we could share them with the professionals and to make open discussion in the near future.

Circumstantial Changes

Circumstantial changes relating to the OSH can be summarized as shown in the following figures for recent decade.

● Role and Function of Government

Past	21C
Policy decision Planned by a few of elites Too uniform	**Policy decision** Stakeholders' Participation Diversity
Enforcement Bureaucratic Fragmented Centralized	**Enforcement** Systematic Functional Decentralized
Evaluation of policy Lack of tools Subjective Based on quantity	**Evaluation of policy** Various tools Objective Qualitative evaluation

● Business Competitive Advantages

Past	21C
Capital **Land** **Workforce** **Techniques**	**Techniques/Knowledge** **Workforce** **Risk Management Capability** Financing, Purchasing, Production, Sales, HRM, Quality, Environment, Safety, Health **Social Asset** Industrial/IT infra Credit of society **Information Handling Capability** **Morale/Sociability** **Capital** Land

● Employment relationship

Past	21C
Life time employment Full time employment	Temporary employment Part-time employment
Collective employment	Individual employment
Royalty Academic Background	Personal Skill/Capability Experiences

● Nature of OH problem changes

Past	21C
Due to specific - localized - over-exposure - specific agents - for a certain group	**Due to specific** - wide area - at very low concentration - multi-components - for non specific group
Problem/Symptom based Post-control (reactive) Direct to problem Individual employment	System based Pre-control (proactive) Orient to management Comprehensive control

Changes of Characteristics of OH problem
➡ New Approaches to Control measure

Governmental Organization and Public Sectors

The Ministry of Labor (MOL) is in charge of planning, policy making, inspections, supports, and enforcement of OHS policy and act.

There are six regional agencies and forty local offices to conduct practices such as inspections and administrative and technical supports.

Total number of labor inspectors is 1,382 in the MOL as of the year 2006. Among the 1,382 labor inspectors, 298 inspectors are working in the OSH department.


The Ministry of Labor

KOSHA assists the MOL to protect workers' safety and health in the workplace by providing various services such as technical information, accident investigation, epidemiologic study, training, research, testing and certifying for safety machinery & equipments and personal protective equipments except for legal inspections.

KOSHA has the OSH Research Institute, the OSH Training Institute, 6 regional centers and 18 local branch offices. Total number of 1,319 personnel is working at the KOSHA as of 2007.

Private Sectors

There are basically five categories in the OHS private sectors.

● **Industrial Safety Management Association**

OSH consultations to the industry (mainly workplace safety area), training services, some services for legal inspections and regulatory safety audit under the permission and direction from the MOL.

● **Occupational Health Management Institution**

OSH consultations to the industry (mainly for workers' health), training services, some services for legal inspections and regulatory safety audit under the permission and direction from the MOL.

● **Workplace Environmental Monitoring Institution (Designated Measuring Agency)**

Under the permission and direction from the MOL, mandatory workplace monitoring services are provided.

● **Workers Health Examination Center (Designated Medical Facility)**

Under the permission and direction from the MOL, mandatory workers health examination services are provided .

● **Consulting Agency related to the Management Systems**

Consulting and certification services related to the management systems such as ISO 14000, OHSAS 18000.

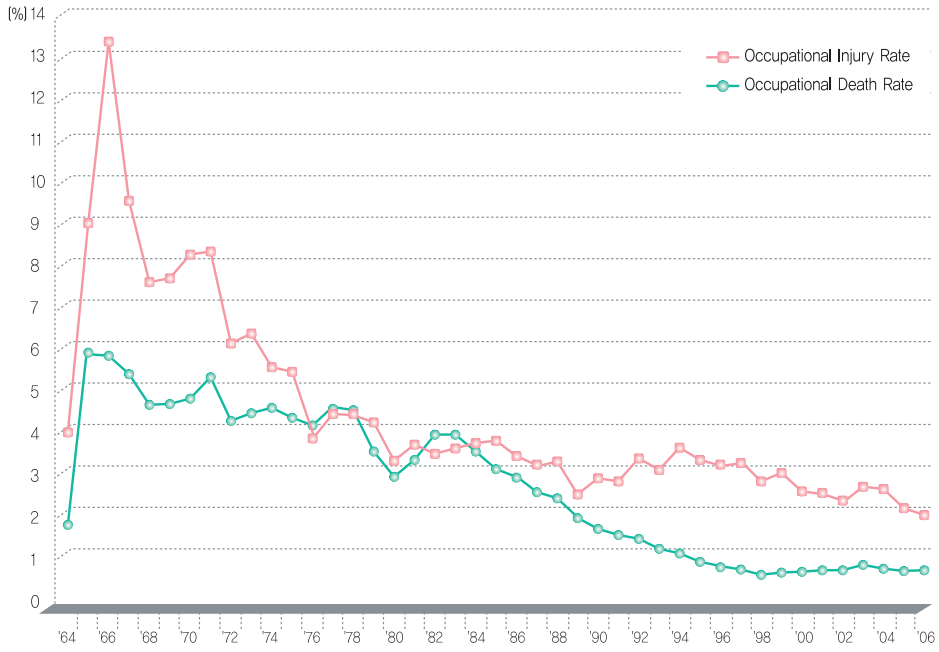
Framework of Workers Compensation Insurance

The Industrial Accident Compensation Insurance Scheme was established in 1964 to ensure that employers compensate for occupational injury and illness. The Act, the Industrial Accident Compensation Insurance Act was enacted compensation must made swiftly and equitably for injuries with funds collected from the employers. The Korea Labor Welfare Corporation (KLWC) was established to operate the insurance system, and to implement a variety of activities to prevent industrial accidents.

In 2000, the application scope was expanded to all business having one or more workers. The KLWC charges the applicable enterprises with insurance premiums to obtain insurance expenses. Workers are not held responsible for any costs involved in the insurance.

Occupational Injury and Illness Statistics

Occupational injury and illness rate have been decreasing until 1997 as shown in [Figure 1]. Fatality rate has sharply been decreased in the 1960s and 1970s. However, its reduction rate was very slow in the 1980s and 1990s. For recent decade, injury and illness rate shows staggering near 0.7% and fatality rate continuously drops down though it went slow.



[Figure 1] Occupational Injury Rate and Death Rate

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Special Issue

Risks and Safety of Korean Society

At present, Korean society is getting into "complex risk society" where more complex and diverse risks coexist concurrently, compared to fragmentary risks in the past. "Safety" can be described as a comprehensive result from technology system and human relationship. To free from risks and prevent disasters, we have to change our way of thinking from the start. In other words, we have to enhance the quality of our lives rather than to pursue the material abundance. If we look into dismal aspects of what we have done for development, we can find clues to make our society a safer and better place. To do so, we have only to have easy and composed attitudes and bring forth cultural renovation to create reliable organizations and practices.

Introduction

Modernism appeared itself with risks. That is to say, a new type of risk society that we couldn't see in the past appeared. As the risks from Western modernism reflect the characteristics of the society, the risks Koreans have experienced in a relatively short time reflect the nature of Korean modernism.

While the theory of risk society in the West is in a sense composed of concepts of post-modernism to overcome modernism itself after a long-term stage of industrialization and modernization, Korean experience is best described by the combination of two seemingly different types of risks. One type of risks is the result of compressed modernity characterized by failure of social coordination and high risk-taking propensity, and corruption, and another type of risks is best represented by advanced information technology and ecological problems as is shown in all other post-modern societies.

Increase in objective risks is not always followed by public perception. During the development era, Koreans seems to have ignored the increase of risks, and sometimes have regarded high-stake risk-taking as a heroic action as it guaranteed profit maximization at least in short-term. However, we all

should remember that extreme risk aversion corresponds to compulsion, and at the same time, extreme risk-taking is abnormal as well.

During the Korea's rush-to modernization, rapid growth was the highest value to be accomplished regardless of the fairness of the means in a short period. However, we had to face painful realities hidden below fruitful results of economic growth in our society. The power which has supported our high-speed economic growth was the main player to bring about risk elements on a large scale. This way, growth and risk are two sides of the same coin. High-speed growth made it possible for us to improve the standard of living, free from diseases and enjoy consumption, but it also brought about frequent industrial disasters, environment destruction, and a series of mass disasters.

Growth fetishism prevailing over the society resulted in the vulnerability of social system in hyper-growth. After all, 'miracle' and 'mirage' are not different from each other, but they are just the two-sides of the same social system. This vulnerability of hyper-growth system led to coordination failure in most of the sectors of the society, and they brought about unreliable principles of social organizations. These unreliable principles weakened the functions of social coordination and had large influences on social interaction.

Major accidents and their characteristics of 1990s[1]

The results of rush-to-development ended up with a series of big accidents in 1990s. When you mention big accidents, it means man-made disasters. Disasters can or do cause damages to our lives and our property. They include fires, collapses, explosions, traffic accidents, chemical & biological & radiological accidents, environmental pollutions, other accidents similar to them and disasters due to typhoons, collapses, heavy rain, storm, heavy snow, earthquakes, yellow dust, red tides and other natural phenomena equivalent to them, which are defined as damages of lives and properties required to deal with by a government or local autonomous entities. What is most interesting here is artificial disasters. Unlike natural disasters, man-made disasters we experiences can be divided into the one with system errors and the one with mistakes from architects, operators or participants. So it can be called as organizational disaster. Of course, this type of classification is based on analytic purpose.

Major accidents of 1990s are shown in Table 1. They have something in common if you look closely into them.

They can be summed up as follows: tendency of taking high risks, failures of social coordination and cooperation, insufficient emergency response system, political corruptions and unfair enforcement of laws, etc.

The way they tried to accomplish their goals regardless of fairness of means in a short period brought about growth fetishism. Though it succeeded in outward expansion of economy, it gave rise to weak growth of the social system. Particularly, it failed to bring social integration while many sectors of the society differentiated very rapidly.

<Table 1> Major accidents in Korea during 1990s

Description of accidents	Dates	Casualties
Collapse of Wooam Shopping Mall in Cheongju	Jan. 1993	28
Train derailment in Gupo Station in Busan	Mar. 1993	78
Asiana airplane crash	Jul. 1993	66
A ferry sunken in Wido	Oct. 1993	292
A fire on a excursion ship at Chungju Lake	Oct. 1994	29
Collapse of Seongsu Bridge	Oct. 1994	32
Gas explosion in Mapo	Dec. 1994	13
Gas explosion at subway in Daegu	Apr. 1995	101
Collapse of Sampoong Department Store	Jun. 1995	502

The first common things found in the accidents of 1990s were the tendency of taking high risks. When P is the probability that an accident can happen, L is the damage you will experience when an accident happens, and W is the gain you will have if an accident doesn't happen, a rational and normal person will maintain W (1-P) >= LP. But if you ignore the safety regulations and the environmental conditions deteriorate, P will increase dramatically. Also the size of L will increase sharply. When high-risk taking is prevalent in a society, it may reflects that i) the values or believes to underestimate P (Probability that an accident can happen) are generalized, or ii) L (Damage you will experience), particularly the values of our lives, is greatly underestimated. The reason why the government, corporations or people tend

1) It is the excerpts from "Yee Jaeyeol, "Principles of Social Organizations on Safety Control: Social Organizational Review on the Causes and Countermeasures of Disasters," Lim Hyun Jin et al., <Risks and Safety of Korean Society>, Press of Seoul Nation University, 2003.

to take risks is that they think that safety is the costly countermeasures.

In fact, when you choose countermeasures with a lot of risks, you are more likely to maximize your returns at least in short-term calculation. Especially, people apply a very high discount rate to 'the values to be materialized in the future' when they experiences rapid changes in the society. In a society where people desperately want to save the present cost, risk-taking is identified as an efficient option for investment.

A high risk-taking society preferred 'speed' to 'safety', 'appearances' to 'substances', 'results' to 'processes', 'cost-saving' for the present to 'cost to be added' in the future. In the speed-stricken society, the cost you save today is transferred to the cost you pay for tomorrow, and the amount of cost will increase at a rapid rate. If everybody wants to save the cost for today, all the bills with payment postponed will flow into a day over the country and the total amount will be accumulated up to the verge of 'bankruptcy' rapidly.

The second characteristics are the failures of social coordination and cooperation. The unreliableness doesn't entirely rely on engineering defects. Abnormal distortions of social communications such as illegal practices to subcontractors or structured corruption elevated the probability of disasters. The other side of big accidents revealed the failures of organizations and markets.

The management of complex hardware, the human resources and the know-how are scattered piece by piece and out of harmony. If the levels or processes of communication are not properly applied when a certain level of combination is required in an organization, the whole system will get weakened. Compared to construction of space shuttle or nuclear power plant, the construction of bridges, dams or buildings doesn't require a complex organizational interaction.

In that sense, the most fundamental causes that we have experienced disasters in Korea are due to lack of cooperation to a minimum, not lack of adjustment to a maximum. That's why advance notices or emergency response system to disasters have not been operated.

Thirdly, the major accidents are closely associated with corruptions and private uses of power by governmental officials. Unreasonable regulations and excessively arbitrary judgment granted to law enforcers gave them pretexts for levying various forms of dues.

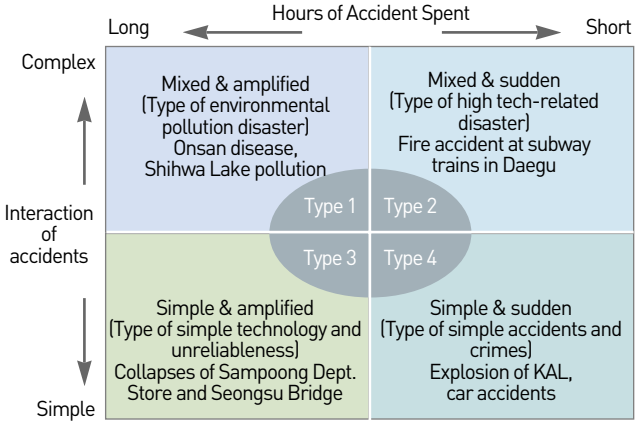
Types of disasters and their occurrences in Korea

After the period of the major disasters passed, however, new types of disasters started to appear in 2000s. The typical disaster was the fire accident at subway trains in Daegu in 2003.

<Table 2> describes the disasters based on interactions between accidents and average hours spent for accidents. The interactions between accidents explain the complexity of the system and technology, and the average hours spent explains how many hours the accidents consisting of a disaster were required. That is to say, it tells you about hourly combination between accidents. This kind of classification utilizes the

characteristics to be shown after reorganizing the disasters into the frame of accident structures. It can play a role of drawing out the diversities and characteristics of disasters hidden.

<Table 2> Classification of Disasters



This way, we can classify disasters into four types as follows: ① mixed & amplified, ② mixed & sudden, ③ simple & amplified, ④ simple & sudden. Each type of disasters has a relatively differentiation. The mixed & amplified type shows environmental pollution disaster. The mixed & sudden type shows high tech-related disaster. The simple & amplified type shows simple technology and unreliable constructions, and the simple & sudden type shows simple accidents and terrors.

Type 2 is about the mixed & sudden disasters which had a lot of interaction between accidents and required a few hours. In other words, it means that the disasters happened very quickly in a short time and meanwhile there were a lot of interactions between people and machines. Type 3 is about the disaster of the past (simple & amplified) which had less interaction between disasters and required a lot of hours. It means the disasters whose dangerous elements were overlooked for a long time. The disasters of mixed & sudden type cannot be identified by individuals due to their complex interactions and fast progressions, and there are a lot of possibilities the errors in the system design happen.

Taking into account the various characteristics from the fire at subway trains in Daegu, in other words, the characteristics of normal accidents from extreme rationalization of subway services and those of abnormal accidents from incendiary fires, the unintended results from intended technology and the failures of crisis incubation and organization study, the fire at subway trains in Daegu was definitely different from the disasters of Korea in the past. It shows not only that Korean disasters are changing but also that the disasters in the future will assume very diverse features like the disasters of the past (simple & amplified type) and those of today (mixed & sudden, mixed & amplified). Furthermore, it suggests that our society is approaching "dual-risk society" in that more complex and systematic risks coexist with the traditional risks of the past.

In a modern society, the complexity of system design will increase more and more. So it seems that it is difficult to avoid the possibility of errors. Errors of system design were developed by theorists who understood the organization as an open system. In other words, it is the errors in the process of designing system that amplify crisis by operating the system unintentionally due to unexpected problems. These errors happen when system needs complex interaction and tight coupling relation. If interaction between machines and people appears very complex and this situation gets very tense, the number of unclear cases increases by geometric progress. So it is not easy to design system which can deal with all the situations properly.

The nature of disasters in Korea is changing as well. It shows that the disasters in the future will assume very diverse features like the disasters of the past (simple & amplified type) and those of today (mixed & sudden, mixed & amplified). Furthermore, our society is getting into complex risk society where more complex and diverse risks coexist concurrently, compared to fragmentary risks in the past.

Risk structure and changes of Korean society

In addition to 'post-modern risks' Beck mentioned about, the risks we experience are very diverse and multi-dimensional. They come from environment or society. There are risks due to a specific geopolitical place as well. If you take these problems into account comprehensively, you can understand the risks that our society is facing[2]. It can be summed up in brief as follows:

First, they are the ecological risks in pending all over the globe. They are also the possibility of artificially-made self obliteration or representative disasters immanent in our society of advanced scientific technology which Beck et al. emphasized and paid attention to through the theory of risk society. Their typical examples are destruction of ozone layers, acid rain, forest destruction, disturbance of ecosystem, desertification, global warming, El-Nino phenomenon and extinction of species, etc.

The risks the earth ecosystem faces often result from reckless developments of the developed countries and excessive consumption of carbon energy. And the risks from ecosystem destruction and environmental pollution are not limited to some specific countries. Of course, Korea is not an exception as well. According to the millennium report announced recently, 60% of global ecosystem has been destructed[3]. The point of this report is that 2/3 of the benefits from nature is endangered, due to our reckless abuse of nature. Destruction of nature brings about the results that we get rid of the assets in advance our descendents will use. Sustainability of environment is also in severe danger.

Secondly, there are various forms of natural disasters Koreans are facing now. For example, it means the risks of our lives and properties, resulting from the natural phenomena such as typhoons, earthquakes, drought and heavy rain, etc. They are related to ecological risks all over the globe, due to industrialization, but there are quite a few natural phenomena regardless of those risks. For example, typhoons and heavy rain have been our natural disasters as Korean peninsula is placed in the Asian monsoon region. According to data from UNDP, when you assess the risks of natural disaster such as earthquakes, typhoons, floods and drought by country, the number of people who lost their lives from natural disasters for past 20 years amounts up to 1.5 million. For Korea, we have had 123 victims on the average (2.86/1 million), and it is a very low figure all over the world[4].

Thirdly, it is the risks of national security. It means the risks from military conflicts and confrontations at the quasi-state of war including wars. These kinds of risks are daily events after the Korean War. They were at the peak in the Korean War, and after that, Korea maintained the highest risks of security in the word, and under the regime of Kim Dae Jung president, they have been decreasing as Korea expanded exchanges and cooperation between North and South Koreas. Terrors against a governmental system and a national leader can be said to be an important example of risks of national security.

Fourthly, the risks of political suppression appear when a political group exercises its political power at its discretion to threaten our lives and security or force us into losses of our properties. In Korea, the violence over a wide range under military regimes can be said typical risks of political suppression. In those days, people who would not obey the military regime had to be deprived of their fundamental human rights, kept in custody, tortured, or have the lives of their family threatened. These risks have been reduced when the political democratization progressed, followed by the Civilian Government, the Government of the People and the Participatory Government.

Fifthly, the risks of economic lives means the situation people are threatened with the basic living expenses. The risks of economic lives from a long economic slump, economic disasters, high unemployment and insecure social safety net can be the risks on a social scale beyond individual problems. Koreans were once exposed to the extreme risks of economic

2) Regarding this part, see Yee Jaeyeol, Noh Jin Cheol, Seo Mun Ki, Lee Kyung Young and Hong Deok Ryul 〈Risk society and ecological and social safety〉 Korea Information Society Development Institute, 2004 pp. 33~54 and Lim Hyun Jin, "Social disorganization and new social and cultural risks," How can we cope with our society of risks and disasters, A paper presented at symposium of 27th anniversary of Asan Foundation, 2004.

3) According to this study, the changes of earth's surface, excessive exhaustion of natural resources, expansion of alien species, water and air pollution and climate changes, etc. have a direct effect on environmental destruction, and the elements of population and economy have an indirect effect on it. Don Melnick et al, Environment and Human Well-Being, A Practical Strategy, UN Millenium Project, Taskforce on Environmental Sustainability, London: Earthscan, 2005.

4) For reference, North Korea has 605 victims which shows the highest casualties, followed by Sudan (275) and Ethiopia (272). United Nations Development Programme, Reducing Disaster Risk: A Challenge for Development, UNDP, 2004.

lives during the Korean War and right after the war, and the progress of rapid industrialization helped Korean people to escape those situations.

Sixthly, there are the risks of technological disasters. Though the productivity and the conveniences of our lives have enhanced with technological development, the minute technological defects or errors can lead to big accidents. As you can see from Chernobyl nuclear accident and difficulties of nuclear waste treatment, nuclear energy is considered as source of horrible accidents. And there are the risks of technological disasters found in the industrial workplaces, large buildings and facilities, and they are likely to get bigger. In addition to them, transportations such as cars, vessels and airplanes have the risks of big accidents as well. On August 15, 2003, the blackouts in Canada and Eastern region of U.S.A caused subway trains, telephones and three airports to stop completely.

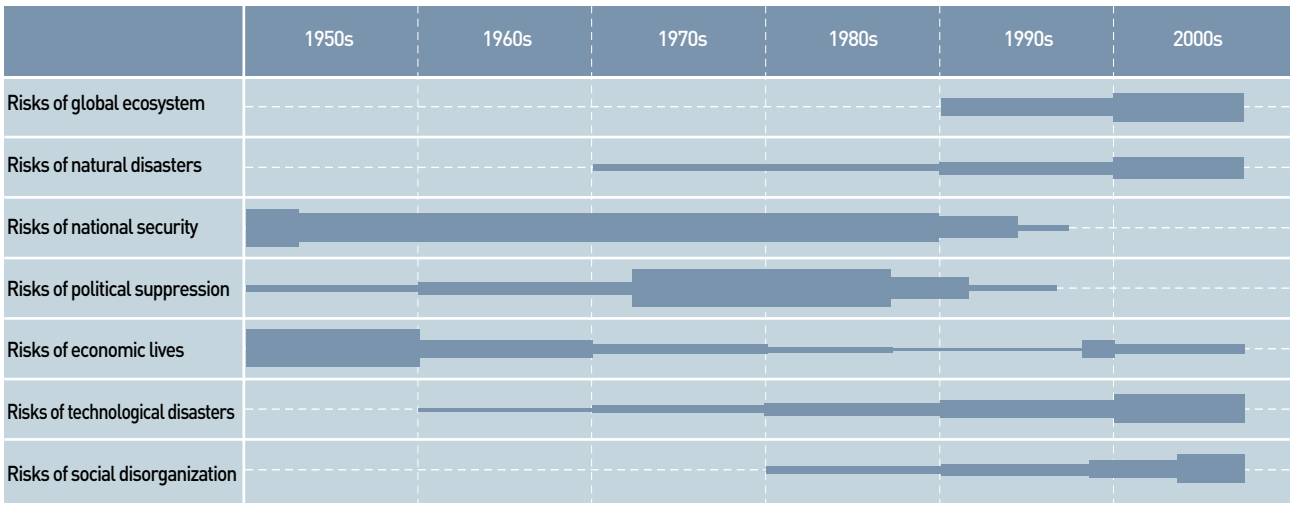
The functions of skyscrapers and traffic system get paralyzed as well. The key risks of 'risk society' Beck pays attention to are 'the risks of scientific technology.' That's because as Rachel Carson indicated, scientific technology is the source of surprising productivity and at the same time the source of imagination. The risks of technological disasters are moving to the new dimension along with development of recent information technology. As governmental administration and society are organized by information and communication system, the problems of a company or an organization spread rapidly like the crises of the society and those risks are more likely to grow into crisis. Besides, the risks are growing that our personal information is widely exposed and our privacy is threatened.

Seventhly, there are the risks of social disorganization. This is the situations that the organic dependent relationships among people are severely disorganized, or the hostile relations between people get bigger. Beck generalized it as a 'personalization.' For the former example, we can cite divorces and suicides in terms of personal matters, and for the latter example, we can mention ordinary violence and crimes. Social disorganization results from a variety of causes. The long extreme poverty caused street crimes. The loss of ethical leadership of people in the leadership class brought about collective selfishness. The intense competition among people leads to disorganization of the community's solidarity. The ordinary governmental violence under the authoritarian regime brought forth ordinary violence from home, schools and companies.

As the theory of risk society in the West indicated, Table 3 shows how Korea has watched the development of the society after the Korean War, considering various elements of risks that Korean society has, not limited to but including the possibilities of catastrophe of ecological dangers and extinction of species in the high industrialized society.

The risks of economy and national security after the Korean War have significantly decreased after the 1980s and the regime of Kim Dae Jung's government in 1998, and the risks of political suppression that reached the top in 1970s and 1980s have decreased a lot, due to progress of procedural democracy after 1990s, but the risks of technological disasters have increased, due to progress of industrialization. The risks of global ecosystem and social disorganization have continuously increased after 1990s.

<Table 3> Trend of risks in Korean society



* Thickness of lines indicates a relative size of risks, and this is the trend of the period.

Beyond that, it is thought to analogize the prospect of the society of Korean risks. First of all, it is highly likely for the risks of economic lives, national security and political suppression to keep decreasing in the future. The risks of technological disasters can be divided largely into two types. The first type is the risks of industrial and technological disasters. These risks cannot but to increase along with large dependency on technology in our society, but they will be influenced by maintenance of social system and by the degrees of social disorganization.

On the other hand, it is assumed that the risks of information technology will keep increasing for quite a long time as information technology progresses. However, the risks of social disorganization which will decidedly influence on the realization of the risks of technological disasters depend on how people can overcome the anomic status due to maintenance of national leadership and rapid changes in the society. By the way, the risks of global ecosystem cannot be solved by a country. They should be dealt with internationally by mutual efforts of the world. If not, the risk will increase in the future.

Considering the universality and particularity that the theme of a risk society has, our society can be defined as 'a dual and complex risk society.' What we need most in this 'dual and complex risk society' is to expose the elements of accidents and risks that are prevalent in our society which has gone through industrialization and information society concurrently, and at the same time experienced tradition, modernism and post-modernism. Through this concept, we can catch the western risks of the future including the elements of risks from 'compressed/crippled modernism', the risks from unpredictable environment and nuclear power, and the risks from gene technology. At the same time, we can understand the risks from insufficient investment on education and poor welfare environment.

Risk management and preparation

We have experienced 'evitable accidents' due to lack of adjustment and communications between social organizations and sectors. Frequent occurrences of similar disasters mean that we didn't learn from the pains of the past. According to a study, we have had our organizations for risk management well established, compared to big accidents of the past, but we aren't equipped with the learning mechanism to improve the system and practices by introspecting the whole situation of risk management.

After all, it is impossible to escape from risks if you only make a new mechanism or go campaigns temporarily. The complex risks structured in our lives are embedded in our practices or habits microscopically but expressed collectively and macroscopically. Another problem is that we didn't integrate our society and equip ourselves with ethical resources properly, unlike development of technology system and structures of the society.

To explain effective disaster management, we can use two approaches such as technological paradigm and cultural paradigm. In the technological paradigm, we can identify the risk elements in advance with help of development of scientific technology and make a design of safety devices for them. And we can accomplish our goals by classifying and taking control of the procedures and the contents of tasks to prevent disasters and training the workers.

In this technological paradigm, however, we think that the risk elements are basically measurable, calculable and predictable as we believe the risks 'objective' and 'neutral.' But the researchers based on cultural paradigm indicated that there would be risks if you deal with the safety problems only as technological problems. An anthropologist emphasized that our recognition of risks and our social attitude are closely associated with culture.

Social organizers placed emphasis on importance of 'a safety culture'. The reason is that the cultural practices of a person such as conviction, standards and attitudes heavily influence on the operation of the organization or whole system including technological elements. At this point, you should not consider a safety culture as a reified concept. A safety culture is a process, and it is supported by organizational practices. So you don't have to take 'a safety culture' simply as a cognitive process or knowledge. Rather, you have to understand it as a process for you to be equipped with learning capability.

The theory of organization learning places emphasis on importance of production and practices of knowledge. Particularly, it thinks an organization as a community for practices. It emphasizes that in this organization, a variety of activities happen in the social relationship, and the constituents get the embodied knowledge, and that the newcomers into the organization can understand the learning process naturally in the community.

Repetitive indications that the risk management system didn't change though accidents repeat means that the governmental organizations and their learning processes are imperfect. 'Safety' is defined as an emergent attribute of technological and social system. That is, it can be said to be a comprehensive result that is produced by interaction of technology and human relations. To free from risks and prevent disasters, we have to change our way of thinking from the start. In other words, we have to enhance the quality of our lives rather than to pursue the material abundance. If we look into dismal aspects of what we have done for development, we can find clues to make our society a safer and better place. To do so, we have only to have easy and composed attitudes and bring forth cultural renovation to create reliable organizations and practices.

A new civilization which we will experience in the future will make it possible what we have dreamed. However, technological progress will produce another problem we have to deal with. So we had better not think that our problem will be solved through technological process. In that sense, we think that the risk is an existent restraint that can be never solved.

The 1st Korean Working Conditions Survey

Research Paper

This survey aims to provide an overview of the state of working conditions in Korea, as well as indicating the nature and contents of changes affecting the workforce and the quality of work. The specific objective of the survey is to develop social & occupational health indicators for the working environment.

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Center for Occupational Disease Research, OSHRI

Background

The workplace has changed dramatically due to globalization of the economy, use of new information and communication technology, growing diversity in the workplace (e.g. more women, older and higher educated people), and an increased mental workload. Work itself and work environments play a significant determinant of workers' health.

The Foundation's European Working Conditions Survey, conducted every five year, has been providing a valuable insight into quality-of-work issues since 1990. The survey represents an effective means of tracking over time the impact of crucial issues and events: EU enlargement, the ageing workforce and pressures associated with an ever-increasing pace of life, competitiveness, productivity, globalization and restructuring. The survey report contributes to be a source of reference for policymakers and as the basis for further research.

Aim of the survey

This survey aims to provide an overview of the state of working conditions in Korea, as well as indicating the nature and contents of changes affecting the

workforce and the quality of work. The specific objective of the survey is to develop social & occupational health indicators for the working environment.

Survey methodology

KOSHA carried out its first Korean survey on working conditions in 2006. For the survey, a total 10,043 of workers were interviewed face-to-face in their own homes.

● Sampling

A representative sample of the economically active population aged 15-64 year, i.e. persons who were either employees or self-employed at the time of interview were selected. Retired and unemployed persons, as well as housewives and students, etc., were excluded. The basic sample design is a multi-stage random sampling. We used the Enumeration Districts in the 2005 Population and Housing Census for sampling.

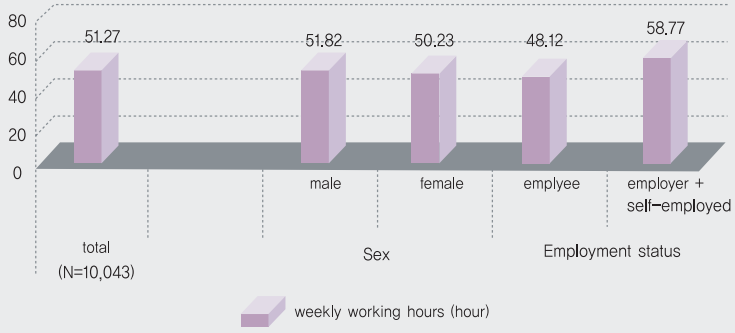
● Weighting

The survey weighting was carried out on the basis of the economically active population, which means that its distribution by region, locality, size, gender, age, economic activity and occupation is identical to that of the active population distribution.

● Questionnaire

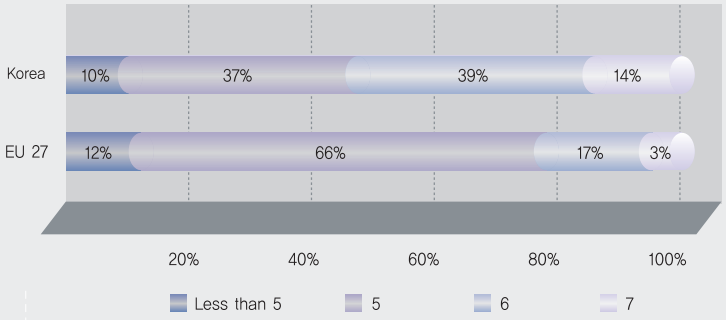
The contents of the questionnaire were as follows: occupation (1 item), job history (2 items), type of employment (1 item), the kind of employment contract (1 item), industry and main activity of the company (3 items), working time (14 items), working environment (10 items), physical workload, computer work, and emotional workload (13 items), provision of occupational safety and health information (1 item), job demand (5 items), job control (2 items), work-related stressor (12 items), working time arrangement (5 items), skill (1 item), violence and discrimination (8 items), communication (5 items), boss (1 item), health risk (2 items), absenteeism (3 items), satisfaction (3 items).

Main Findings

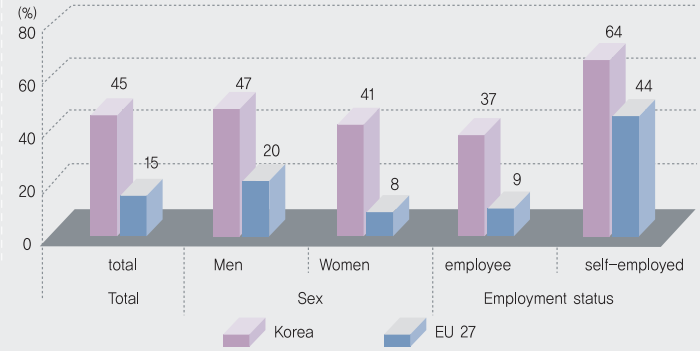


[Figure 1] Average weekly working hours

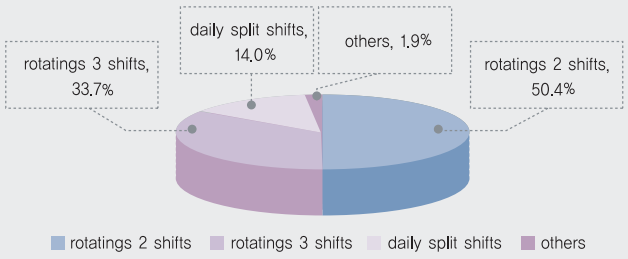
- Korean workers work average 51 hours per week (* EU27: 38.6 hours per week). Fifty three % of all workers work more than 5 days per week (* EU27: 35%). Forty five % of all workers work more than 48 hours per week (* EU27: 15%).



[Figure 2] Number of days worked per week

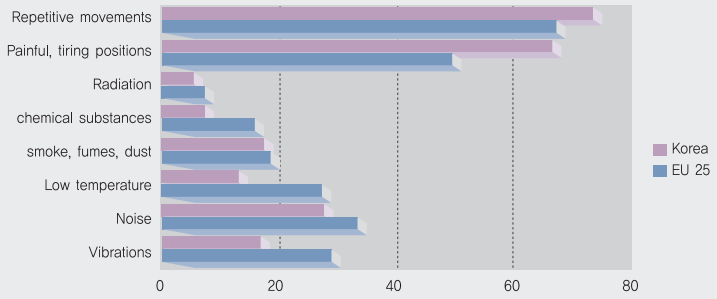


[Figure 3] Long working hours (48 per week)



[Figure 4] Shift work type

- Fifty four % of workers work outside normal working hours. The proportion of people working on Saturday and Sunday is 75% and 42%, respectively.
- Over 75% of all workers work the same number of hours every day and over 80% work the same number of days every week. Over 75% have fixed starting and finishing times.
- Around 10% of employees is a shift worker (* EU27: 17.3%). Rotating 2-shift is the most common type of shift work (50.4%)
- Sixty seven % of workers say they are 'satisfied' or 'very satisfied' with working conditions in their job (* EU27: 82%).
- Less than 1% of workers say they have experienced physical violence from people within workplace (0.3%) or physical violence from people outside workplace (0.6%), or bullying (0.7%) or harassment(0.6%) in the workplace (* EU25: violence from people within workplace 2%, violence from people outside workplace 4%, bullying and harassment 5%).
- The work intensity index* for Korean workers is 30 (* EU27: 45).



* proportions exposed a quarter or more of the time

[Figure 5] Exposure physical risks* (per 100 workers)

<Table 1> Work -related symptom per 100 workers

Symptom	Korea, 2006	EU27, 2005
Muscular pain	18.1	22.8
Stress	17.9	22.3
Backache	16.8	24.7
Fatigue	16.7	22.6
Headache	11.2	15.5
Irritability	not surveyed	10.5
Injuries	7.0	9.7
Stomachache	6.7	5.8
Sleeping problems	5.1	8.7
Eyesight problems	5.1	7.8
Skin problems	4.8	6.6
Anxiety	4.5	7.8
Depression	3.4	not surveyed
Hearing problems	2.7	7.2
Allergies	2.2	4.0
Respiratory problems	2.0	not surveyed
Heart disease	1.0	2.4
Other	0.4	1.6

<Table 2> Number of days of health-related leave in the previous 12-month period by sex

Sex	Average no. of days taken by workers	Average no. of accident-related days taken by workers	Average no. of other work-related days taken by workers
Korea average	**13.4**	**4.2**	**8.0**
Men	15.4	6.4	7.7
Women	11.0	1.5	8.4
EU27 average	**4.6**	**0.4**	**1.8**
Men	4.2	0.5	1.8
Women	5.0	0.4	1.7

- More than 60 % of workers are able to choose or change the order in which they perform tasks, their speed of work or their working methods (* EU27: more than 60%).

- The two most common risk for men and women are repetitive hand/arm movements and working in painful or tiring positions: 71% make repetitive hand/arm movements a quarter of the time or more, while 61% work in painful or tiring positions (* EU25: 62% and 46%). By occupation, the most exposed groups in painful or tiring positions are skilled agricultural and fishery workers, services in restaurants, driver and transporting work.

- The most often reported work-related symptoms are muscular pain (shoulder, neck, upper arms and lower extremities) (18.1%), followed by stress (17.9%), backache (16.8%) fatigue (16.7%) and headache (11.2%).

1) This index assign a value of 0 to 'never', 10 to 'almost never', 25 to 'a quarter of time, etc. The composite index is the average of two indicators** of work intensity. Two indicators for work intensity: 'working at a very high speed' and 'working to tight deadlines'

Asbestos Exposure and its Health Effects in Korea

Outcomes of asbestos exposure include asbestosis, lung cancer and mesothelioma. Researches show that mesothelioma, which is almost always caused by previous exposure to asbestos, has rapidly increased in many developed countries recently. However, regardless of asbestos exposure embedded in Korean history, reported cases of mesothelioma are very rare in Korea. This could be due to the reason that asbestos was not popularly used in the past as we anticipated or it is still in its latent period.

This paper will review the status of asbestos exposure, asbestos-related diseases and researches on asbestos in Korea.

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Department of Occupational Health, KOSHA

Introduction

Asbestos is a well known occupational and environmental carcinogen. Asbestos has been used in various industries in Korea for the purpose of insulation, anti-friction materials, and fire protection. An example of asbestos usage can be found in amelioration of traditional housing. Prior to the 1970s, traditional housing was covered with tiles or rice sheaves. However, when Korea entered the economic development period in 1970s, houses of roofs with rice sheaves in rural areas have been changed to roofs with slates that contained approximately 20% asbestos. This resulted in most of asbestos being found in roofing slates in Korea.

Outcomes of asbestos exposure include asbestosis, lung cancer and mesothelioma. Researches show that mesothelioma, which is almost always caused by previous exposure to has rapidly increased in many developed countries recently. However, regardless of exposure embedded in Korean history, reported cases of mesothelioma are very rare in Korea. This could be due to the reason that asbestos was not popularly used in the past as we anticipated or it is still in its latent period.

This paper will review the status of asbestos exposure, asbestos-related diseases and researches on asbestos in Korea.

Production and import

Asbestos mines had existed in Korea since the 1930s, where Korea was the leading asbestos producing country until the end of the World War II. Most of the asbestos produced in Korea was used for military purposes in Japan, and in 1944, the production of asbestos reached 4,800 tons. However, when the war ended in 1950s, the production of asbestos sharply declined (Choi et al, 1998).

Korea has virtually used asbestos since the government carried out the roof amelioration plan with asbestos corrugated roofing slate in 1972. Asbestos production increased again in the 1970s and reached 16,000 tons in 1982. Most asbestos was chrysotile, but some were tremolite. Asbestos production came to an end in 1990, with the total amount of domestic production of 165,445 tons.

From the Korea International Trade Association statistics, information on imported asbestos is available since 1976. According to the statistics, 74,206 tons of asbestos was imported in 1976, which were mostly chrysotile from


Canada. The amount of imported asbestos reached its peak with 95,000 tons in 1992, and decreased gradually to 4,748 tons in 2006. In 2006, the total amount of imported asbestos was found to be 1,698,188 tons.

However, it is undoubted that asbestos has been imported prior to 1976. This is because the roof amelioration project started in 1972 and ended in 1977.

According to the National Administration Reports, more than 2,233,000 houses changed their roofs from rice sheaves to asbestos corrugated roofing slates from 1972 to 1977. The amount of imported asbestos from 1972 to 1975 can be estimated by the amount of imported asbestos and corrugated slate production from 1976 to 1977. From this, total amount of imported asbestos can be estimated, where it is anticipated to be 2,026,963 tons.

In a nutshell, it may look like import of products known to contain asbestos has increased while import of asbestos has decreased. For example, reports show that the imported amount of known asbestos in the friction materials has continuously increased from 1,009 tons in 1996 to 2,183 tons in 2006. However, all imported friction materials known to contain asbestos were not necessarily all asbestos containing materials, because these included non-asbestos products. As a result, asbestos was found in only 8% (217 tons) of the imported friction materials known to contain asbestos, when the new classification system was applied to the imported friction materials in 2007. Korea imported asbestos containing friction materials from China (169 tons), Germany (20 tons), Italy (13 tons), USA (8 tons), Spain (4 tons), Japan (2 tons). All materials imported from Germany were exported. In 2007, the amount of asbestos found in imported cement boards and textile known to contain asbestos was 28% and 7.5% respectively.

Therefore, from looking at these examples and evidences, it would be incorrect to state that the import of asbestos containing materials has increased recently in Korea.

Exposure

Asbestos has been used for production of asbestos corrugated roofing slates, asbestos cement boards, ceiling boards, automobile friction materials, heat-resistant gaskets and packing materials, and asbestos textile. However, Korea has never used spray-on asbestos insulation, where they applied non-asbestos fibers for most pipes and boilers for insulation, although there may be boilers and pipes covered in asbestos insulators.

There are still some cases where workers insist that they were exposed to asbestos because they misunderstood non-asbestos fiber as an asbestos fiber.

Most asbestos was used for producing asbestos corrugated roofing slate in 1970s, where more than 80% of asbestos was used for production of construction materials. In 1990, 84.3% of asbestos was used for construction materials followed by 8.5 % for friction materials and 5.5% for asbestos textile. In 1998, 95.5% of asbestos was used for producing construction materials followed by 2.5% for friction materials(Choi et al., 1988).

Data from the KOSHA show that the number of workplaces permitted to use asbestos was 43 in 1993 and 31 in 2004. Furthermore, the number of workers exposed to asbestos decreased from 319 in 1993 to 102 in 2004 in construction material manufactures, from 230 to 36 in vehicle suppliers manufactures, and from 115 to 5 in textile industry. However, there were more workplaces to use asbestos without permission, especially at small-scaled enterprises (Choi et al., 1988).

In addition, the mean air concentrations of asbestos have gradually decreased from 6.07 fibers/m^3 in 1984 to 1.21 fibers/m^3 in 1996 in textile industry, from 1.7 to 0.55 in friction material manufacturing industry, and from 0.4 to 0.14 in construction material manufacturing industry (Choi et al., 1998).

Asbestos related diseases

A few cases of asbestos-related diseases such as asbestosis, lung cancer and mesothelioma were reported in Korea.

Asbestosis can develop after heavy exposure to asbestos, where it can develop in asbestos product manufacturing industry like textile and friction materials. With the survey conducted by KOSHA, 4 cases of asbestosis were found in 1994. The other two cases were claimed: one was a 51 year-old

pipe fitter who worked at a power plant for 13 years and the other was a 63 year-old supervisor who worked at a briquette manufactory for 30 years, which was located near the asbestos mine. We assume many cases of asbestos would have been unreported, mostly due to misdiagnosis as pneumoconiosis.

Lung cancer can develop with relatively high asbestos exposure, and it is very difficult to decide whether lung cancer was caused by asbestos exposure or not, because counting body burden of asbestos is not yet adopted in Korea. The case will only be accepted if a worker with lung cancer has been exposed to asbestos for at least 10 years, with the accumulated concentration of 2.5 fibers · years/cc, which is one tenth of the level for two fold increase of lung cancer. The workers' compensation fund accepted 41 lung cancer patients as a cause of asbestos exposure up until 2007.

Mesothelioma can develop with low level of asbestos exposure even the latency is very long. The first compensated case of mesothelioma caused by asbestos exposure was from a 55 year-old female spinner in an asbestos textile industry in 1993 (Park et al., 1995). Nineteen cases of mesothelioma were accepted as a work-related disease up until 2007.

It is a surprise that the compensated mesothelioma cases were very few compared with the cases detected by the cancer registry. The unreported cases were probably workers who worked in extremely small-scaled enterprises, which were not covered by the workers' compensation up until 2000. Unfortunately, Korea still does not have a system to compensate mesothelioma regardless of the work status like other developed countries.

Mesothelioma

Information on asbestos exposure related mesothelioma can be obtained from four data sources; the surveillance system by pathologists, the cancer registry, the death certificates, and the national health insurance corporation.

The surveillance system on mesothelioma started in 2001. This has been operated by pathologists from 23 university hospitals, and funded by the KOSHA, where it reports around 20 cases of mesothelioma in each year. Among the reported cases, 85 were diagnosed from 2001 to 2005, and 75 were diagnosed before 2000. The strength and advantage of this data is correctness of the diagnosis because it is reported by the pathologists. The weakness is the coverage of the data because only university hospitals have involved and applied the system. However, it is assumed that reported cases cover more than half of the total cases.

The cancer registry by the National Cancer Center has reported 40~60 cases of malignant mesothelioma in a year to from 1988 to 2002. Data from 2003 to 2006 are not available because of the confidentiality issue. However, data from 2007 will be available after amending the legislation. The strength of the cancer registry is the coverage and correctness, while the weakness is no information of work history.

The death certificate data show 25~35 cases of mesothelioma in a year (Ahn YS, 2007). It is not difficult to assume that some cases would be missing in the death certificate.

The annual national health insurance data report slightly more than 150 cases of mesothelioma including approximately 50 fatality cases which occur within a year after the diagnosis (Ahn YS, 2007). The strength of this data is that it covers the whole population. The weakness is incorrectness of diagnosis due to combined mixture of confirmed and non-confirmed diagnosis. Considering that mesothelioma is still very fatal disease, the fatality cases within a year after the diagnosis can be hypothesized to be an actual cases of mesothelioma.

Based on the four data sources, annual cases of mesothelioma can be estimated to be around 50 cases. Incidence of mesothelioma in Korea is still very low compared to the developed countries, only one tenth of developed countries. This can be explained by several reasons. First, outcomes, mesothelioma, are not exploded yet because the industrialization in Korea started later compared to the developed countries, in 1970s and 1980s. Second, Korea did not use crocidolite, which caused most of mesothelioma in the western countries. Last, Korea never used spray-on insulation with asbestos. Many insulation materials for boilers and pipes were substituted with non-asbestos fibers when they started to be used popularly. It means that a chance for exposure to friable asbestos would have been reduced. The assumption is also supported by the report of Yu et al (1998) that asbestos content in lung tissue of Korean was a half of that of Japanese.

If Korea follows the same tract with developed countries, mesothelioma would increase up to 400~600 cases in a year. However, the cases of mesothelioma would be lower due to the above mentioned reasons.

Policy and regulation

Workers exposed to asbestos are subjected to receive Special Health Examination once a year by the law. The

KOSHA has a program to issue a pocket book for securing periodic health examination of workers exposed to carcinogens. The program enrolled 683 retired workers who were exposed to asbestos by May 2008. Because there will be more retired workers eligible for the pocket book, KOSHA researchers are in search of the lost workers.

The KOSHA started the quality control program in laboratories to analyze asbestos fiber by polarized microscope and phase-contrast microscope in 2008.

The Occupational Exposure Limit of asbestos was enforced from 2 fibers/cc to 0.1 fibers/cc in 2002. Crocidolite and amosite were banned in 2000 and all asbestos except chrysotile, were banned in 2003. Construction and friction materials containing chrysotile were banned in 2007 and all asbestos and its products will be fully banned from 2009.

Building owners require permissions from the Ministry of Labor in order to demolish or remove a building where asbestos containing materials were used. They should have an appropriate way of removing asbestos containing materials with sealed process and of abandoning the waste not to release in the air.

Social concern

A worker, whose job was maintaining and repairing a subway corporation in Seoul, developed a lung cancer in 2000. His claim for compensation was accepted because he could have been exposed to asbestos during handling asbestos gasket. After that, a service worker at a station, who developed lung cancer, claimed the compensation. He was not exposed to asbestos regularly during his duty, except for a year and a half during repairing air-conditioning and heating equipment of a station, where asbestos was believed to be released. The Supreme Court judged that the case was acceptable for compensation because he had a possibility of being exposed to asbestos. About that time, labor union strongly encouraged the corporation to find asbestos in working environments and to remove them all. Approximately 1~10% of chrysotile and tremolite were found among spraying materials on the ceiling and walls in 15% of stations, although it was not officially applied. The subway corporation decided to remove all asbestos containing materials from the stations. The air concentration of asbestos in working places for removing asbestos containing materials ranged from 0.01 to 0.09 fibers/cc, but the other areas were always keep less than 0.005 fibers/cc.

Conclusion

The diagnostic criteria for lung cancer by asbestos should be amended in order to reduce a conflict between workers and the agency. Compensation for mesothelioma should also be extended to all workers exposed to asbestos regardless of their prior enrollment of workers' compensation. Seeking for lost retired workers should continue. Building demolishing work should be monitored carefully because asbestos containing materials can be removed quickly without appropriate abatement.

The outbreak of asbestos-related diseases did not yet come in Korea. It could either be related to relatively small amount of use in Korea, different way of usage, or delayed peak period of consumption. Korea has already banned asbestos with some exception, where it will be totally banned from 2009. All countries banned the use of asbestos after they experienced a rapid increase of asbestos related diseases. However, Korea would be the first country to ban asbestos completely before seeing and experiencing the tragic consequences.

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Analysis of the Characteristics of Fall Accidents and R&D of Safety Devices

[Source] Song, In Yong et al., OSHRI, 2007

Research Summary

Death rate in Korea caused by fall acclidents is 3.76 per 10,000 workers, 25 times as large as the UK's and 7 times as large as the US's. Therefore, it is urgently required to take preventive measures against fall accidents. This article aims at providing basic data for the establishment and revision of domestic safety standards related to fall and ladders by reviewing safety standards of foreign countries. Especially, it tries to present preventive measures against low-height fall by developing safety devices based on analysis of the characteristics of low-height fall and a questionnaire survey on workers' safety consciousness on fall.

Policy Research Team |
OSHRI

Purpose of Research

In 2006, 11,687 people, 13% of the total accidents, were injured and 427 people, 17.4% of the total deaths, were killed by fall accidents in industrial sites. Among them, fall victims who fell from a height of less than 3 meters were 8,238 people, accounting for 70.5% of the total fall accidents, and such low-height fall accidents occur mostly in connection with ladders, means of transportation, and mechanical equipment, etc. Death rate in Korea caused by fall is 3.76 per 10,000 workers, 25 times as large as the UK' s and 7 times as large as the US' s. Therefore, it is urgently required to take preventive measures against fall accidents. This article aims at providing basic data for the establishment and revision of domestic safety standards related to fall and ladders by reviewing safety standards of foreign countries. Especially, it tries to present preventive measures against low-height fall by developing safety devices based on analysis of the characteristics of low-height fall and a questionnaire survey on workers' safety consciousness on fall.

Research Methods and Details

● **Collection of data related to fall and analysis of the characteristics of fall accidents**

- Conduct a comparative analysis of ladder safety standards of advanced countries'
- Analyze the causes of fall accidents and the characteristics of low-height fall accidents by type
- Conduct a comparative analysis of fall accidents of advanced countries' and domestics
- Analyze fatal accident cases caused by low-height fall and devise preventive measures

● **Questionnaire survey on workers' safety consciousness on fall**

- Questionnaire survey on workers based on Delphi methods
- Identify the relationship between safety consciousness and workers' social factors, health, and/or psychological factors, etc.

● **Development of the device monitoring safety helmet wearing**

- Conduct monitoring on a person not wearing a chin strap using the transmitter-receiver attached to the safety helmet from a remote place
- Transmit the radio wave generated from the safety helmet sensor to the

central control PC through a radio relay device

● **Development of monolithic and split-type swing-style safety working garments to which a swing-style safety belt is attached**

- Develop shock absorbing safety working garments for protecting the body by absorbing shock caused by low-height fall

● **Development of safety work platform for low height**

- Develop an electric safety work platform for low height
- Develop a folding-type safety work platform for low height

[Figure 1] Electric safety work platform for low height

[Figure 2] Folding-type safety work platform for low height

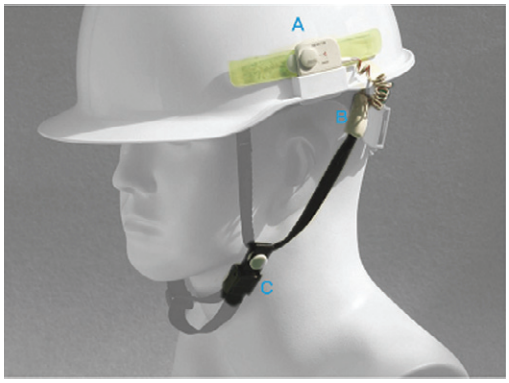
Research Results

Compared with the manufacturing industry, the construction industry showed more injured persons, 1.7 times, and deaths, 2.6 times, accounting for 50% or more with respect to ladders, means of transportation, and mechanical equipment, etc. With respect to low-height fall accidents, aged workers in their 50s accounted for 41.3%; men accounted for 92.9%; and a treatment period of 29~90 days accounted for 42.9%. Analysis of low-height fall accidents by time showed that a time zone of 8~12 o'clock recorded the highest share as injured people accounted for 36.8% and deaths accounted for 41.7%.

Therefore, systematic improvement requiring the exact classification of fall height based on domestic survey data on fall accidents for occupational accident statistics and a statistical study of fundamental causes of low-height fall is needed.

● **Research & development of a device monitoring safety helmet wearing**

As shown in [Figure 3], a device monitoring safety helmet wearing was researched and developed. If a wireless module sensor is attached to the part of the chin strap of the safety helmet, wearing or non-wearing of the safety helmet is transmitted to the PC program at a remote place of about 500 meters through a radio relay device.



[Figure 3] Electronic chin strap and safety helmet

● **Research & development of safety working garments**

Swing-style safety working garments which can minimize inconvenience at work with a swing-style safety belt attached to the working garments were developed. In case of fall, the shock absorbing belt attached to the safety garments absorbs shock as it is torn by an impact force of 200kgf~400kgf. In case of low-height fall, safety garments with a shock absorbing pad attached was also developed. The garments absorb about 80% of shock which can be transmitted to the region of shoulder and waist.

● **Research & development of safety work platform for low height**

An electric safety work platform and a folding-type safety work platform for preventing low-height fall accidents were developed.

Report on early Diagnosis and Prediction of Asbestos Related Diseases

[Source] Ahn, Yeon Soon et al., OSHRI, 2007

Research Summary

We tried to presume the number of cases of the actual occurrence of malignant mesothelioma using various kinds of data sources including statistics on the causes of death, statistics on the use of health insurance, and the malignant mesothelioma monitoring system, etc. and the future amount of generation of malignant mesothelioma related to asbestos by applying the age-cohort model, etc.

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Purpose of Research

The purpose of this research is to build a system which can track the occurrence of workers' diseases related to asbestos in the long term by establishing a cohort of workers exposed to asbestos and to calculate disease risk caused by asbestos exposure to date by conducting analysis in connection with disease database including the data on the causes of death issued by the National Statistical Office. In addition, we tried to presume the exposure amount of workers exposed to asbestos and the amount of generation of malignant mesothelioma by building a database related to asbestos exposure by year/ industry/ job type (research results concerning the amount of mining of asbestos, the imported amount of asbestos and asbestos products, and the amount of exposure by industry or job type, etc.) and a job-exposure matrix based on the database.

Research Methods and Details

● Survey of prevalence of asbestos related diseases (diffuse parenchymal lung diseases such as pleural disease and asbestosis, etc.)

The posteroanterior chest radiographs of about 1,300 workers in about 100 workplaces who took a physical examination as a person requiring an asbestos special health examination or a health care pocketbook holder from 22 special health examination organizations throughout the country were collected. Two specialized professors read the posteroanterior chest radiographs according to the ILO classification standards and calculated prevalence of asbestos related diseases.

● Establishment of a cohort of workers exposed to asbestos and evaluation of carcinogenic risk

A cohort of workers exposed to asbestos was established with respect to persons who took an asbestos related special health examination during 2000~2006; workers in workplaces subject to asbestos work environment measurement; workers in workplaces allowed to produce and use asbestos; workers in the workplaces subject to the 2004 investigation into the actual conditions of manufacturers; and health care pocketbook holders.

● **Construction of database on asbestos exposure by year/ industry/ job type**

A database on asbestos exposure by year/ industry/ job type (research results concerning the amount of mining of asbestos, the imported amount of asbestos and asbestos products, and the amount of exposure by industry or job type, etc.) was built; workers exposed to asbestos were identified (persons who took an asbestos related special health examination by year; analysis of the current status of workers exposed to asbestos in workplaces subject to investigation into the actual conditions of manufacturers; analysis of the current status of workplaces allowed to produce and use asbestos); and a job-exposure matrix based on these data was also established.

● **Forecast of the amount of generation of malignant mesothelioma related to asbestos**

The actual number of malignant mesothelioma was presumed using various kinds of data sources including statistics on the causes of death, statistics on the use of health insurance, and mesothelioma monitoring system, etc.; an equation was set up using the number of deaths caused by mesothelioma by year in Korea and Japan; the future number of cases of the occurrence of malignant mesothelioma was estimated by year using this formula.

Research Results

● **Survey of prevalence of asbestos related diseases (Diffuse parenchymal lung diseases such as pleural disease and asbestosis, etc.)**

Only reader A stated that there was pneumoconiosis in diffuse parenchymal lung, and 416 (29.9%) out of a total of 1,389 cases was read as pneumoconiosis. The films read by both readers A and B were 1,299 cases, out of which A read 220 cases (16.9%) as pleural hypertrophy and B read 275 cases (21.2%) as pleural hypertrophy. The number of cases read by either of the two readers as hypertrophy was 413 cases (31.8%), and the number of cases read by both of the two readers as pleural hypertrophy was 82 cases (6.3%); the coincidence level of reading (Kappa value) was low, ie 0.176.

● **Establishment of a cohort of workers exposed to asbestos and evaluation of carcinogenic risk**

A cohort was established by collecting data on 6,660 workers exposed to asbestos (personal information including a resident registration number, history of exposure to asbestos, and information on workplaces, etc.). With respect to 6,301 male workers among them, deaths caused by cancer during 2000 ~ 2006 were analyzed, and a standardized death rate caused by cancer was calculated by using the male population of Korea as standard population.

● **Construction of database on asbestos exposure by year/ industry/ job type and job-exposure matrix**

A job-exposure matrix was established by analyzing and adding data collected from this research to the data accumulated by the OSHRI in 2006. To establish the job-exposure matrix, existing data same as this research data were used. In the case of data omitted from the existing job-exposure matrix, they were supplemented by using this research data.

● **Forecast of the amount of generation of malignant mesothelioma related to asbestos**

The future number of cases of the occurrence of malignant mesothelioma estimated using various kinds of data sources including the malignant mesothelioma monitoring system, statistics on the causes of death, statistics on the use of health insurance, and statistics on cancer registration is 92 cases (72 cases based on 2004), at least 2 times as large as the number of cases of monitoring system registration and about 60% of the number of cases of the use of health insurance.

As it was impossible to presume the amount of future generation by applying the age-cohort model with the data reported to date in Korea, we set up an equation using the number of deaths by year in Korea and Japan, and forecast the future number of cases of the occurrence of malignant mesothelioma by year using this formula. With regard to the estimation of the number of deaths caused by malignant mesothelioma, the accumulated number of deaths caused by malignant mesothelioma per million population of Korea by 2020 was presumed to be 57 people, and the accumulated number of deaths was presumed to be 10,000 people in 2035. The estimated number of deaths considering the imported amount of asbestos was 4.28 people per million people (accumulated number of deaths: 42.66 people per million people) in 2023. Therefore, it was presumed that a total of 2,092 people would die by 2023 with 210.64 deaths per year.

Study on Nerve Toxicity Caused with an Organic Solvent Exposure

[Source] Lee, Sung Bae et al., OSHRI, 2007

Research Summary

We tried to check the possibility of causing nervous diseases by monitoring manifestation changes in nerve proteins distributed in each nerve tissue and neurotic symptoms caused by organic solvent, cumene inhalation exposure using experimental animals and, through this, pre-identify nervous diseases having the possibility of causing clinical symptoms to workers.

Purpose of Research

As society is becoming complex and diverse, and human civilization is highly developing, neuropathy, one of serious diseases mankind suffers is gradually increasing. This trend is caused by various environmental factors and chemical substances. Neurotoxicity is very important in that various toxic substances cause diseases to mankind by having an effect on the nervous system and that it is used as a tool for studying the functions and organization of the nervous system. Regression, hypofunction, and extinction of nerve cells due to many factors cause serious diseases to the human body. Many people suffer from various nervous diseases caused by unidentified factors, and as the causes of occurrence are being highly regarded as the subject of research, a lot of researches are recently making progress. To understand the diseases caused by neurotoxicity, anatomy of the nervous system, physiology, genetic mechanism, and treatment possibility, etc. should be researched.

Therefore, this article tried to check the possibility of causing nervous diseases by monitoring manifestation changes in nerve proteins distributed in each nerve tissue and neurotic symptoms caused by organic solvent, cumene, inhalation exposure using experimental animals and, through this, pre-identify nervous diseases having the possibility of causing clinical symptoms to workers. If the possibility of causing nervous diseases is confirmed, that will not only become useful data for researching the relation among various brain diseases (Parkinsonism, Alzheimer's disease, Huntington's disease, etc.) which are recently on the rise and exposure to organic compounds but also protect workers' health from occupational diseases caused by organic compounds.

Research Methods and Details

An experiment was carried out by making experimental animals inhale cumene, test substance, and exposed to it whole body. 3 exposure groups (8, 80, and 800ppm groups) including a control group were made to be exposed 6 hours a day, 5 days a week for 90 days. In addition, each group was reclassified into groups exposed 1 day, 14 days, 28 days, and 90 days according to the period of exposure to examine the manifestation changes of protein in neurobehavior and nerve tissue. First, clinical symptoms of neurotoxicity which could be caused through inhalation of and exposure to cumene were identified, and then nerve proteins changes were also identified using the

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OSHRI

methods of Western blotting and immune histochemistry. Through this, harmfulness caused to the nervous system by organic compounds could be identified and/or forecasted.

Research Results

- No death of the experiment animals of the exposed during period. And the results that observed general symptoms such as an appearance, whether or not there was life and death, mobility, bleeding, breathing ideal, etc. were special, and was not able to find opinion.

- The 8ppm exposure group showed tendency of increased weight in comparison with the control group, but showed no dose dependency.

- Considering the relative weight of internal organs, the 800ppm exposure group on the 14th day showed dose-dependent ($p<0.05$) increase of liver, and on the 90th day of exposure, all the exposure group showed dose-dependent ($p<0.05$, $p<0.01$) increase of liver, compared with the control group.

- According to the measurement of the mobility of the test groups by exposure to the test substance, the 800ppm exposure group showed decrease in mobility compared with the control group with a significance of $p<0.05$.

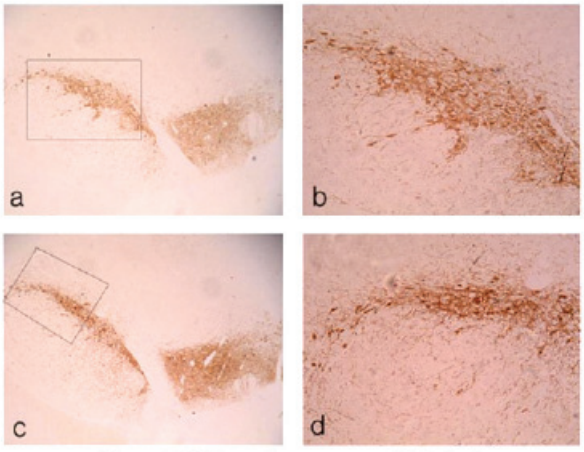
- The landing foot splay of 5 rats from each group was investigated on 28th, 60th, and 90th of the exposure. The results showed that no toxicity related with direct degeneracy of peripheral nervous system, however, it was judged that the replacement of neurotransmitter will be affected.

- According to the inspection result of Western blotting in basal ganglia, tyrosine hydroxylase (TH), when compared with the control group by the values according to the exposure, increased dose-dependently on 14th and 28th days, then recovered on 90th day of exposure.

- In the TH immunologic reaction of corpus striatum, the 800ppm exposure group showed increase of the nerve fibers projected from cerebrum or midbrain compared with those of the control group.

- The TH in the substantia nigra of midbrain decreased dose-dependently in accordance with the exposure. Its density decreased according to the duration and concentration of the exposure.

- In the 800ppm exposure group, the distribution of the TH immunologic reactive cells in the substantia nigra connected to mid brain showed that the cell bodies of nerve cells which distributes TH atrophied and the immunostaining was stronger than that of the control group.



[Figure 1] TH immunity response cell (90 days)

a. TH (tyrosine hydroxylase) immune response cells in the substantia nigra and ventralis tegmentum of the control group

b. An enlarged picture of the region of the substantia nigra in a.

c. TH (tyrosine hydroxylase) immune response cells in the substantia nigra and ventralis tegmentum of the 800ppm exposure group

d. An enlarged picture of the region of the substantia nigra in c.

As described above, by exposure to cumene at 800ppm for 90 days, it was identified that mobility decreased, manifestation of TH which is an enzyme in dopamine synthesis decreased, and the cell bodies of nerve cells which distributes TH atrophied. It was thought that it may have relation with Parkinsonism which is characterized by decrease of dopamine. In this study, the cumene exposure was conducted only for 90 days, therefore, in order to investigate more precise influence of chronic exposure, further studies on other parts than the midbrain (substantia nigra) in connection with basal part with more indicators are required.

Current Status and Research Trends of the Occupational Safety & Health Research Institute

With best wishes for success of the 18th World Congress on Safety and Health at Work, we briefly introduce the OSHRI to the world's labor, management, government, academic circles, and experts in the field of safety & health who participate in the Congress.

Oh, Byung Sun Director |
Department of Safety Management
Policy Research, OSHRI

Introduction

Korea's rapid growth in the 1960s and 1970s paved the way for raising the standard of living and improving the quality of life, but it was also a major cause for the rapid increase of occupational accidents. In connection with this, Dr. M.A. Batawi, an ILO expert on safety and health, submitted a proposal for the establishment of a research institute for preventing occupational accidents in Korea to the International Labor Organization on Sep. 15, 1968.

Sympathizing with the need, the Korean government agreed to set up a national labor science research institute as part of a project under the United Nations Environment Programme (UNEP) agreement on Dec. 28, 1974 and opened the National Labor Science Research Institute having 36 researchers on Apr. 19, 1979. The research institute greatly contributed to the prevention of occupational accidents through R & D activities in the occupational safety and health field. Especially, it played a leading role in establishing occupational accident prevention systems in Korea by adopting advanced countries' occupational accident prevention methods and systems. Among other things, it introduced a national performance test system for maintaining workers' life and health with respect to protective equipment and dangerous machines and tools.

As the Korea Occupational Safety & Health Agency (KOSHA) was established on Dec. 9, 1987, it performed specialized functions for occupational accident prevention. The National Labor Science Research Institute was closed on Feb. 16, 1989, and the Occupational Safety & Health Research Institute (OSHRI)" was established as an organization affiliated with the KOSHA on Jul. 12, 1989. The OSHRI consisted of Research Statistics Section, Machine & Electricity Research Team, Chemistry Research Team, Civil Engineering &

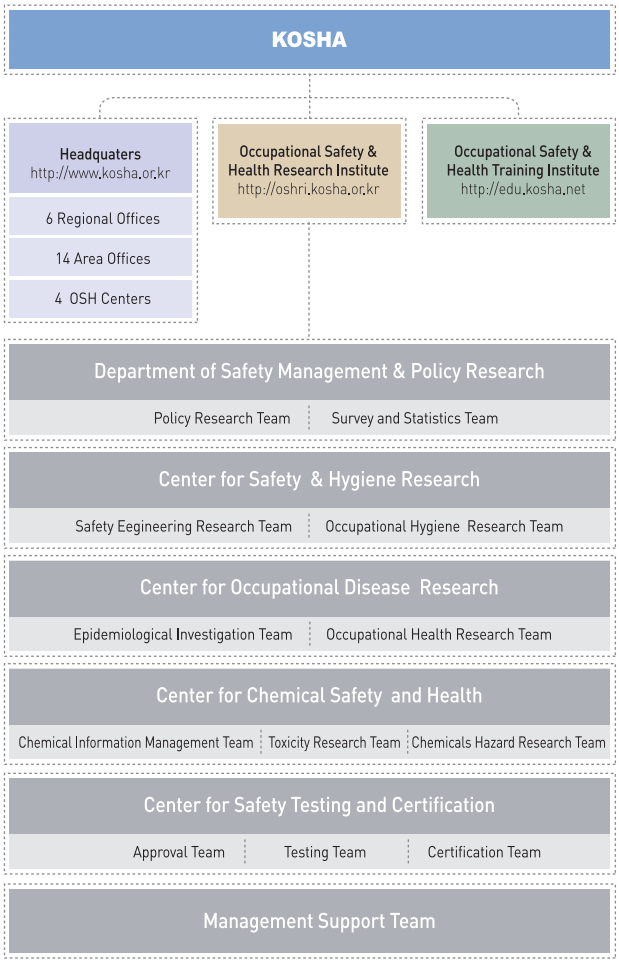
Construction Research Team, Occupational Health & Hygiene Research Team, Protective Equipment Test Section, Safety Device Test Section, and Analysis Office with a total of 66 researchers. After this, the government devised comprehensive countermeasures for occupational disease prevention and established an occupational health research institute by merging with the occupational disease research institute attached to Joongang Hospital of the Korea Labor Welfare Cooperation on Jan. 18, 1992 in order to strengthen related research functions. It triggered off the separation of the OSHRI into an Occupational Safety Research Institute and an Occupational Health Research Institute.

The Center for Chemical Safety & Health affiliated with the Occupational Health Research Institute was established on Sep. 5, 1997 and it performed the evaluation of harmfulness of chemicals and conducted experimentation and research with regard to industrial toxicity. On Nov. 18, 1998, the Occupational Safety Research Institute and the Occupational Health Research Institute were integrated again under the office regulations, and accordingly the name of OHSRI was regained. Currently, the OHSRI consists of 1 department, 4 centers, and 1 team with a total of 150 staff.

The OSHRI, Korea's only specialized occupational safety & health research institute, is divided into Safety and Hygiene Research Center, Center for Chemical Safety and Health, Occupational Disease Research Center, and Department of Safety Management Policy Research. In addition to this, there are a section for testing the performance of personal protective equipments and safety devices for dangerous machines and tools and a section for analyzing the causes of the occurrence of occupational accidents and calculating statistics. Since September 2007, the OSHRI has published OSH Research Brief every month in order to introduce the latest safety and health research trends at home and in advanced countries and policies which are becoming social issues.

Roles of OSHRI

The Occupational Safety & Health Research Institute (hereinafter referred to as the "OSHRI") is an organization affiliated with the Korea Occupational Safety & Health Agency and its organization chart is shown in [Figure 1]. The OSHRI researchers are actively conducting scientific research for the purpose of contributing to the country as well as workers by creating a safe and optimum work environment; by preventing occupational accidents and diseases; and by protecting workers's health.



[Figure 1] Organization Chart of OSHRI

The research activities are divided largely into in the field for preventing occupational accidents and diseases, performance test of the protective equipments and safety devices, and study and analysis of statistics of occupational accidents and diseases. Their major work is as follows:

- Conduct comprehensive and multilateral researches in occupational safety and health for occupational accident prevention.
- Research on the development of the Ministry of Labor's strategies and governance system for occupational accident prevention; establish related laws and regulations, technical standards and guidelines, etc.; conduct statistical research in occupational accidents; and support governmental activities for preventing occupational accidents.
- Conduct cooperative researches in close association with societies related to safety and health, universities, public research institutes, and test agencies in order to ensure effective and efficient researches.
- Actively accept and reflect research requirements from workplaces, business groups, workers groups, and academic circles and contribute to the development of the country and the organization through technical support for publicizing research results.
- Contribute to occupational accident prevention by having protective devices and equipment of excellent quality through performance test of dangerous machines and tools, protective devices and personal protective equipments.

Organization and Research Activities of OSHRI

● Department of Safety Management Policy Research

The Department studies, analyzes, and evaluates occupational safety and health systems and policies. It also conducts theoretical research in safety management systems and lays groundwork for efficient and systematic by setting and comprehensively adjusting mid-long term targets of occupational safety and health research.

- Policy Research Team

[Figure 2] OSH Research Brief

As shown in <Table 1>, in order to improve safety & health policies and systems, the Team subdivides its research activity into national safety & health management system research, research in safety & health problems caused by labor environmental changes, and investigation into actual conditions for producing basic data and information.

It promotes efficient research by using a joint study comprising industries, academic circles, and researchers and outside research manpower; distributes research results; and manages cooperative business with outside organizations. In addition, the Team improves the quality of research through research planning and evaluation and publishes Safety & Health Research Brief monthly. See [Figure 2].

< Table 1 > Researches for improving safety & health policies and systems

Classification	Details
National safety & health management system research	Research for proving the effectiveness of related laws and systems by establishing and presenting occupational safety & health policy directions; analyzing operations and periodically evaluating them. The effect and effectiveness of occupational safety & health policies should be analyzed so that safety & health management models suitable for the characteristics of each workplace can be developed
Research in safety & health problems caused by labor environmental changes	Research in safety & health problems in workplaces caused by labor environmental changes, for improving the quality of working life and health; providing social safety nets in dangerous society; and protecting vulnerable groups' health
Investigation into actual conditions for producing basic data and information on safety & health	Investigation into the actual condition of national-level safety & health for producing basic data and information on safety & health, and research in occupational accident prevention policies to cope with globalization

- Survey & Statistics Team

Occupational accident statistics are one of the most important data in establishing accident prevention policies and implementing research tasks and projects. Therefore, it is positively necessary to maintain the reliability of statistical data and build a fast support system in order to meet various demands in a rapidly-changing information-oriented society. To keep pace with this trend, Survey & Statistics Team performs the following work:

- Occupational accident compensation statistics: statistics showing workers' occupational accidents recognized through the National Workers Compensation Insurance
- Statistics of occupational accident causes: statistics thoroughly analyzing causes of the occurrence of occupational diseases and accidents
- Fatal accident statistics: statistics on death accidents and major accidents set forth in the Occupational Safety & Health Act
- Statistics on work environment measurement: results based on annual workers health examination.

● Center for Safety and Hygiene Research

The Center plays the role of radically preventing occupational accidents by promoting research and development for ensuring advanced occupational accident prevention techniques and providing technical support for workplaces in the field of safety engineering research and occupational hygiene research. The Center has been more effectively operated since it was divided into Safety Engineering Research Team and Occupational Hygiene Research Team in 2008.

■■ Safety Engineering Research Team

The Team efficiently conducts researches by using a joint study comprising industries, academic circles, and researchers and outside research manpower after subdividing its work into machinery, electricity, construction, and human engineering fields. In 2008, the Team conducted research with "Reduce Death and High Frequency Accidents to Half" as the slogan. Currently, the Team is making efforts to enhance the on-the-spot practicality of such research results. In addition, the Team determines the order of priority of research tasks by analyzing high frequency accidents by type and promotes performance prediction type research by applying itemized weight. In the mid-long term, the Team will contribute to occupational accident prevention through research in engineering countermeasures against accident risk factors, safety evaluation methods, human engineering application, safety countermeasures by physical factor and major accident prevention techniques, etc. The Team's major research tasks in this year are as follows:

- Analysis of causes of fall accidents in the manufacturing industry and research its preventive measures
- Analysis of characteristics of fall and collapse in the construction industry and research its preventive measures
- Research in safety model development for preventing fall accidents on small construction sites
- Analysis of accident characteristics for preventing constriction accidents and research its preventive measures
- Thorough analysis of slip and collision accidents and research its preventive techniques

■■ Occupational Hygiene Research Team

The Team obtains source technology in the field of occupational hygiene and conducts research with emphasis on practicably applicable to industrial sites. To do so, the Team strives to prove the need for and the validity of the appropriate research; evaluate harmful factors which became a social issue and the exposure of various kinds of harmful factors related to work; and propose substantial improvement plans. In addition, the Team conducts the quality assurance project regarding work environment measurement samples and asbestos analysis for improving the analysis ability of work environment measuring organizations. It also carries out research in quality assurance techniques, error cause analysis and accuracy improvement plans, etc. The Team's major research tasks in this year are as follows:

- Research in characteristics of the occurrence of rubber fumes in tire plants and carcinogenic substance exposure evaluation
- Evaluation of irregular construction workers' work in chemicals industrial complexes and harmful factor exposure characteristics
- Development of standard samples for quality assurance of asbestos analysis
- Analysis of major causes of asphyxiation accidents by job type in confined space and research its preventive measures

● Center for Occupational Disease Research

The Center has investigated the causes of work related diseases and pathogenesis and conducted preventive researches in the development of diagnosis techniques for early detecting occupational diseases in a systematic and continuous manner for 20 years. In 2008, the Center was divided into Health Research Team and Epidemiological Investigation Team for efficient operation. The Center's major research tasks for this year are as follows:

- Research based on an epidemiological investigation in workplaces regarding harmful factors to worker's health such as dust, heavy metals, harmful chemicals and physical factors, etc.
- Research conducted in terms of management for forecasting and preventing recurrence; it includes investigation into the causes and occurrence patterns of occupational diseases by using accumulated data on the occupational diseases which occurred in the past
- Research in diagnosis methods based on occupational medicine and system improvement methods for accurate diagnosis of new kinds of unidentified occupational diseases
- Research in the development of analysis techniques ensuring accurate measurement of the concentration of harmful factors and that of metabolic products
- Research in the work related disease prevention field including the development of job stress evaluation tools; job stress management; the development of human engineering harmful factors evaluation tools; preventive management of

musculoskeletal disorders; work related disease prevention policies and systems.

● Center for Chemical Safety & Health

Center for Chemical Safety & Health was set up for systematically conducting research in chemical substance management policies, harmfulness and toxic mechanism, dangerousness and safety. The Center consists of Chemical Information Management Team, Toxicity Research Team, and Chemicals Hazard Research Team.

■■ Chemical Information Management Team

The Team conducts various kinds of research works related to chemical substance analysis, along with research in chemicals harmfulness and dangerousness, information transmission, and chemical substance management policies, etc. Recently, in response to international chemical substance management policy changes, the Team carries out research related to improvement in the reliability of material safety data sheet, chemical substance information transmission systems in the area of occupational safety & health, and exposure scenarios, etc. for safe use of chemical substances.

■■ Toxicity Research Team

The Team grasps the toxic mechanism of various kinds of harmful chemical substances used in workplaces, conducts research in inhalation toxicity and skin toxicity of organic solvents and heavy metals, and carries out research in development of biological exposure and biological effect indicators with respect to workers who handle harmful chemical substances, using genetic toxicity and biochemical techniques. Using toxicity research techniques regarding genetic toxicity, skin toxicity, and inhalation toxicity, etc., the Team strives to provide data on toxicological exposure standards for work environment management, develop toxicity test methods, and produce data on toxicity of harmful substances. Recently, the Team expands its research scope to harmful chemical substances such as asbestos, welding fumes, and metal working fluids while continuously conducting research in genetic toxicity and inhalation toxicity regarding organic solvents.

■■ Chemicals Hazard Research Team

The Team conducts research in the development of safety countermeasures for controlling the risk factors of chemical substances likely to cause a fire or explosion in a workplace and minimizing damage. Its major activities include research for identifying the causes of an explosion and a fire by dangerous reactive substance in a chemical process through a physiochemical characteristics test and a fire explosion characteristics test, etc. Recently, the Team also promotes research for identifying the characteristics of grain dust and metal dust highly likely to cause an accident and research for developing risk evaluation techniques.

● Center for Safety Testing & Certification

The Center strives to encourage and provide excellent products whose safety has been ensured by operating the performance test of the protective devices of harmful and dangerous machines & tools and the protective equipments used in industrial sites and the S mark safety certification system for various kinds of machines, etc.

The performance test of protective device and protective equipment is to determine whether produced or imported products meet the test standards by testing their performance, material, and structure, etc. with respect to the protective devices of dangerous machines & tools and the protective equipment. Currently, with respect to 14 kinds of protective devices and 11 kinds of PPEs, tests divided into the new test, main test, preliminary test, and retest, etc. are conducted.

In order to encourage manufacturers to produce excellent products, the grand prize for the quality of protective devices and PPEs have been awarded since 1997. The grand prize contributes to accident prevention on industrial sites by receiving competition applications and comprehensively evaluating product performance and quality so that excellent products can be identified and supplied. This year will also see excellent award-winning products in the grand prize competition put on display in the OSHRI information exhibition booth during the 18th World Congress on Safety and Health at Work.

[Figure 3] Performance test and safety certification marks

Activities in addition to research

In order to provide policy-based institutional support for occupational accident prevention and improvement in preventive ability on industrial sites, the OSHRI performs various operations as follows:

● Operation of the quality assurance management of work environment measuring organizations for ensuring the reliability of assay data

Since 1992, the OSHRI has conducted the quality assurance management of work environment measuring organizations twice a year in order to verify the reliability of work environment measurement analysis of work environment measuring organizations and improve the analysis ability of each measuring organization. It also operates a training program for improving the ability of analysis experts.

● Operation of quality assurance management with respect to special health examination organizations

The purpose of analysis quality assurance management is to identify and use the exposure level of harmful substance when making an occupational disease diagnosis by accurately analyzing biological samples such as blood and urine in the short term; and to establish new preventive health management methods for workers prior to the occurrence of occupational diseases by monitoring the exposure level of harmful substances using biological monitoring in the long term. Currently, Occupational Disease Research Center of the OSHRI conducts analysis for voluntary items in addition to mandatory quality assurance management such as 9 items of organic analysis and 5 items of inorganic analysis.

● Operation of pneumoconiosis quality assurance management system

Pneumoconiosis quality assurance management was introduced to prevent confusion caused by a diagnosis of pneumoconiosis. Since 1997, quality assurance management has been applied to special health examination organizations or radiation experts in pneumoconiosis health examination, medical specialists in the department of radiology, lung function examiners and doctors who finally determine lung function examination results and the relevant training is provided twice a year.

● Operation of hearing quality assurance management system

It is known that, in case of worker's hearing test, accuracy of the machine, measurement environment, technique, and cooperation by the worker subject to the test have an effect on the reliability of the test. Therefore, the OSHRI operates the hearing quality assurance management system in which various factors having an effect on the hearing test have been standardized in order to ensure that the hearing test result can be accepted as reliable by the appropriate worker.

● Operation of occupational disease monitoring system

The occupational disease monitoring system for early detecting occupational diseases by more accurately grasping whether or not an occupational disease has occurred and/or its scale has been operated since 1998, and, as shown in <Table 2>, monitoring is performed respectively under the occupational disease monitoring system by disease and the occupational disease monitoring system by region.

<Table 2> Details of the operation of the occupational disease monitoring system

Classification	Details
Occupational disease monitoring system by disease	Diseases such as skin disease, musculoskeletal disorder, mesothelioma, leukemia, asthma, and lung cancer
Occupational disease monitoring system by region	Regions such as Incheon, Gumi, Ulsan, Changwon, and Busan, etc.

● Operation of a laboratory for thorough analysis of other asbestos and chemical substances

In order to thoroughly analyze physiochemical characteristics of domestic asbestos and chemical substances, the OSHRI has a laboratory for thorough analysis operated by relevant experts.

Introduction of Korean Society of Safety

Shin, Chang Seob President |
Korean Society of Safety

Overview

In the middle of 1980s, Korean industries developed greatly under economy-oriented governmental policies, but they have had to meet a lot of accidents by paying little attention to safety, which led to huge casualties and losses on property. In the midst of this period, Korean Society of Safety (KOSOS) was founded to promote systematic academic research and technology development on safety and contribute to establishing a safe society through a variety of accident prevention activites. In the early days of establishment, KOSOS focused mostly on equipment safety, electricity safety, ergonomics and safety system related to industrial safety, but with the changes of the demands of the society for development and safety, it changed its name into Korean Society of Safety in 2003 and expanded our interest from industrial safety into transportation, security and disaster safety.

With the establishment of the corporation approved by Ministry of Labor in March 8, 1986, KOSOS published the first edition of Journal of Korean Society of Safety in November of the same year. Starting the first president Kim Won Kab, it has produced the 2nd and 3rd president Kim Yong Soo, the 4th president Jung Kook Sam, the 5th president Mok Yeon Soo, the 6th president Lee Young Soon, the 7th president Lee Nae Woo, the 8th president Yoo Jae Hwan, the 9th president Kim Hong and the 10th president Shin Chang Seob as of May 2008. They have contributed greatly to KOSOS and its accomplishments.

KOSOS consists of 1,000 members including special members, group members, life members, regular members and student members. It is operated by a president, ten vice presidents, 39 staffs and 60 representatives including eight advisers.

Activities

Activities of KOSOS are focused mainly on development of safety technology with a variety of activities such as research and survey on safety, safety diagnosis, industry-academic cooperation, academic conferences and lectures, exhibitions and technology seminars. Also we publish Korean Journal six times a year and English Journal two times a year and a Technology Journal. In addition, we hold a workshop where about 300 members participate in spring and fall every year. This workshop has been getting more and more attentions with heated and informative discussions. So we get a lot of requests to have the papers published to Journal of Korean Society of Safety, a journal registered by Korea Research Foundation, which is published every other month. And we are planning to publish our English journal, International Journal of Safety, in cooperation with other foreign societies of safety to make it an international journal. Regarding our activities with foreign countries, we held the first Asia-Pacific Symposium on Safety (APSS) at Gyeongju in 1999 to exchange our information and technology with foreign scholars on safety, and we also held the 5th APSS in Busan in 2007. And now we have produced the president of Asia-Pacific Association on Safety Engineering Society (APASES).

Action Plan

To make the activities of Korean Society of Safety known over the world, KOSOS plans to make APSS an internationally prominent academic congress by expanding the participating countries of APSS whose principal members are Japan, China and Taiwan, etc. In addition, we will hold technology seminars by region and field to promote domestic academic research and enhance the standard of safety technology.

Introduction of Korean Society of Occupational and Environmental Hygiene

Kim, Hyun Wook President
| Korean Society of Occupational and Environmental Hygiene

Overview

The Korean Society of Occupational and Environmental Hygiene (KSOEH) was founded in 1990 to develop the study of occupational and environmental hygiene in Korea, promote the capabilities of the members and protect workers' health. Though it has a short history of eighteen years, members amount to 2,000. KSOEH is proud that it has developed into a prominent and professional academy in the field of occupational and environmental hygiene in Korea.

Activities

KSOEH holds two academic conferences in winter (February) and summer (August) every year. This conference deals with the presentations of a variety of worksite experiences of the members as well as academic and scientific themes on occupational and environmental hygiene, exchanges information with the members and discusses the political and social issues related to occupational and environmental hygiene.

It also publishes Journal of KSOEH four times a year (March, June, September, December). This journal is registered to Journal of Korea Research Foundation in recognition of professional activities.

Members of KSOEH consist of those of the academic societies, occupational environment measuring agencies, occupational health managers from companies, occupational and environmental hygiene workers from the government who work on the academic research and studies and make and execute the policies of this field. They work at the front line of protecting workers' health and prepare for information applicable to the worksites. This way, they make a good contribution to improving occupational environment in our workplaces.

As much as the society is more developed and advanced, the harmful elements which have influence on the body of workers get more complex and diversified. To solve this problem, it is required to integrate a variety of fields of academic studies, make more comprehensive and profound research and exchange information between each other. Therefore, it guides the members to organize a society for the research on many fields and start their voluntary activities on KSOEH website. At present, a society of Nano-Materials Study and a Society for Informing Harmfulness of Chemical Substances are organized.

With experiences in the field of occupational and environmental hygiene, KSOEH is planning to join International Occupational Hygiene Association (IOHA), an international academic society on occupational and environmental hygiene, to share experiences with other foreign societies. To do so, the application for registration is already submitted.

Action Plan

KSOEH will continue to develop its academic study on occupational and environmental hygiene. Based on our theoretical knowledge about it, we will strive to apply it to the workplaces, and will not limit our capacity to the domestic areas. We will find more ways to expand our information exchange with other foreign academic societies. Finally, we will make efforts to contribute to development of the world with our academic research and accomplishments.

Introduction of Ergonomics Society of Korea

Shin, Seung Heon President |
Ergonomics Society of Korea

Overview

Ergonomics Society of Korea(ESK) was founded in March 27, 1982, joined Korean Federation of Science and Technology Societies in February 1, 1985, and accepted the authorization of establishment of a corporation aggregate from Korea Engineering Promotion Agency in December 30, 1992. ESK joined International Ergonomics Association (IEA) in August 1, 1990 and are designated as an academic society by Korean Industrial Property Office in September 2, 1998. We were established to develop, supply and apply ergonomics and its technology for the sake of the general public and to contribute to development of ergonomic technology related to human engineering. We hold academic conferences, forums and workshops, publish journals and other publications, cooperate with universities and academies for promoting standardized design and prosperity of lives, and exchange information with domestic and foreign institutions. We have a total of 550 members including regular members and corporative members.

Activities

Since ESK was established, it has been making efforts in a variety of areas to create a safe and secure society, focusing on usability and human-oriented design. Our achievements have been presented and discussed in the academic conferences and published on the Journal of Ergonomics Society of Korea to make them public. We established Ergonomic Design Award in 1997 and have offered this award every year. This is the first and top design award granted to the products which embody ergonomic elements in its most sophisticated form. We judge the products for this award by dividing them into the areas of home appliances, mobiles, furniture and software.

In addition to this, we have had charge of ergonomics-related standardization projects. We are in charge of establishing the ergonomics-related standards of Korean (Industrial) Standards (KS), and we participate in the establishments and approvals of ergonomics-related international standards in the technical committee 159 (ISO TC 159) of International Organization for Standardization (ISO). For example, we worked on utilization of Human Anthropometric Data (ISO 7250 series) and Visual Display Dimensionality (ISO 9241 series). We joined IEA in 1990 and produced two council members. This privilege is given to the country whose 500 members or more are subscribed to IEA. At present, we have three voting members and one treasurer in IEA. And we held the international conference of IEA in the COEX Convention Center in Seoul very successfully in 2003, and produced one IEA fellow in 2006. This way, we are very happy to see our position in IEA well recognized along with the strengthened positions of the ergonomic engineers in Asia. We have held Ergonomics Society of Korea & Japan Ergonomics Society Joint Symposium every year since 1996 to exchange and promote the understandings and knowledge of ergonomics between two countries. In this symposium, about 20 papers are presented every year. Most of the contents are about the areas that each country is interested in, related to ergonomics.

Action Plan

Internationally, we will strengthen our relation with international ergonomics institutions and exchange information for complementary cooperation in order to heighten our position in this field. And we will start a collective project with Ergonomics Society of Japan to promote the development of ergonomics between two countries. Domestically, we won't be just satisfied with our theory and technology which we have accomplished so far, and instead we will play a proactive role of suggesting a variety of policies necessary to develop our society and supplying our technology for the industries as much as they want us to. And we'll strive to contribute to making our society where everyone lives happily, safely and comfortably utilizing ergonomics in our daily lives. Finally, we will adopt the road map of ergonomics strategy which will show its process to us to solve the important matters of ergonomics.

Introduction of Korean Academic Society of Occupational Health Nursing

Kim, Young Im President
| Korean Academic Society of Occupational Health Nursing

Overview

Korean Academic Society of Occupational Health Nursing (KSOHN) was founded in 1990. With cooperation of KSOHN and eight regional directors across the country, KSOHN has made an academic development of occupational health nursing activities such as trainings to 350 members and occupational health nursing-related researches, hosting academic conferences, and publications of Journal of Korean Academic Society of Occupational Health Nursing. It has developed so far after 18 years, and in 2007 its Journal of Korean Academic Society of Occupational Health Nursing was nominated to be published in the Journal of Korea Research Foundation, a prominent journal in Korean academic area, which paved its way to secure the position.

Activities

Workers are considered as social minority though they are the driving force for developing society. KSOHN has developed a wide variety of activities by putting emphasis on creating a forum for presentations and discussions to take care of the health of workers. It has discussed major problems for workers and suggested the countermeasures against some very controversial issues through seminars, academic conferences and researches by taking care of health of female workers, taking control of harmful substances to workers, dealing with musculoskeletal disorder related to some occupations, introducing occupational health special nurse system, taking care of health of foreign workers, and developing health promotion program for workers including the prohibition of smoking and alcohol.

Action Plan

Domestically, KSOHN will strive to have its journal formally registered, not nominated, to be published on the Journal of Korea Research Foundation, have website be an important place for exchanging information with members, support members' researches and handle research projects from outside. To promote occupational health nursing activities through international exchanges, KSOHN will hold a symposium under the theme of Maternity Protection of Female Workers in the XVIII World Congress on Safety and Health at Work from June 29 to July 2, 2008 and work to develop occupational health nursing activities by making a continue exchange of information with the occupational heath nurse scholars from Japan, Taiwan and Thailand, etc. Also with mutual assistance with the academic societies, KSOHN will make efforts to produce a creative result of occupational health nursing practices in the fields of regional health service and the occupational health service.

Implementation of WHO Global Plan of Action on Workers' Health in Europe

This paper briefs the burden of occupational diseases and injuries, key approaches of WHO Global Plan of Action to address the challenges of protecting and promoting workers' health in the 21st century, the current activities of WHO European Regional Office in the implementation of WHO Global Plan of Action in Europe.

Kim, Rok Ho Programme Manager |
Occupational Health, European Centre for Environment and Health
WHO/EURO Office

Introduction

Workers represent half of the world's population and are the major contributor to the economic and social development of contemporary global society. Their health is determined by a number of factors including hazards in the working environment, social factors, behaviours and access to health services. The processes of social transformation and globalization over the last decades have brought about changes in the world of work which provide new opportunities and challenges to protecting and promoting health at work. In 1996, the World Health Assembly endorsed the Global Strategy on Occupational Health for All and urged Member States to devise national programmes to provide occupational health services for all workers and particularly for high risks sectors, vulnerable groups and underserved populations (Resolution WHA 49.12)[1]. New policy initiatives such as the World Summit on Sustainable Development and a number of regional ministerial conferences in the area of health, labour and environment called for further strengthening WHO action on occupational health and linking it to the promotion of public health. In addition, several WHA Resolutions have urged the Member States and WHO to take action on specific health topics which include protection and promotion of health at work. In May 2007, the WHO Global Plan of Action on Workers' Health 2008 ~ 2017 (WHA 60.26) was endorsed as a follow up to the WHO Global Strategy on Occupational Health for All and in response to the above mentioned initiatives and challenges[2]. It addresses different aspects of workers' health, including primary prevention of occupational risks, protection and promotions of health at work, addressing work-related social determinants of health, and improving the performance of health systems.

WHO European Regional Office is implementing the WHO Global Plan of Action on Workers' Health with the support of the WHO Collaborating Centres and WHO contact persons in European Region*. This paper briefs the burden of occupational diseases and injuries, key approaches of WHO Global Plan of Action to address the challenges of protecting and promoting workers' health in the 21st century, the current activities of WHO European Regional Office in the implementation of WHO Global Plan of Action in Europe.

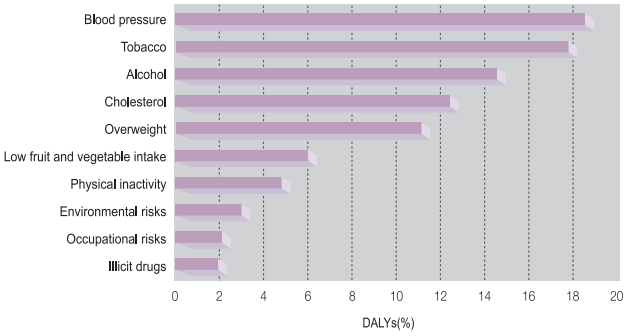
1] WHO, Global Strategy on Occupational Health for All : The way to health at work http://www.who.int/occupational_health/globstrategy/en/ accessed on 25 May 2008

2] WHO, Workers' health : global plan of action, http://www.who.int/gb/ebwha/pdf_files/WHA60/A60_R26-en.pdf accessed on 25 May 2008

* In this paper, European region indicates the 53 member states of WHO European Regional Office as of May 2008. They include the countries of Eastern Europe, Caucasus, and Central Asia (EECCA) as well as the 27 members of European Union. For the list of member states, see http://www.euro.who.int/countryinformation

Burden of Occupational Diseases and Injuries

The burden of disease expressed as disability-adjusted life years lost from specific risk factors provides policy-makers with valuable information in the priority-setting of public health policies in their countries. According to the World Health Report of WHO on global burden of disease, hazardous exposure at the workplace is one of the most important risk factors affecting the burden of disease in Europe, claiming 2.5% of the total disability-adjusted life years (DALYs) in the region. Occupational diseases and injuries are a significant cause of ill health often affecting young and productive members of the society[3].



[Figure 1] Burden of disease due to major risk factors in European region

〈Table 1〉 Comparison of occupational burden of diseases to other factors in European region (unit: thousand DALYs)

Risk factor	DALYs in European region
Selected occupational risks	**2483**
Occupational injuries	1000
Carcinogens	443
Airborne particulates	409
Ergonomic stressors	97
Noise	634
Urban air pollution	**859**
Illicit drug use	**2332**
High Blood Pressure	**19349**
Alcohol	**15261**
Tobacco	**18613**

[Figure 1] and <Table 1> show the magnitude of burden of disease from occupational risk factors as compared with burdens from other high priority risk factors in public health practice in European region. The occupational burden of disease is much smaller than the burdens from high blood pressure, alcohol drinking or tobacco smoking. However, it is comparable to, or slightly greater than the burdens from illicit drug use, which one of the priority risk factors in most European countries. It is interesting to note that occupational burden of disease is four times greater than the burden from urban air pollution, although only major risk factors were considered. Overall, occupational risk factors are the ninth most important burden of disease in European region. According to the ILO estimates of fatalities and accidents, in European region, approximately 300,000 persons die of occupational or work-related diseases, and 27,000 persons, of occupational accidents. Occupational diseases and injuries result in approximately 4% loss of GDP. If we take into account the sufferings of the families and friends as well as the loss of economic productivity, the total occupational burden of disease is huge in terms of health and economic terms.

Challenges of occupational health in the 21st century

Traditionally, the protection of employees' health and safety from the workplace hazards has been the primary responsibility of the employers, although the government played the role of regulatory control and stewardship through the labour laws and standards on working conditions. The success of primary prevention approaches in western European countries resulted in a remarkable decreased in the incidence of serious occupational diseases in the 20th century. However, new challenges are emerging in European region.

● Public health approach to occupational health

Workplace health promotion became an important activity of occupational health services in late 20th century in the western European countries. Accordingly, occupational health became an important policy area for health ministries as well as of labour

3) WHO, World health report 2002 – Reducing Risks, Promoting Healthy Life, http://www.who.int/whr/2002/en/ accessed on 25 May 2008

ministries, because it provides an access to the half of general population for key public health interventions. In many European countries, there was a shift from labour approach to public health approach[4]. The leadership role of health ministries in addressing the topics of workers' health has become more critical in the 21st century. Unfortunately, the cooperation and collaboration between labour and health ministries are not always optimal in the development and implementation of national strategies and policies on workers' health in many countries.

● Health inequalities

Occupational health is not equal to all workers. Health and safety of the vulnerable workers in high-risk sectors are often invisible, and thus, not well protected even in the developed world. Access to basic occupational health services varies differs within and between countries. For example, the occupational health services coverage of the working population varies over 90 to below 10% between the EU and non-EU countries in the European region.

● Globalization

The globalization of manufacture and economics facilitated by rapid population growth in poor countries assures an unending supply of cheap labour, allowing limited attention to hazard control, thereby impeding progress in occupational health and safety[5]. The occupational illness is generally less visible and not adequately recognized as a problem in low-income countries. Those outside the workplace can also be affected through environmental pollution and poor living conditions[6]. Health of migrant workers has become one of priority issues in the European region due to the EU enlargement and the globalization of labour market. Impact of globalization on workers' health is a challenge even in developed countries because new employment patterns and working conditions can adversely affect cardiovascular and mental health of the working population and their families.

● Economic transition

In European region, many countries experienced a transition from planned economy to market-oriented economy in recent decades. This had a huge impact on the health and safety of workers as well as on the occupational health systems in those countries. It is a challenge for WHO European Regional Office to assist the transfer of knowledge, know-how and experience in occupational safety and health policy and services from the established market economies to the countries in socio-economic transition and the establishment of long-term East-West partnerships between the relevant national institutions[7].

● Newly emerging occupational health risks

There is a gap in the information and knowledge on the occupational health impacts of new technologies such as nanotechnology. The impact of climate changes on workers' health is an issue that the governments will have to address in developing national action plans to address the impact of climate changes as many occupations require people to work in hot conditions, irrespective of the weather, and effective management systems for ensuring health and safety are in place[8]. The aging of working population is another challenge for the policy-makers of developed countries.

● Old problems

Old problems remain in the economies in transition. It remains a challenge to provide occupational health services to the workers in the informal economy, small and medium-sized enterprises, agriculture, and migrant and contractual workers, with essential interventions and basic occupational health services for primary prevention of occupational and work-related diseases and injuries. Hazardous forms of child labour are not still eliminated in European region. For example, there have been international concerns about children in Central Asia working in the cotton field during the cotton-picking season.

WHO Response: Global Plan of Action on Workers' Health

The Sixtieth World Health Assembly in May 2007 adopted WHO Global Plan of Action on Workers' Health. This new initiative of WHO responds to the above challenges of the 21st century by providing a framework for concerted action by all health and non-health actors for protecting and promoting the health of workers, establishing political momentum for primary prevention of occupational and work-related diseases, and ensuring coherence in the planning, delivery and evaluation of

4) Vanhoorne MN, Vanachter OV, De Ridder MP. Occupational health care for the 21st century: from health at work to workers' health. Int J Occup Environ Health. 2006 Jul-Sep;12(3):278-85.
5) Gochfeld M. Occupational medicine practice in the United States since the industrial revolution. J Occup Environ Med. 2005 Feb;47(2):115-31.
6) Rene Loewenson. Globalization and occupational health: a perspective from southern Africa Bulletin of the World Health Organization, 2001, 79: 863–868.
7) WHO European Regional Office. Health development action for South Eastern Europe: occupational health services. http://www.euro.who.int/stabilitypact/projects/20060906_24 accessed 25 May 2008
8) WHO European Regional Office. Heal-health action plans. 2008. http://www.euro.who.int/InformationSources/Publications/Catalogue/20080522_1 accessed 25 May 2008

health interventions at the workplace. In particular, this plan recommends a number of action to be taken by the Member States and by WHO with the objectives to: (1) devise national policy instruments on workers health; (2) protect and promote health at the workplace; (3) improve the performance of and access to occupational health services; (4) provide and communicate evidence for preventive action; and (5) address workers health through other policies. The plan of action provides guidance to the Member States and WHO in their activities on workers health over the period 2008-2017. It will stimulate the development of policies, infrastructure, technologies and partnerships for improving the health of all workers. In such a way it will contribute towards achieving a basic level of health protection in all workplaces throughout the world. The implementation of the plan will be facilitated by a Global Steering Committee. Its mid-term and final evaluation will be reviewed by WHO governing bodies in 2013 and in 2017.

Implementation of WHO Global Plan of Action in Europe

WHO European Regional Office implements the WHO Global Plan of Action on Workers Health in European region to meet the challenges in the Region. The key strategy of implementation is to work with the WHO collaborating centres and national contact persons in occupational health in the development of national strategies and action plans corresponding to the WHO global plan. The collaboration with international partners such as ILO and EU is also another key strategy of regional implementation, because ILO and EU also announced their new strategies on health and safety at work in the past two years[9), 10)]. A coordination meeting of responsible officers of WHO/Europe, ILO and EU was held in Vilnius, November 2007. It was confirmed that all three strategic documents share common approaches. Basic consensus was reached at the working level on joint activities for synergistic implementation of international strategies in 2008 and 2009. The network of WHO contact persons on occupational health in 33 countries will meet in Helsinki, Finland, on 22 ~ 23 September 2008, hosted by the Finnish Ministry of Social Affairs and Health. The European Network of 33 WHO Collaborating Centres will meet in Madrid, Spain, on 14-16 October 2008, hosted by the European Institute of Health and Social Welfare. At both meetings, the participants will review the objectives of WHO Global Plan of Action on Workers' Health, and develop a plan of regional implementation. These meetings will be followed by a meeting in Dresden, Germany, in January 2009, where the steps towards a successful implementation of international and national strategies will be discussed. The latter meeting will be hosted by the German Statutory Accidents Insurance (Deutsche Gesetzliche Unfallversicherung, DGUV). In all of these meetings, the participating countries will discuss on the sub-regional initiatives such as Baltic Sea Network on Occupational Health and Safety, and South-Eastern Europe on Workers' Health, for effective and efficient development and implementation of national action plans in accordance with the WHO Global Plan of Action. Along with the above inter-country approaches, WHO European Regional Office is implementing WHO Global Plan of Action through bilateral collaborations with the member states. The countries of economies in transition are the priority for WHO because there are urgent needs of policy support in the national implementation of the WHO Global Plan of Action. Biennial collaborative agreements (BCAs) were signed between the Regional Director of WHO European Office and the Ministers of Health in the Republic of Croatia, the former Yugoslav Republic of Macedonia, the Republic of Serbia, and the Russian Federation. WHO is providing technical and policy support to the national counterparts for the national implementation of WHO Global Plan of Action tailored to specific needs of the working population in these countries.

Conclusion

In WHO European region, the occupational burden of diseases and injuries is one of ten highest priorities in need of public health interventions. In the 21st century, challenges in the protection and promotion of health of the working population are the public health approach to occupational health, globalization, economic transition, and newly emerging risks in addition to old problems of vulnerable workers and sectors. Responding to these challenges, the World Health Assembly adopted the WHO Global Plan of Action on Workers Health 2008-2017 in May 2007. This plan recommends a number of actions with the five objectives to devise national policy instruments, protect and promote health at the workplace, improve the occupational health services, provide evidence for preventive action, and address workers health through other policies. WHO European Regional Office is actively implementing the plan through inter-country and country activities with the support of WHO collaborating centres, WHO contact persons, and international partners such as ILO and EU.

9) ILO Promotional Framework for Occupational Safety and Health (2006) http://www.ilo.org/public/english/protection/safework/promoframe.htm accessed 25 May 2008
10) EU Strategy on Health and Safety at Work (2007) http://ec.europa.eu/employment_social/news/2007/feb/commstrat_en.pdf accessed 25 May 2008

Workers' Health Surveillance in Europe: strengths and weaknesses, opportunities and threats

WHS is a long existing approach for the prevention and early detection of occupational and work-related diseases. In the 20th century there have been legal obligations for employers and employees in most European countries regarding workers' health surveillance.

André N.H. Weel MD PhD |
Project manager of NSOM

Introduction

The International Labour Office (ILO) has defined Workers' health surveillance (WHS) as a generic term which covers procedures and investigations to assess workers' health in order to detect and identify any abnormality (ILO, 1997). WHS is a long existing approach for the prevention and early detection of occupational and work-related diseases. In the 20th century, there have been legal obligations for employers and employees in most European countries regarding workers' health surveillance.

However, the differences in legislation between the countries were considerable. In some countries like the Netherlands, there was a voluntary periodic medical examination for most workers. This tradition has been founded by Georg Burger, chief medical officer of the Philips factories, with the introduction of the periodic radiological thorax examination of Philips employees for the prevention and early detection of pulmonary tuberculosis (1930).

The European Framework Directive of 1989 introduced the obligation for employers to offer WHS, for the member countries of the European Union. In subsequent years, EU member countries implemented this obligation in their own legislation.

In 1997 the ILO has formulated important recommendations for the application of workers' health surveillance in occupational health practice.

The practice is still unsatisfactory in many countries. We study strengths and weaknesses of the current status of WHS in Europe, and make some recommendations for improvement.

With the guideline for preventive medical examination of workers, the Netherlands Society of Occupational Medicine hopes to improve this practice in a qualitative and quantitative aspect. Although not yet

evidence-based, the guideline's approach offers good chances to contribute to the health of working people and to scientific evaluation.

The European Framework Directive

In 1989, workers' health surveillance obtains a prominent position within the European legislation. The Council directive of 12 June 1989 "On the introduction of measures to encourage improvements in the safety and health of workers at work (89/391/EEC)", usually called the Framework Directive, is coming into force. Article 14 of this directive openly declares:

- To ensure that workers receive health surveillance appropriate to the health and safety risks they incur at work, measures shall be introduced in accordance with national law and/or practices.
- The measures referred to in paragraph 1 shall be such that each worker, if he so wishes, may receive health surveillance at regular intervals.
- Health surveillance may be provided as part of a national health system.

Consequences for EU member states

In the EU member states, the influence of the Framework Directive 1989 has been moderate. In many countries, especially in southern Europe, WHS had been obligatory for many years already. These countries applied the so-called fitness approach: a worker should go for a periodic medical examination to be carried out by a 'competent doctor'. In case of approval the workers gets a certificate that he is still 'fit for the job'. If he could not show such a certificate to his employer, the employer is not allowed to keep this worker in his current job.

In the countries of North and West Europe, we see a combination of fitness approach and adaptation approach. The latter approach means that the emphasis of WHS is on the balance between work load and working capacity and the detection of early signs of disease. If the balance is not good, the worker and sometimes also the employer receives advice how to improve the situation : by medical treatment, or by adjustment of the work load or working conditions. In this approach, the repeated WHS may be used to assess changes in health and working conditions an the group level.

On January 1, 1994, WHS started to be an obligation for Dutch employers. The working conditions act obliges all employers to offer an examination to his employers 'with regular intervals'. For employees, participation remains voluntary. Article 18 in the last revision of the Working Conditions Act says:

> At given times, the employer offers the opportunity of an examination to the employees. This examination is focused upon the health risks that are caused by the work. The purpose of the examination is to prevent or restrict these risks as much as possible.

In the opinion of the Dutch government, WHS should not be a general health check-up. The examination should be restricted to the effects of work-related health risks. This opinion has caused a lot of discussion. Should professionals really ignore the consequences of unhealthy living habits upon numerous chronic illnesses? Nowadays, it is generally recognized that these personal risks and chronic illnesses deserve attention in WHS. The Dutch approach is an adaptation approach for most workers.

●The ILO guidelines

In 1997, the International Labour Office has published technical and ethical guidelines for workers' health surveillance, as a tool for improvement of the occupational health practice in this respect. These guidelines describe the criteria for proper health examination of workers in a transparent way. Because they are so helpful in thinking about WHS, we quote the main ILO advices below.

There are active roles for employers, employees and occupational health professionals. Employers and employees should formulate the objectives of WHS. The surveillance of workers' health should be appropriate to the occupational risks in the enterprise. The particular programme must relate the results of the programme to its declared purposes and what the consequences will be for workers' health and livelihood (work, job security/income), and what the impact of the programme will be on the structure of the workplace and working conditions. Health assessment procedures may include, but are not limited to, medical examinations, biological monitoring, radiological examinations, questionnaires or a review of health records.

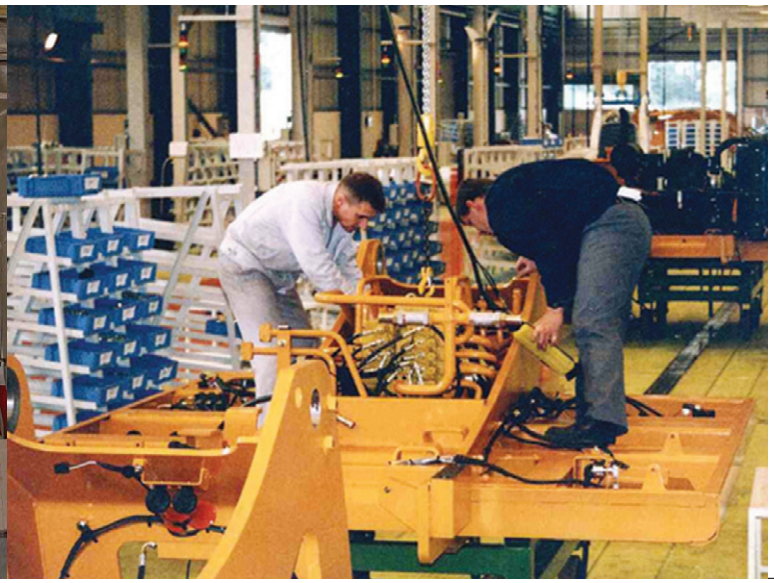
Individual workers' health surveillance may identify health disorders which are not necessarily but might be work-related. This could justify targeted special workers' health surveillance programmes or targeted surveys for individuals or groups presenting a common health disorder or exposed to specific occupational hazards in the enterprise. Moreover, the collection, analysis and communication of workers' health information should lead to action. Workers' health surveillance may be prescribed by law or not and may be compulsory or voluntary.

The employer should make the necessary arrangements to provide workers access to health surveillance, preferably during working hours and at no cost to the worker concerned. Medical examinations and tests should not be carried out as a perfunctory routine. Due consideration should be given to their value and relevance. They should be governed by a set of principles which include:

- selecting appropriate tests which are acceptable to workers;
- discarding tests that cannot meet requirements with respect to their relevance, specificity and sensitivity; and
- periodically reviewing health surveillance programmes as a whole and modifying them in the light of improved working conditions.

Occupational health physicians or medical practitioners engaged in an occupational health practice should retain overall responsibility for biological tests and other medical investigations as well as for the interpretation of results, although tests can be performed by nurses, technicians and other trained personnel under their supervision.

Special attention should be given to the manner in which forms are conceived. There may be irrelevant questions and some important aspects may be missing. Forms and questionnaires to be filled in by workers or by occupational health professionals may not meet the necessary criteria of respect and confidentiality. Occupational health professionals should examine such forms and questionnaires and endeavour to have them revised if necessary.



Workers' personal health data covered by medical confidentiality should be stored only by personnel bound by rules on medical confidentiality.

Medical confidentiality with regard to communications on conclusions of workers' health assessments should be strictly observed in accordance with national practice and recognized ethical guidelines. Occupational health professionals should take all necessary measures to prevent the results of a medical examination being used for other than the intended purpose and to ensure that medical confidentiality is fully respected. General and collective information on the health of workers in the enterprise must be provided to employers and workers and their representatives in an appropriate manner for prevention, protection and promotion purposes. The shift from a fitness to adaptation approach implies that the results of the health assessment should also be used for the objectives of advising the worker and the employer on the measures that they should take to overcome the problem; on which lifestyle might minimize work-related problems.

The results should be used to protect and promote the health of the individual, collective health at the workplace, and the health of the exposed working population. As indicated in the ILO Code of Practice on the Protection of Workers' Personal Data, genetic screening should be prohibited or limited to cases explicitly authorized by national legislation.

● Analysis of current WHS in Europe

▶▶▶Strenghs

WHS consisting of a health questionnaire and medical examination of employees is the only method that may reveal disease in a preclinical stage and contribute to the onset of treatment at the earliest moment.

If carried out with regular time intervals, and focussed upon diseases for which the employees are at risk, applying specific and sensitive screening methods, the effectiveness of WHS may be expected to be at its maximum.

▶▶▶Weaknesses

Scientific evidence for the effectiveness of WHS is poor. In the literature, there is no systematic review about the effectiveness of WHS. It is quite difficult to carry out such a review due to the large differences in applied WHS methods. Occupational health professionals are often not able to convince employees and employers about the usefulness of WHS, especially in working populations with apparently low sickness absence rates.

▶▶▶Opportunities

The demands for an evidence-based health surveillance of workers are formulated with an increasing sense of urgency. The European Framework Directive is a potential incentive for WHS, be it not of a scientific but of a legislative nature. For service providers like occupational health services, WHS may contribute to a sound financial basis. Customer companies are more and more aware of the importance of a proper health policy, and WHS may be a central element in that policy.

▶▶▶Threats

There are unclarities and confusion about objectives, approaches and tools of WHS. In many cases, objectives for WHS have not been formulated when starting the screening. In those situations, evaluation of effectiveness is not possible at the end.

The biggest threat is lack of motivation of all parties involved in WHS. This is what we have observed in the Netherlands. In 2004, the Centre of Excellence of the Netherlands Society of Occupational Medicine (NSOM) has carried out a study into the application of WHS in practice. The results are shocking. Many employers do not meet their obligations. The number of workers that is really offered WHS is gradually decreasing. It is estimated 10 to 20% over a five-year period. Many workers do not consider WHS to be important for their health. For them WHS is sometimes a kind of ritual without consequences: “You fill in a questionnaire and you don't get any feedback”. The government hardly maintains

the legal obligations regarding WHS. Many employers think that the benefits do not outweigh the costs.

Conditions for improvement

In 2005, the Centre of Excellence NSOM was given a project assignment by the Ministry of Social Affairs to develop strategies and tools to improve the practice of WHS in the Netherlands from a qualitative as well as from a quantitative point of view.

How might WHS be made attractive for all parties involved? An expert group was formed. This group has defined four conditions for improvement of the current situation:

● Involvement of the organisation

WHS aims to contribute to the health of workers and the organisation (company, institute, factory, school, hospital) as a whole. Eventually the management is responsible for WHS. The occupational physician plays a key role as main advisor and partially as involved in the execution of WHS. The occupational physician is responsible for the relevance and the technical quality of the examinations (medical, biomonitoring, questionnaire) that are elements of WHS.

WHS is a process that should be planned and coordinated carefully. The management appoints a company project group; the occupational physicians is advisory member of this project group.

The management decides about the objectives, contents and execution of WHS, after study of the advices of the project group and the occupational physician.

● Clear objectives for WHS

There are three core objectives of WHS:

- prevention of occupational and work-related diseases in individual and groups of workers
- monitoring and promoting the health in individual and groups of workers in relation to their work
- monitoring and improving the functioning and employability of individual workers.

These three core objectives are valid for each concrete WHS programme. Depending on the specific company situation and the risk assessment, a core objective may get a higher priority.

Moreover, the organisation may formulate own company-specific objectives. These should fit within the core objectives. Company-specific objectives may regard the approach of specific company problems, e.g. stress at work, a high prevalence of musculoskeletal complaints, or a high (or rising) sickness absence rate on a particular department.

The examination methods should be based on the objectives. If so, it is possible to determine the efficacy of a WHS programme: one could assess to what extent the objectives have been realized.

● The physical and psychological status of the worker

In shaping a WHS for a given company, one should take into account the health risks in the work and working conditions (as described in the most recent risk assessment report). But these are not the only basis for the WHS. Personal risks like a poor physical or mental health status, a chronic illness, or unhealthy and risky life habits should be considered as well. The latter factors may be influential regarding the functioning of workers in their work.

● Interventions

In the past, many WHS programmes have been limited to examination and detection. In many cases, the results were not used for improvement. Agreements about the actions and steps to be taken for improvement of the health status of the workers (diagnosis and treatment) and the working conditions, should be an intrinsic part of each WHS programme.

The WHS guideline of the NSOM

This guideline intends to combine the conditions for improvement described above, the legislative demands, the ILO guidelines. The WHS guideline has been drafted by the expert

group of NSOM, and commented by OHS professionals, employer and employee organizations. The WHS guideline is a description of a process of steps to be taken by company representatives and occupational health professionals, in close cooperation. See the schedule below.

Recommendations

The process of Workers' Health Surveillance in five stages

Stage 1. Orientation and decision making

① Set up a project group
② Select objectives
③ Assess financial sources
④ Take decision

Stage 2. Preparation

① Divide tasks
② Assess contents
③ Contract experts, OHS professionals
④ Plan execution

Stage 3. Execution: activities for individual workers

① Carry out screening test
② Complete questionnaire
③ Examine functional fitness
④ Do additional diagnostics
⑤ Carry out individual interventions

Stage 4. Execution: activities for groups of workers

① Draft group analysis and group report
② Carry out group interventions

Stage 5. Evaluation and follow-up planning

① Evaluate and plan follow-up

The competent national authorities should review the national practices on WHS, establish priorities and devise an approach to ensure that WHS reflects the needs at enterprise and local levels, so that WHS is managed in a cost-effective manner with no loss of quality.

To a certain extent and with expert support, branches or sectors of industry can develop their own WHS programmes. One could describe a WHS for some jobs that are numerous in a given branch, like the nurse in the health care sector, and the truck driver in the sector of road transport. However, company specific circumstances should always taken into account in drafting the WHS programme.

Branch organisations may support their member companies in setting up WHS programmes. This is especially the case for small and medium-sized companies. These organisations may also develop WHS instruments to be applied within their branches, like questionnaires.

In most cases, the results of WHS will give rise to action and interventions within companies. However, in other cases a more profound research into health problems or working conditions after a WHS is required. This is especially the case if signs of high mental or psychosocial load of workers have been found.

For the prevention of occupational and work-related diseases, evidence-based WHS programmes are needed. The Coronel Institute of the University of Amsterdam is developing evidence-based WHS programmes for different occupational groups.

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Occupational Injury and Illness Statistics in Korea

They announce the present occupational accident statistics on a quarterly basis after they collect the governmental data of occupational-accident survey and the approvals for application of medical treatment to the accident out of the occupational accidents which need more than four days' medical treatment, from any establishment (more than 1 regular employee) which applies the occupational accident compensation insurance under the law of occupational accident compensation insurance

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System of occupational accident statistics and development of occupational accident compensation insurance

● Changes of the system of occupational accident statistics

Occupational accident statistics in Korea is applied to the employees who work at the establishments that covered by the occupational accident compensation insurance, and it is closely associated with the system of occupational accident compensation insurance. Starting with the enforcement of the system of occupational accident compensation insurance in 1964, occupational accident statistics has taken the form of the present after the approval (Approval No. 11806) of general statistics in accordance with Article 8 of Statistics Law in 1977, the establishment of occupational accident survey regulations and the enactment of occupational safety and health law in 1981, the establishment of Korea Occupational Safety and Health Agency (KOSHA) in 1987, the establishment of Korea Workers' Compensation & Welfare Service (KWCWS) in 1995, the establishment of a computer network among KWCWS, KOSHA and Ministry of Labor to make occupational accident

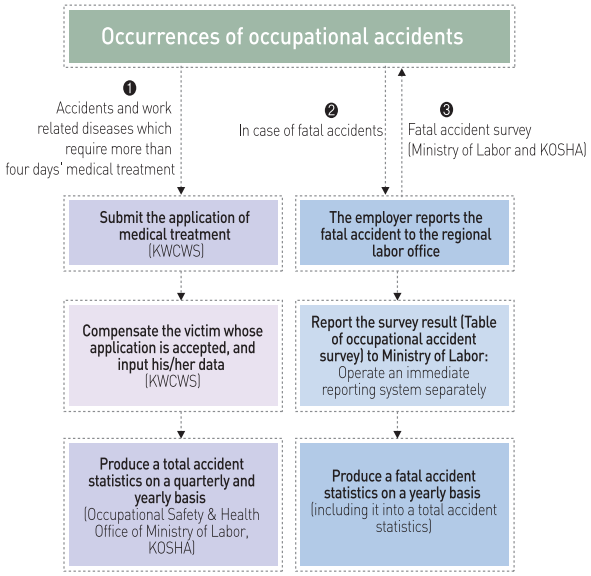
<Table 1> Changes of system of occupational accident statistics

Dates	Description of Changes
1964. 01.	Enforcement of the system of occupational accident compensation insurance (more than 500 regular employees) and production of occupational accident statistics.
1972. 01.	Analysis of collection of occupational accident survey data
1975. 03.	Approval of reports of occupational accident survey data
1977. 02.	Approval of general statistics of occupational accident survey (Approval No. 11806: Korea National Statistical Office)
1981. 01.	Establishment of occupational accident survey regulations
1981. 12.	Enactment of occupationalsafety and health law
1992. 07.	Expansion of application of occupational accident statistics (more than 5 regular employees)
1993. 01.	Exemption of duties of occupational accident report (replaced with submission of application of medical treatment)
1996. 10.	Establishment of a computer network (KWCWS-KOSHA-MOL) to produce the occupationalaccident statistics
1998. 05.	Transfer the work of occupational accident statistics to Ministry of Labor(KOSHA)
2000. 07.	Expansion of applications of occupational accident statistics (more than 1 regular employees)
2000. 12.	Approval of designated statistics of the survey of occupational accident causes (Approval No. 38001: Korea National Statistical Office)
2002. 12.	Establishment of duties of recording and maintaining the occupational accidents (Article 10.2 of occupational safety and health law)
2005. 03.	Constitution of T/F for improving the system of occupational accident statistics (Ministry of Labor)
2005. 09.	Preparation of the action plans for improving the system of occupational accident statistics (Ministry of Labor)
2006. 01.~Present	Operation of the working group for improving the system of occupational accident statistics (Ministry of Labor)

statistics in 1996, and the transfer of the work of occupational accident statistics to KOSHA in 1998 (Table 1). In the early days when the system of occupational accident compensation insurance went into effect, the government became the central operating body to collect and analyze the data of occupational accidents and produce its statistics. From establishment of occupational accident survey regulations in 1992, they analyzed the data of occupational accident survey table targeting the whole victims, and when they allowed the employers to submit the applications of medical treatment in terms of the law of occupational accident compensation insurance instead of reporting the occupational accidents, they used them as a basic data for producing the occupational accident statistics. Since then, with development of information and telecommunication industry, they established the system to produce the occupational accident statistics between the institutes for occupational accident prevention and follow-up service and the governmental agencies to produce a variety of occupational accident statistics and analyze the causes of the accidents. Therefore, they announce the present occupational accident statistics on a quarterly basis after they collect the governmental data of occupational accident survey and the approvals for application

<Table 2> Expansion of applications of industrial accident compensation insurance

Years	Description (Standard of application)	Number of establishments (Place)	Number of employees (Unit: 1,000)	Remark (Dates of enforcement)
1963.11.5. (Enactment)	Applied to the establishments (mining and manufacturing industry) with over 500 regular employees	64	81	1964.1.1.
	Applied to the establishments (mining, manufacturing, electricity and gas, transportation and warehousing industry) with over 200 regular employees	289	161	1965.4.1.
	Applied to the establishments (mining, manufacturing, electricity and gas, transportation and warehousing industry) with over 150 regular employees	594	222	1966.1.1.
	Applied to the establishments (mining, manufacturing, electricity and gas, transportation and warehousing industry) with over 100 regular employees tate-run businesses were excluded from the application	1,142	336	1967.1.1.
	Applied to the establishments (mining, manufacturing, electricity and gas, transportation and warehousing industry) with over 50 regular employees or over 13,000 temporary employees on a yearly basis	3,696	683	1968.1.1.
1970.12.31. (Partly amended)	Applied to the establishments with over 30 regular employees or over 8,000 temporary employees on a yearly basis or the construction projects whose contract amount was over 20 Million Won (for each project	5,583	779	1972.1.1.
	Applied to the establishments with over 16 regular employees or over 4,200 temporary employees on a yearly basis or the construction projects whose contract amount was over 10 Million Won (for each project)	17,551	1,517	1973.7.1.
	Expanded to the businesses with over 5 regular employees related to the industries of producing chemistry, coals, petroleum, rubber or plastic products out of the mining and manufacturing industries	21,369	1,836	1976.1.1.
1981.12.17. (Partly amended)	Expanded to the establishments with over 10 regular employees or over 2,700 temporary employees on a yearly basis or the construction projects whose contract amount was over 40 Million Won	54,159	3,464	1982.7.1.
1982.12.31. (Partly amended)	Introduced the system of the lump sum payment for industrial accident compensation insurance by the construction projects	60,213	3,941	1983.7.1.
1986.5.9 . (Partly amended)	Expanded to the establishments with over 5 regular employees or over 1,350 temporary employees on a yearly basis	83,536	5,357	1988.1.1.
1989.4.1. (Partly amended)	Expanded the application scope of industrial accident compensation insurance from the establishments whichapplied Labor Standard Law to all the businesses	154,820	7,058	1992.1.1.
1993.12.27. (Partly amended)	Added the industries of education service, public health & care, social welfare research and development to the application scope of industrial accident compensation insurance Extended the time limit of payment of estimated insurance premium and flat premium from less than 60 days to less than 70 days	186,021	7,893	1996.1.1.
1997.8.28. (Partly amended)	Prepared for exemption of the application to apprentices and trainees in the workplaces Prepared for exemption of the application to transferee abroad	227,564	8,236	1998.1.1.
1999.12.31. (Partly amended)	Expanded to the construction project whose contract amount was over 20 Million Won and which has over 1 regular employee Allowed the employers of the small and medium-sized companies (SMC) with less than 50 employees to join the occupational accident compensation insurance	706,231	9,485	2000.7.1.
2003.12.31. (Partly amended)	Applied to the construct projects, whose contract amount was less than 20 Million Won, performed by the person with construction license Applied to the agriculture, forestry, fishery and hunting businesses by a corporation with over 1 regular employee	1,006,549	10,599	2005.1.1.
2004.1.29. (Partly amended)	Allowed the employers of SMC who has no employees to join the insurance temporarily (the person who does the transportation business for passengers or freight using vehicles without employees)	1,039,208	10,473	2004.1.29.



[Figure 1] Flow chart of production process of occupational accident statistics

of medical treatment to the accident out of the occupational accidents which need more than four days' medical treatment, from any establishment (more than 1 regular employee) which applies the occupational accident compensation insurance under the law of occupational accident compensation insurance (see Figure 1).

● Changes of the occupational accident compensation insurance

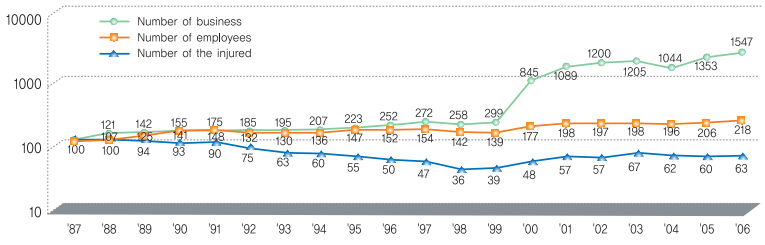
When examining the changes of the occupational accident compensation insurance by focusing on the applications of the law of occupational accident compensation insurance, you will know that we have followed the same way with development progress of our country. A regulation of occupational accident compensation that stipulated that an employer is irresponsible for occupational accidents of workers (Part 8 of Labor Standard Law) was first established in 1953. And when we enacted the law of occupational accident compensation insurance in 1963, we could finally have the compensation system for occupational accidents. In the early days of 1964, when the law of occupational accident compensation insurance took effect, this law was applied to 64 establishments (about 81,000 employees) of mining and manufacturing whose employees were over 500. Since then, its sizes and types of industry for application of the law were expanded. In 1976, in case of some specific

<Table 3> Occupational accident occurrences by year

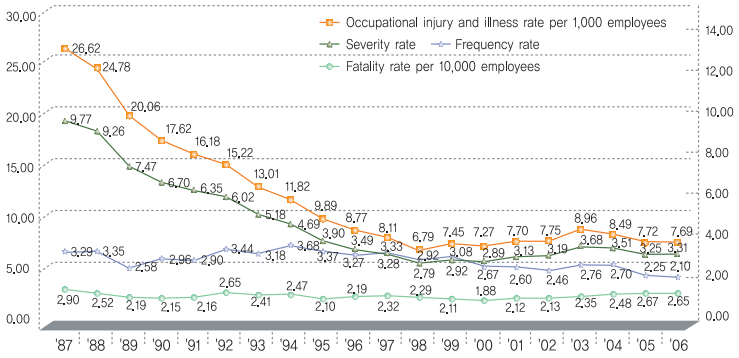
(Unit: Person)

Years	Number of establishments (Place)	Number of employees	Number of the injured (accident rate : %)	Number of the casualties (fatality rate per 10,000 employees)	Number of the occupational diseases	Economic loss (Estimated amount: 1 million Won)	Severity rate	Frequency rate
'87	83,536	5,356,546	142,596 (2.66)	1,761 (3.29)	1,623	1,206,030	2.90	9.77
'88	101,445	5,743,970	142,329 (2.48)	1,925 (3.35)	2,150	1,484,973	2.52	9.26
'89	118,894	6,687,821	134,127 (2.01)	1,724 (2.58)	1,561	1,846,527	2.19	7.47
'90	129,687	7,542,752	132,893 (1.76)	2,236 (2.96)	1,638	2,696,757	2.15	6.70
'91	146,284	7,922,704	128,169 (1.62)	2,299 (2.90)	1,537	3,507,570	2.16	6.35
'92	154,820	7,058,704	107,435 (1.52)	2,429 (3.44)	1,328	4,657,820	2.65	6.02
'93	163,152	6,942,527	90,288 (1.30)	2,210 (3.18)	1,413	4,362,655	2.41	5.18
'94	172,871	7,273,132	85,948 (1.18)	2,678 (3.68)	918	4,992,814	2.47	4.69
'95	186,021	7,893,727	78,034 (0.99)	2,662 (3.37)	1,120	5,667,887	2.10	3.90
'96	210,226	8,156,894	71,548 (0.88)	2,670 (3.27)	1,529	6,776,685	2.19	3.49
'97	227,564	8,236,641	66,770 (0.81)	2,742 (3.33)	1,424	7,780,210	2.32	3.28
'98	215,539	7,582,479	51,514 (0.68)	2,212 (2.92)	1,288	7,255,330	2.29	2.79
'99	249,405	7,441,160	55,405 (0.74)	2,291 (3.08)	1,897	6,371,130	2.11	2.92
'00	706,231	9,485,557	68,976 (0.73)	2,528 (2.67)	2,937	7,281,330	1.88	2.89
'01	909,461	10,581,186	81,434 (0.77)	2,748 (2.60)	4,456	8,722,695	2.12	3.13
'02	1,002,263	10,571,279	81,911 (0.77)	2,605 (2.46)	4,190	10,101,675	2.13	3.19
'03	1,006,549	10,599,345	94,924 (0.90)	2,923 (2.76)	7,740	12,409,070	2.35	3.68
'04	1,039,208	10,473,090	88,874 (0.85)	2,825 (2.70)	9,183	14,299,570	2.48	3.51
'05	1,130,094	11,059,193	85,411 (0.77)	2,493 (2.25)	7,495	15,128,855	2.67	3.25
'06	1,292,696	11,688,797	89,910 (0.77)	2,453 (2.10)	10,235	15,818,800	2.65	3.31

establishments for manufacturing such as mining, chemistry, coals, petroleum, rubber or plastic product manufacturers, the law could be applied to the establishments with more than five employees (expanded to 1,833,000 employees from 21,369 companies). In 1982, construction projects adapted the system of the lump sum payment for occupationalaccident compensation insurance, and this system was applied to 3,941,000 employees from 60,213 companies. In 1989, the application scope of occupational accident compensation insurance was expanded from the establishments which apply Labor Standard Law to all the businesses. So it was applied to 7,058,000 employees from 154,820 companies. In 1993, its application scope was expanded to the industries of education service, public health & care, social welfare, research and development, and in 1997, a bill for exemption to apprentices, trainee, and transferee abroad was prepared. In 1999, it was expanded to the construction project whose contract amount is over 20 Million Won and which has more than 1 regular employee, and it allowed the employers of the small and medium-sized companies (SMC) with less than 50 employees to join this insurance temporarily. So it was applied to 9,485,000 employees from 706,231 companies. In 2004, the number of the establishments which introduced this insurance was expanded to 1 million companies including 10 million employees. Accordingly, a law was enacted for collection of premium of unemployment insurance and occupational accident compensation insurance, and both premiums were to be collected together. Besides, the government allowed the employers of SMC who has no employees to join the insurance temporarily. With continuous improvement of the system, 11,680,000 employees from 1,292,696 companies benefited from the occupational accident compensation insurance in 2006.



[Figure 2] Trend of occupational accident occurrences by year (comparison of index)



[Figure 3] Trend of occupational accident index by year (entire industry)

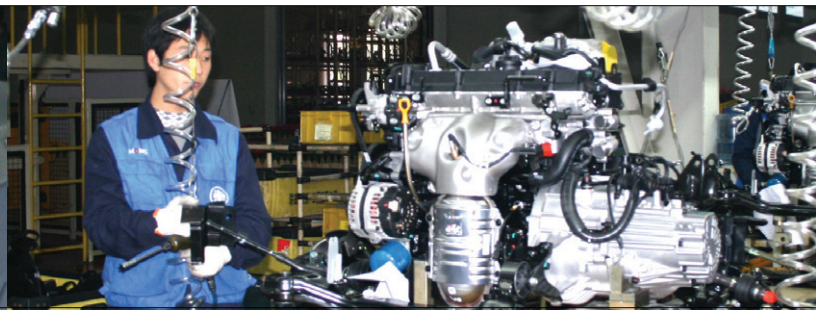
Details of occupational accidents

Trend of occupational accident occurrences by year

The trend of occupational accident occurrences in Korea is closely associated with increases of economically active population and development of industries. In the early days of 1960s when Korean economy started to grow, the occupationalaccidents were few in number. The number of victims in 1964 was no more than 1,489 (rate of accidents 1.82). However, in 1970 when Korean economy headed toward stable growth, the occupational accidents started to be considered as critical social problems, and the number of victims in 1978 increased to 139,242 (rate of accidents 4.48). In 1980, the Korean industrial structure rapidly changed, resulting from innovation of industrial technology, but the working conditions and environments were not up to the standard, which led to a variety of accidents and occupational diseases. As a result, 1984 had to witness 157,800 victims (rate of accidents 3.60), which hit records highs. This fact served as a momentum for Korean government to prepare for the policies of occupational accident prevention in many ways and to recognize the need of an agency to take care of occupational accident prevention. Accordingly, Korea Occupational Safety and Health Agency (KOSHA) was established in 1987. Since then, with help of a variety of the policies of occupational accidents prevention and the executions of the projects, the rate of accidents continued decreasing from the second half of 1980, and finally it recorded 0.99% in 1995. From that time on, the rate of accidents maintained around 0.7%, but the estimated amount of annual economic loss kept growing from 1,200 billion Won in 1987 and 7,700 billion Won in 1997 to 15,800 billion Won in 2006 (see Table 3).

▶▶▶ Comparison of occupationalaccident index

When you look into the trend of changes of the number of the establishments, the employees, victims from 1987, the year of KOSHA established, to 2006, you will notice that the numbers are 121, 107, 100 in



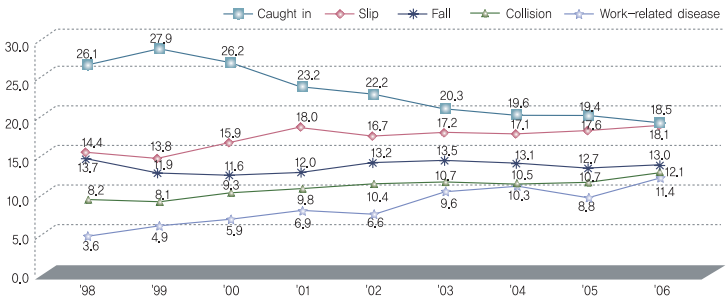
1988, 207, 136, 60 in 1994, 845, 177, 48 in 2000, 1,547, 218, 63 in 2006 respectively (occupational accident index: 100). The number of the establishments and the employees has been on the increase, compared to that of 1987, and the number of the victims decreased before 1998, but it was a little bit increasing (see Figure 2).

▶▶▶Comparison of occupational accident index by industry

When you look into accident rateand frequency rate by year, you will notice theirrates are 26.62 and 9.77 in 1987, 24.78 and 9.26 in 1988, 11.82 and 4.69 in 1994, 7.27 and 2.89 in 2000, 7.69 and 3.31 in 2006 respectively. So they show the similar trend to the trend of changes of the number of the victims. Severity rate was shown to be 2.90 in 1987 and 1.88 in 2000. Usually, it tends to have decreased and increased in this range a little bit repetitively every 4 and 5 year. Fatality rate per 10,000 employees tends to have decreased and increased in the range of 3.68 in 1994 and 2.10 in 2006 a little bit repetitively every 4 and 5 year. See [Figure 3].

●Changes of forms of major occupational accident occurrences

When you look into the trend of the changes of forms of occupational accident occurrences from 1998, when the work for the statistics of occupational accident was transferred to KOSHA, to 2006, the rate of the accidents from getting wound and caught out of the whole accidents was 27.9% in 1999 and 18.5% in 2006, which has been on the significant decrease, and the rate of the accidents from collisions and turning over has been on the gradual increase. The rate of occupational diseases was 3.6% in 1998 and 11.4% in 2006, which has been on the significant increase. Particularly, in the year of 2003 when the occupational skin diseases and liver diseases were added to the criteria for work-related diseases, this rate is shown to have significantly increased, compared to that of the previous year. In the year of 2006 when they started to classify the accidental lumbago into the work-related diseases, its rate of increase against that of the previous year was 29.5%. The rate of the work-related diseases out of the whole occupational accidents was 11.4%, which was the highest rate (See Figure 4 and Table 4).



[Figure 4] Trend of changes of occupational accident occurrences by year

<Table 4> Major occupational accident occurrences by year

(Unit: Person)

Years	Total number of the injured	Caught in	Slip & Trip	Fall	Collision	Drop & Hitting	Excessive movements	Occupational diseases	Others
1998	51,514	13,429	7,418	7,057	4,248	4,505	2,869	1,838	10,150
1999	55,405	15,461	7,659	6,609	4,489	4,280	3,405	2,732	10,770
2000	68,976	18,058	10,935	7,981	6,440	5,529	5,297	4,051	10,685
2001	81,434	18,856	14,672	9,771	8,001	7,025	5,954	5,653	11,502
2002	81,911	18,146	13,705	10,835	8,525	7,580	6,182	5,417	11,521
2003	94,924	19,238	16,373	12,799	10,193	8,183	7,000	9,130	12,008
2004	88,874	17,395	15,159	11,676	9,371	7,343	7,149	9,183	11,598
2005	85,411	16,557	15,071	10,814	9,125	6,454	6,535	7,495	13,360
2006	89,910	16,649	16,305	11,686	10,908	6,632	3,131	10,235	14,364

Epidemiologic research on sudden cardiac deaths and cancers from a tire manufacturer

Tire manufacturing industry is known for leading to high potential cancer risk regarding such as bladder cancer and leukemia. In September 2006 to September 2007, including diseases resulting in sudden cardiac deaths, lung cancer and liver cancer occurred in at a Korean tire manufacturing factory in a relatively short time. Ministry of Labor requested Occupational Safety and Health Research Institute (OSHRI) of Korea Occupational Safety and Health Agency (KOSHA) to conduct epidemiologic research to investigate its causes and to establish its measures. The research was conducted for about four months. The results are as follows :

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Background

From May 2006 to September 2007, 13 employees died from diseases in a tire manufacturing factory. Seven workers died from cardiac diseases, two from lung cancer, one from meningioma, one from hepatocellular carcinoma, one from esophageal cancer and one from suicide. OSHRI conducted the epidemiologic research to this accident to investigate the common causes of 12 cardiac diseases except for one suicide and identify if they are related to any exposures to the past works at the factory. The invsestigation team composed of three teams; analysis of the job characteristics team, work environments evaluation team and health effects team, and each team did its special investigation. The subjects for this research were 7,140 people who had worked at the factory related to the deaths and other 16 subcontractors. They took four rounds of measurement of the working environment to find chemical and physical elements, and conducted two investigations to the job characteristics. The data we analyzed to evaluate health effects of the subjects were the mortality records from Korea National Statistical Office (KNSO), the medical insurance records (TEDS) from Korea National Health Insurance Corporation (KNHIC) acquired with the consent of the workers, and both general and temporary health examination data. Usually, the epidemiologic research by OSHRI should go through the review from the evaluation committee of epidemiologic investigation which consists of 15 experts across the country. The result of this investigation on the tire factory was also put under review from the committee. Besides, it went through the process to collect the opinions from the advisory committee consisting of experts recommended by NGOs, the academic circles, Korea Employers Federation (KEF), Federation of Korean Trade Unions (FKTU) and Ministry of Labor and the representatives of the workers' families.

Results of Epidemiologic Research

The epidemiologic research was conducted by subdividing into three parts: "general characteristics of the company" which reflect the characteristics of works and operations, "evaluation of working environments" which measures and evaluates their chemical and physical elements, and "evaluation of health effects" which evaluates the dangers of getting cardiovascular diseases and cancers.

● General characteristics of the company

The establishment of the tire manufacturer for investigation was founded in 1941. It introduced a variety of information system for production management annually, and in the years of 2003 and 2005, it started to operate production management system called 1st and 2nd TOP (Total Operation Performance). The average production against monthly average workforce in each year has increased 2.3%~5.5% annually since 2001. The production against workforce in 2002, 2003 and 2006 compared to the previous year increased.

Working schedule of the 74.3% of workers were shift work. Among those working on site, 88.5% of workers of the company do the shift work and 78.8% of workers of the suppliers do the shifts. They do three shifts under four groups and have two days off after five days on duty.

In this type of three shifts, the morning group works for 7 hours 10 minutes, the afternoon group for 7 hours 20 minutes, and the night group for 7 hours 20 minutes. However, the data from the company shows that the shift workers work four more hours as overtime working before or after shifts.

There is so called 'double duty'. When you have two days off after the night shift, you are sent to the morning shift again without having the days off, or you are sent to the night shift before starting the morning shift.

● Results of evaluation of working environments

At present, this factory produces tires using about 66 kinds of chemical substances. The evaluation of working environments revealed that those substances could be acute induction elements of sudden cardiac death, chronic danger elements to facilitate cardiovascular diseases, and chemical and physical elements known for carcinogenic substances.

HCFC (Hydrochlorofluorocarbon), methylene chloride and nitrate considered as elements of inducing sudden cardiac death were found not to be used at the time of epidemiologic research. At that time, carbon monoxide was found to be less than TWA-TLV and styrene, butadiene, polynuclear aromatic hydrocarbons and carbon disulfide less than TWA-TLV as well.

Regarding rubber fumes, their exact compositions and effects on health were not reported yet, but they exceeded 0.6mg/m^3 from exposure limit of UK in the vulcanization process and production management. In the elaboration process and vulcanization process, 7~8 species of polynuclear aromatic hydrocarbons which can lead to cancers in the human body were detected.

The vulcanization process makes a very hot thermal environment with steam and fumes, etc. arising from hot rubbers. This creates over than 40℃ hot environment from June to August and over 30℃ to November.

"A research on improvement of harmful gases and thermal environment from vulcanization process," conducted on this factory by a university on September 2007, showed that high temperature from the vulcanization process would not go out of the factory but it flows out to the bottom of partitions and goes into the place where workers work. Considering this research results, it was assumed that some workshops were likely to be exposed to high temperature not only in the vulcanization process but also in the processes adjacent to this process. Regarding noise measurement, 46% of workers were exposed to noises which exceeded 85dBA.

● Results of evaluation of health effects on cardiac diseases and cardiovascular diseases

This research shows that in 1996 to 2007, the standardized mortality ratio (SMR 141.1; CI 60.8~278.1) of workers with ischemic heart diseases (gender, age-adjusted) was 1.7 times as high as the standardized mortality ratio (SMR 84.0; CI 67.8~102.9) of general population, and the SMR of the current workers with seven person dead was high (SMR 151.4; CI 60.7~312.0), compared to the SMR of the retired workers with one person died (SMR 80.9; 0.1~450.0). The SMR of the current workers from ischemic heart diseases was 5.6 times in 2006 as high as the nationwide mortality statistics.

The standardized medical utilization ratio from angina pectoris, one of ischemic heart diseases, was high in the current workers with results of 261.7 (CI 176.5~373.6) in 2006 and 244.9 (CI 217.0~472.0) in 2007 respectively, compared to prevalence rate of annual angina pectoris diagnosed by doctors under 2005 Korea National Health and Nutrition Examination Survey. This result was significant in terms of statistics.

We examined if the increase in mortality rate of the current workers with ischemic heart disease and the increase in medical utilization rate from angina pectoris were common in this factory or just limited to a specific operation, and if the medical utilization from hypertension and diabetes increased along with this condition. The mortality rate from ischemic heart disease was shown larger in the current workers than in the retired workers. Most of them were found in the worksite group, the technology group and the research group except for the office group. And if you look further into the mortality rate from cardiovascular diseases, you can see the death in every working group.

When comparing the medical utilization rate of the current workers with ischemic heart diseases by the working groups, those from the research group who accepted medical treatment in

2003 and 2004 were 10.4 and 9.3/1,000 workers respectively. This was higher than the other working groups. In 2005, most of the groups showed almost similar medical utilization rate except for the technology group which had no examinees in 2005, but the office group had 16.6 and 10.0 examinees out of 1,000 workers in 2006 and 2007 respectively. This was the highest of the other working groups. In the years of 2003 to 2007, the medical utilization ratio of the current workers with hypertension, one of the underlying diseases out of ischemic heart diseases, was 157.4 (CI 140~177.0) in 2007. This was higher than that of the entire nation with the same disease and it was also significant in terms of statistics. Meanwhile, the medical utilization ratio of the retired workers with hypertension was 141.3 (CI 104.9~186.3) to 210.9 (CI 168.0~261.4) from 2004 to 2007. This was higher than that of the entire nation with the same disease and it was also significant in terms of statistics.

When comparing the medical utilization rate of the current workers with hypertension in the period of 2003 to 2007 by the working groups, those from the office group showed the highest medical utilization rate of the worksite group, the research group and the technology group. The same goes for the retired workers. And the medical utilization rate of the current workers with diabetes, one of the basis diseases out of ischemic heart diseases, in the period of 2003 to 2007, was lower than that of the entire nation with the same disease and it was statistically significant in terms of statistics in 2003 to 2005. Meanwhile, the medical utilization ratio of the retired workers with hypertension was 109.8 (CI 67.9~167.8) to 147(CI 103.5~202.6) from 2004 to 2007. This was higher than that of the entire nation with the same disease and it was also significant in terms of statistics in 2006 to 2007. The medical utilization rate of the current workers with diabetes in the period of 2003 to 2007 showed no significant difference when compared by each group.

In the period of 2003 to 2006, the workers of stage 2 hypertension (over 160 mmHg of systolic blood pressure or over 100 mmHg of diastolic blood pressure) out of the health screen examinees increased but gradually reduced in the office group, the research group and the worksite group in 2004. However, there were 3.31% in the office group, 2.9% in the worksite group, 2.1% in the technology group and 1.5% in the research group.

Stage 1 hypertension (over 140~159 mmHg of systolic blood pressure or over 90~99 mmHg of diastolic blood pressure) showed 0.8~27.9% but after 2004, it gradually reduced and showed 0.8~6.6% in 2006. It was the highest in the office group.

When we examined the smoking and alcohol drinking habits of some workers through the health interview survey their smoking rate was 67.3%, which was higher than 53% from that of national sample group, and their drinking rate was 41.1% in 1 to 3 times a week, 7.8% in 3 to 4 times a week. This rate means higher than the results of National Health and Nutrition Survey (NHNS). Particularly, some factories showed higher frequency of drinking rate. However, their obesity rate was low, compared to the results of NHNS. In the SMR for twelve years from 1996 to 2007, stomach cancer (7 cases) and esophageal cancer (1 case) were higher than national mortality rate, but its statistical significance was not shown. The standardized medical utilization ratio of the treatment episode data set from KNHIC was high in stomach cancer, esophageal cancer, colon cancer, blood-forming organ cancer, kidney cancer, laryngeal cancer, bladder cancer, lung cancer and pancreatic cancer, but there was no statistical significance in the other cancers except for stomach cancer.

● Conclusions

Although the SMR of entire causes of mortality of both current and retired workers in the period of 1996 to 2007 was low, compared to the whole population (total mortality SMR 84), that is to say, though this group is the workers' group and it should be the group whose death toll from any cause whatsoever is fewer than average death toll of the entire nation, the standardized mortality ratio from ischemic heart diseases (ischemic heart diseases SMR 141) was relatively very high. Specifically, most of the deaths from ischemic heart diseases were found in the current workers (seven out of total eight workers). In this way, the mortality of the current workers from ischemic heart diseases was particularly higher than total mortality rate (total mortality of the current workers SMR 67, ischemic heart diseases SMR 151).

To explain this result, based on the data we have collected and analyzed, the first possibility is task-relevant. Considering that the mortality toll from ischemic heart diseases was shown significantly higher in the current workers than in the retired workers (ischemic heart diseases from the current workers SMR 151 and from the retired worker SMR 78) and this kind of death occurred only in the worksite group, the research group and the technology group except for the office group, it is assumed that the mortality from ischemic heart diseases is very likely to be related to worksite, research and technology-relevant tasks.

In this research, it is likely that high temperature was the occupational causes of sudden cardiac deaths and over working due to shift work was one of the occupational risk factors of coronary heart disease. Generally, it is known that sudden cardiac deaths occur, resulting from various individual factors. The primary focus of this epidemiologic research, however, is the identification of collective characteristics of occupational risk

factors rather than non-occupational factors. So task-relevance of sudden cardiac deaths should be determined individually by considering the occupational characteristics and working environments including individual risk factors.

As stomach cancer is the most common cancer in Korea, it is necessary to analyze and examine in many ways why the workers in this establishment showed significantly high medical utilization rate for stomach cancer.

However, as the workers in the rubber tire factory are exposed to various chemical substances whose harmfulness is not revealed and they are apt to be exposed to many carcinogenic substances and the factory is not ventilated properly, they need to improve their working environment as technically as possible to minimize their workers' exposures to these substances.

Action Plan

● Necessity of further research

It is necessary to perform the research on effects of the organizational culture and the working methods on the health of workers.

Also, we need to find out through case-control study if there are any differences between the workers (case) of this factory using medical utilization for ischemic heart disease and the workers (control) not using medical utilization, and which group is exposed to specific risk factors including non-occupational risk factors. Then we can work out the customized countermeasures suitable for collective health characteristics of workers. Besides, regarding cancer diseases whose standardized mortality ratio was higher than that of the whole population and stomach cancer whose medical utilization rate was higher than that of the whole population, it is necessary to make a follow-up study on cancer diseases in the tire manufacturers along with examinations of data whose diagnosis accuracy is confirmed. And for rubber fumes and fine dust whose harmfulness is not found, it is necessary to research their effects on the health of workers including those who work at other tire factories.

● Recommendations on the manufacturer

The workers of rubber tire factory are likely to be exposed to various chemical substance and carcinogenic substances whose harmfulness is not found. When we examined the ventilation facilities including local ventilation system in this epidemiologic research, their abilities to ventilate were not met. So the manufacturer should improve their working environment by rearranging those ventilation systems properly.

To prevent sudden cardiac deaths, they need to improve thermal environment like vulcanization process and minimize the exposure of workers to this environment. If the exposure is inevitable because of the nature of the process, they should take actions not to have this task placed on to the workers who is in Stage 2 hypertension (over 160 mmHg of systolic blood pressure or over 100 mmHg of diastolic blood pressure) or who have been treated with ischemic heart diseases.

If you prevent sudden cardiac deaths more aggressively, they have to make and carry out the plans for specific working environment control and task control for workers not to be exposed to the occupational causes of sudden cardiac deaths and the occupational risk factors of coronary heart diseases. In addition, all of sudden cardiac deaths have the underlying diseases such as coronary heart diseases. As this kind of death occurs in the group whose health is not in good condition, the manufacturer should take care of their health by paying good attention to non-occupational risk factors (habitual elements of smoking and drinking, and basic health elements of hypertension, diabetes and hyperlipidemia) that their workers have. Particularly, for those who have high blood pressure and various disease risk elements at the same time, the manufacturer should take more positive actions such as considerations of their tasks (see "Risk Assessment and Follow-up Guide to Prevent Stroke and Cardiovascular Disease at Work (KOSHA code H-11-2004)" Korea Occupational Safety and Health Agency (KOSHA)). Fourthly, taking into account the one case of sudden deaths, which led to this epidemiologic research, and the working styles of the workers from a department at the first half year of 2006, it is found that the workers have continued to work without day-off even on holiday. It can build up their fatigue. So it is recommended to manage the working hours on their shift system more systematically. Fifthly, it is difficult to identify in a short time the effects of exposure of the workers to various harmful factors of low concentration and the effects of chronic illness or long-term shift system on workers' health. So it is necessary to establish health monitoring system on which the data of the entire workers' exposure to harmful substances and the effects of those substances on their body are stored.

Recommendations for Preventing Major Chemical Accidents such as Fire and Explosion, etc.

In Korea, in order to prevent major chemical accidents in chemical industries, Process Safety Management (PSM) System has been implemented since 1996, and through this, many effects such as reduction in chemical accidents and increase in international credit standing occur. However, more efforts should be made when compared with related statistics in advanced countries.

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Introduction

When a chemical plant is set up based on recent technologies, there is hardly any process of trial and effect as in the past because safety design and safety operation procedures are to be made from the planning phase. However, it is highly likely that serious occupational accidents such as a big explosion causing a lot of casualties and environmental damage will occur. Therefore, the interested parties including the general public demand more thorough safety management from chemical plants.

In Korea, in order to prevent major industiral accidents in chemical industries, Process Safety Management (PSM) System has been implemented since 1996, and through this, many effects such as reduction in chemical accidents and increase in international credit standing occur. However, more efforts should be made when compared with related statistics in advanced countries.

Current status of the occurrence of serious chemical accidents

In 2007, there were 8 serious chemical accidents in chemical plants throughout the nation, leaving 13 people dead and 20 injured. Especially, the fire and explosion which occurred because of failure to comply with safety work permission procedures during the work of coating cosmetic cases in Ansan brought about a lamentable result, leaving 6 people dead and 2 injured.

As shown in <Table 1>, failure to comply with safety work permission procedures and the safety operation procedures is the main cause of the accidents which have recently occurred.

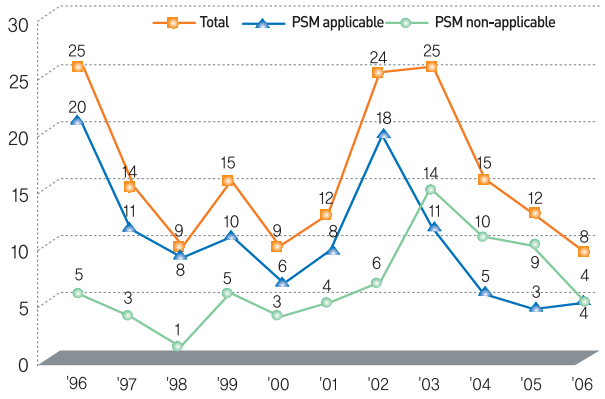
Trends in the occurrence of major occupational accidents by year

Analysis of the number of cases of accident occurrence in PSM sites from 1966 when Process Safety Management System was implemented in Korea to 2007 shows that the ratio of the occurrence of the accidents decreased by 80% as 4 accidents occurred in 2007 compared with 20 accidents in 1996. In short, it can be said that the effectiveness of Process Safety Management System was reflected. The number of cases of the recent occurrence of accidents is not large

<Table 1> Current status of serious chemical accident cases

No.	Date of occurrence	Name of workplaces	Overview of accident	Damage		Cause of accident
				Death	Injury	
Total				13	20	
1	'07.1.3	OO Industries, Inc.	A fire broke out in the process where the victim was putting an organic solvent packed in a 500kg bag manually in the solution tank in order to regenerate unscreened regenerative products (off spec') in a state of Cake + Powder in the residue solution tank.	-	1	Failure to comply with safety work permission procedures
2	'07.2.2	OO Chemicals, Inc.	An explosion occurred in the process where wasted explosives (OO explosive products) was being incinerated.	2	9	Failure to implement risk evaluation
3	'07.8.9	OO Industries, Inc.	An explosion assumed to have occurred from the ignition source of a non-explosion proof motor, etc. in a state where an atmosphere of the danger of explosion was created by the steam of an organic solvent generated in the process where thinner was being sprayed using the air pump in order to clean the pipe and spray nozzle which supplied coating solution for other product coating work after coating cosmetic cases in the spray coating booth.	6	2	Failure to comply with safety work permission procedures
4	'07.8.17	OO Chemicals	An explosion caused by inflammable steam inside the mixer in the process where compound raw materials were being put in the mixer.	2	5	Erroneous design/ defective equipment
5	'07.8.25	OO Trading Company, Ltd.	An accident in which the victim was killed by the shock given by the manhole cover as toluene steam inside the reactor exploded by the ignition source the moment the manhole cover was closed while a toluene solvent was being put in the pipe after the upper manhole of the batch reactor was opened and solid materials were input.	1	-	Failure to implement risk evaluation
6	'07.10.8	OO Inc.	Steam exploded when high-temperature molten matter (aluminum) came in contact with coolant while getting ready for casting machine operation in the aluminum processing plant.	2	2	Failure to implement risk evaluation
7	'07.11.23	OO Inc.	A fire broke out in the flecon bag by static electricity while filling was being transferred into the flecon bag of less than 3 meters by gravity through a cloth hose in the lower manhole during the filling replacement work inside the container (Benzene Feed Guard Beds) removing benzene impurities from the benzene supply line.	-	1	Failure to comply with safety work permission procedures

even when compared with the number of cases of the average occurrence of chemical accidents in the OECD countries. On the other hand, in PSM non-applicable workplaces to which Process Safety Management System is not applicable, the accidents did not reduce but repeated increase and decrease during the same time period, showing the need of active management for preventing serious occupational accidents. See <Table 2>.



[Figure1] Current status of serious chemical accidents by year

Trends in the occurrence of serious chemical accidents by industry

As shown in <Table 3>, most of other chemical product manufacturing industries in which serious chemical accidents occurred most frequently as many as 61 cases are small and medium chemical plants to which Process Safety Management System was not applicable, and most of the cause of the occurrence of the accidents were fire explosion and toxic substance leakage, which accounted for 30% of the total accidents.

Therefore, it is necessary to conduct comprehensive safety management by applying Process Safety Management Systems even to small and medium chemical plants. See <Table 3>.

Analysis showed that the 11 accidents which occurred in the fine chemical product manufacturing industry were caused by failure to pre-verify risk of new materials used in the new product development process or the manufacturing process and design, etc.

<Table 3> Current status of the occurrence of major occupational accidents by industry

year	계	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07
Total	193	25	25	14	9	15	9	12	24	25	15	12	8
Oil refining	24	7	6	0	6	1	0	0	3	1	0	0	0
Petrochemistry	27	4	4	5	0	5	4	1	3	0	0	1	0
Fine chemistry	11	2	1	2	1	0	0	3	1	0	0	1	0
Chemical products	25	0	1	0	1	1	0	0	4	4	7	7	0
Citygas(LPG)	1	0	0	0	0	0	0	0	1	0	0	0	0
Explosives	11	3	1	1	0	0	1	1	2	0	1	0	1
Ship building repair work	5	1	2	0	0	0	0	0	0	0	2	0	0
Other chemistry	61	4	7	3	1	6	4	6	8	16	2	0	4
Other industry	28	4	3	3	0	2	0	1	2	4	3	3	3

<Table 4> Current status by accident cause

Cause of accident	Number of cases	Share (%)
Total	193	100
Failure to comply with safety work permission procedures	53	27.46
Poor equipment maintenance	28	14.51
Failure to comply with operation procedures	48	24.87
Erroneous design/ defective equipment	20	10.36
Failure to install/operate safety devices	18	9.33
Failure to change management	4	2.07
Failure to verify risk of material/ abnormal reaction of material	18	9.33
Impossible to classify	4	2.07

<Table 5> Numbers of deaths and the injured caused by accidents

Classification	Total	PSM applicable	PSM applicable
No. of accidents	193	123	70
No. of deaths	156	86	70
No. of injured persons	584	321	263

<Table 6> Comparisons of PSM applicable materials in each country

Country	Related laws and regulations	Applicable to
Korea	Occupational Safety and Health Act	8 business categories and 21 materials
US	Occupational Safety and Health Act	About 260 kinds of chemical materials and normal quantity specified
EU	96/82 EC	About 180 kinds of harmful dangerous materials and normal quantity specified
UK	COMAH	Applicable to about 1,174 workplaces (as of 2006)
Germany	Federal Leakage Prevention Act	About 322 kinds of chemical materials and normal quantity specified
Netherla-nds	Serious Occupational Accident Prevention Act	Applicable to about 510 workplaces (as of 2006)

Analysis of causes of serious occupational accidents

With regard to the causes of the accidents in PSM applicable workplaces, failure to comply with safety work permission procedures accounts for 27.4% (53 cases); failure to comply with operation procedures accounts for 24.8% (48 cases); and erroneous design and/or defective equipment accounts for 10.3% (20 cases). With regard to classification by accident cause, failure to comply with safety work permission procedures and failure to comply with operation procedures are caused by man-made mistakes such as maintenence man's mistakes, etc. Analysis showed that, when compared with advanced countries, Korean worker's safety recognition level is low. Therefore, it is necessary to establish a system in which man-made mistakes are controllable by making safety work standards or safety work procedures. It can also be said that in order to reduce accidents caused by an erroneous design, it is necessary to introduce a more thorough safety concept in the design stage and conduct a more thorough review of process safety reports. In addition, in order to prevent accidents from occurring due to mechanical defect caused by poor maintenance work and inappropriate inspection, safety checks and inspections and preventive maintenance should be thoroughly carried out.

Analysis of damage caused by accidents

The numbers of deaths caused by accidents are 84 persons (0.7 person per accident) in PSM applicable workplaces and 62 persons (0.9 person per accident) in PSM non-applicable workplaces; and the numbers of injured persons caused by accidents are 143 persons (1.2 person per accident) in PSM applicable workplaces and 261 persons (3.7 person per accident) in PSM non-applicable workplaces, three times more than PSM applicable workplaces. Therefore, if more thorough process safety management is implemented by absorbing PSM non-applicable workplaces into the established system including PSM applicable workplaces, the number of fatal accidents including death can be reduced.

Proposals for Preventing Serious Occupational Accidents

● Plan to prevent accidents in small and medium chemical plants

As shown in <Table 5>, because there is a great difference in the extent of damage between PSM applicable workplaces and PSM non-applicable workplaces, it is necessary to apply PSM systems without the size of a workplace if the workplace is in danger of being involved in a serious occupational accident.

<Table 6> shows comparisons of PSM applicable materials at home and abroad. It can be said that the risk of the potential occurrence of accidents still exists because domestic PSM applicable materials are less than the advanced countries, so that risky small and medium chemical plants are not managed within the framework of PSM systems.

● Strengthening of process management functions for preventing serious chemical accidents

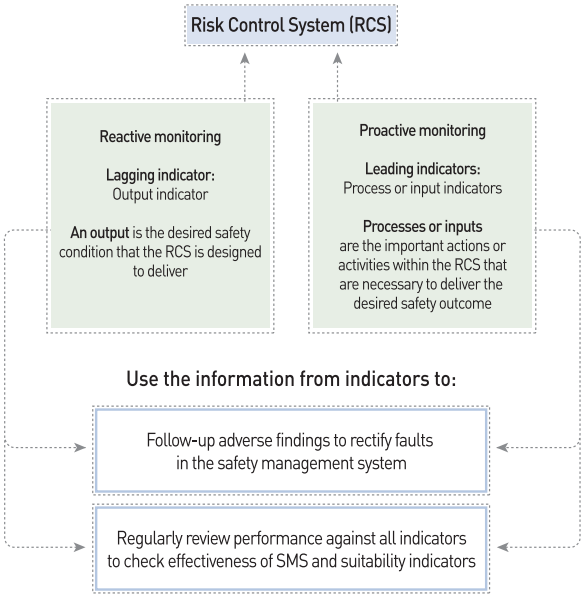
Currently, the concept of serious chemical accident prevention system for domestic chemical plants is well established. Occupational safety and health management system is defined as "the systematic safety and health activities for ensuring continuous improvements through the cycle of P-D-C-A comprising Plan (make action plans and implement the safety and health policy announced by the chief executive officer as part of management polices); Do (implement and operate the action plans); Check (check and take corrective action); and Action (the CEO reviews the results)."

Many desired results were obtained by implementing Process Safety Management System with management systems conforming to the purposes of the introduction of Process Safety Management System including (P) corresponding to "review" of a process safety report; (D) corresponding to "site confirmation"; (C) corresponding to "evaluation of the status of implementation; and (A) corresponding to "continuous improvement." However, as shown in <Table 4>, because more accidents occur in Implementation Phase (C) including operation and safety work permission procedures, etc. than in Review Phase (P) or Check Phase (D), Implementation Phase (C) needs to be strengthened.

In order to ensure safety in the implementation phase, it is necessary to check if risk management is appropriately carried out. To do so, it is required to evaluate and manage the level of process safety at ordinary times, and if the process safety evaluation index is used, the following results can be obtained.

1) Confidence in improved risk management
2) Presentation of appropriateness of risk management system
3) Identification of vulnerable areas through serious occupational accidents
4) Avoidance of the collection and report of unnecessary safety evaluation information
5) Use of other information collected for quality control, etc.

The HSE of UK is spreading a model for evaluating implementation levels to give an advance warning before catastrophic failure occurs. See [Figure 1].



[Figure 1] Dual assurance - leading and lagging indicators measuring performance of each critical risk control system

In the Netherlands, the safety management system standards (NTA8620) developed in 2006 have come into wide use to prevent serious occupational accidents so that the management function can be strengthened in carrying out the SEVESO guidelines in chemical plants.

As seen above, measuring how effectively risk is managed and improving vulnerable areas through this are the main factors of the safety and health management system. Therefore, exertions to prevent serious occupational accidents should be made by introducing and operating such a model in domestic chemical plants.

Overview of the 2nd Conference of Asian Occupational Safety and Health Research Institutes

Occupational Safety and Health Research Institute (OSHRI) of Korea Occupational Safety and Health Agency (KOSHA) held the 2nd Representative conference from Asian occupational safety and health research institutes, at Hotel Korea located in Bucheon-shi, Gyeonggi-do, Korea, from November 20 to November 22, 2007. The representatives of 16 institutes related to occupational safety and health from 10 Asian countries took part in this conference. This conference took place in Korea, followed by the 1st conference that the National Institute of Industrial Health of Japan had hold in Tokyo, September 2004.

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Entering the 21st century, the occupational safety and health are facing new challenges and opportunities as transportation, communications and technology have been highly developed and industrial structure and working environment have been changed as a result of globalization. In this new environment, Asian research institutes need to take proactive approaches as both pioneers and supporters to find the issues on safety and health and develop their solutions and technology. However, the human and physical resources, knowledge and technology to solve the problems of Asian occupational safety and health are limited. And each country in Asia has different situation in its research and interest. As a result, the participants of Asian safety and health research institutes got together to discuss how to enhance workers' safety and health and improve their quality of life in this region by promoting interchange and cooperation among Asian OSH research institutes.

Twenty eight experts in this field from nine countries such as China, Japan, Vietnam, etc. and 30 local and OSHRI's researchers participated in this conference, workshops and technical visits for three days. Ten representatives from each country presented major concerns on safety and health at work and their researches, and how to respond to them at the two sessions in the morning and afternoon of Nov. 20. They also had a Q&A session regarding the situations of their countries to get the participants to understand problems and researches. Prior to the presentations, Dr. Heng-Huat Go, manager of industrial safety and health of Ministry of Manpower in Singapore, had a speech on how to operate the safety and health law and system of Singapore, which were recently revised, to strengthen the risk evaluations and activities for outcome-

driven safety and health. The session was followed by a heated discussion on establishing cooperation mechanism among the participating institutes. Most of the participants expressed sympathy for the need to improve the safety and health at work through interchange and cooperation among them. To make these efforts, some plans were discussed to publish a journal in English and post research projects, trends and results regularly to their websites with a view to sharing their roles on collaborative research and research projects on specific subjects and to make an efficient sharing and utilization of research results among the institutes. In addition, the participants from Philippines, Mongolia, etc. made requests to provide its researchers with training programs to other Asian institutes and supply them with the knowledge, technology and equipments for research. And they agreed to hold this conference regularly and unanimously decided to have the 3rd conference held by National Institute for Occupational Health and Poison Control, China CDC in Beijing, China, Oct. 2010. They also agreed to set up a steering committee to promote cooperation among Asian research institutes, and appointed its chairperson and 8 country members.

In the morning of the second day of Nov. 21, they paid a visit to KOSHA, received some presentations regarding Korean accident prevention system and the prevention projects of KOSHA and looked around its safety exhibition center, research facilities, and inspection and approval center.

In the afternoon of the same day, they had presentations and discussions on a total of 17 research projects in the expert workshops for three themes at Hotel Korea. The three themes were risk assessment and management, chemical material management and safety policy, and occupational diseases and health service.

In the evening, they started the steering committee of Asian research institutes established at the first day to discuss how to organize and operate its conference for collaborative cooperation including its name, goal, organization, membership and official website, etc. All nine members including the chairperson, members and secretary attended this committee, and decided to have Asian Conference of Occupational Safety and Health Research Institutes (ACOSHRI) as its official name. The goal of ACOSHRI is to cooperate among Asian countries and exchange its research result, technology and methodology. They arranged the details to be set up after discussion in the future. Basically, the OSH research institutes operated by Asian countries can be the members of this conference, and the researchers in this field can be the individual members. All the institutes participating in the 2nd conference, however, will be given the full membership. They agreed to have a board committee and an executive committee, and the board committee will include a chairperson, a vice chairperson, 8 directors and a secretary. The head of the institute which holds the conference shall be a chairperson, and the one which holds it the next time shall be a vice chairperson. ACOSHRI built its official web site (www.acoshri.org) for further discussions among members, and they agreed to continue their discussions through this site in the future.

In the morning of the third day, they visited Samsung Electronics to learn how Samsung controls its safety and health at work, and in the afternoon, they enjoyed their time shopping around Namdaemun and experiencing Korean traditions in Gyeongbok Palace and Insa-dong, and had a dinner party in Korean House.

Though it was a tough schedule for participants to have two meetings, presentations, expert workshops and visits to some places in three days, it was a good time for them to know that they can contribute to development of safety and health at work in the region of Asia by sharing their knowledge and experiences and making proactive suggestions for it under common goal of promoting safety and health of worker's in Asian region.

<Table 1> Name of Participating Organization

Country	Name of Participating Organization
China	National Institute for Occupational Health and Poison Control, China CDC
Indonesia	National Occupational Safety and Health Center
	Occupational Health and Safety Agency
	University of Indonesia
Japan	National Institute of Occupational Safety and Health, Japan
Korea	Occupational Safety and Health Research Institute, Korea Occupational Safety and Health Agency
Malaysia	National Institute of Occupational Safety and Health
	Department of Occupational Safety and Health, Malaysia
Mongolia	Center for Occupational Disease Research and Medical Labor Expertise
	Occupational Health Institute in School of Public Health
Philippines	Occupational Safety and Health Center
	Department of Labor and Employment
Thailand	National Institute for the Improvement of Working Conditions and Environment
	Bureau of Occupational and Environmental Diseases
Chinese Taipei	Institute of Occupational safety and Health
Vietnam	National Institute of Occupational & Environmental Health

Domestic and Foreign News on Occupational Safety & Health

OSHRI Activities

Spring Conference by the Korean Society of Safety	
Date	June 4 (Wed) ~ 5 (Thu)
Venue	Jeju KAL Hotel
Presented by	13 persons
Subject	13 theses including Analysis of the Characteristics of Fall Accidents and R&D of Safety Devices

Conclusion of MOU between OSHRI, KOSHA and APAVE, France	
Date	June 6 (Fri)
Venue	APAVE, France
Subject	Memorandum of understanding for personal protective equipments to prevent slip & fall

ChemCon 2008 Conference Presentation	
Date	June 10 (Tue) ~ 13 (Fri)
Venue	Rome, Italy
Presented by	Yang Jeong-seon, Director
Subject	「Overview on chemical control legistration and aspects of GHS in Korea」

Atmospheric Asbestos Analysis Training	
Date	June 11 (Wed) ~ 13 (Fri)
Venue	Asbestos analysis room, 3rd Fl., OSHRI

OSH Policy Forum regarding 「Plan for Advancing Occupational Safety & Health	
Date	June 12 (Thu)
Venue	Hoam Professors' Hall, Seoul National University
Subject	Plan for improving occupational safety & health regulation policies based on risk assessment

Comprehensive Review Meeting on Safety Certification Standards	
Date	June 19 (Thu)
Venue	Conference room, 2nd Fl., Center for Testing and certification

15th Epidemiologic Survey Evaluation Committee Meeting	
Date	June 19 (Thu)
Venue	Grand conference room, 5th Fl.
Subject	Deliberation on determination of an occupational disease of tire production plant workers

Domestic Safety & Health Events

Discussion about "plans for reestablishing the roles of the agencies related to occupational safety & health and plans for activating the organizations' occupational accident prevention" at the 12th meeting of the occupational safety & health system improvement committee, the Tripartite Commission for Economic and Social Development

The occupational safety & health system improvement committee held its 12th meeting on, Thursday, May 22, 2008 and discussed "plans for reestablishing the roles of the agencies related to occupational safety & health and plans for activating the organizations' occupational accident prevention".

As the lead speaker at the meeting, Shin Chang-seop, a representative of public interests (a professor at Choongbuk National Univ.), pointed out, as the reasons for lack of occupational accident rate reduction results in Korea, underdevelopment of the private safety service market; disordered operation of private safety & health service providers; problems involving in the management of quality of services caused by excessive competition; overlapping functions among the Ministry of Labor, the Korea Occupational Safety & Health Agency, and private safety & health service organizations; and restrictions resulting from disharmony in their roles. He suggested the following solutions :

First, overlapping functions between the Ministry of Labor and the Korea Occupational Safety & Health Agency (hereinafter referred to as the KOSHA) should be avoided, and the roles of safety & health service organizations should be reassigned. In short, instead of strengthening of the Agency's quasi-supervisory function, the KOSHA should take a leading role in technical development for Occupational accident prevention and technical support and consultation for workplaces with emphasis on safety & health support for small workplaces as it is difficult for private organizations to do so. To support small workplaces, the government should operate a dualistic management system in which workplaces are divided into a large company whose Occupational accident rate is low and a small company whose Occupational accident rate is high, and the relevant large company is allowed to implement a self-regulating safety management system, while the relevant small company is provided with

continuous technical support and consultation by the government. Private Occupational safety & health organizations should also be activated. Specialization and characterization by organization are necessary, and the field of safety & health diagnosis, which can promote the growth and development of a private accident prevention organization, in the Occupational accident prevention project conducted by the KOSHA should be opened to the private sector.

With respect to the labor-management plans for activation of Occupational accident prevention, the labor suggested: ① activation of labor-management participatory occupational safety & health projects ② activation of occupational safety & health training (opening of an occupationl safety & health leader course, operation of a local training tour) ③ operation of a building for experiencing occupational safety & health ④ implementation of a nationwide campaign for Occupational accident prevention and a campaign for safety & health culture preservation ⑤ investigation into the actual conditions of occupational safety & health and implementation of research activities for Occupational accident prevention, etc. In addition, the management suggested: ① production of teaching materials for Occupational safety & health training appropriate for work type by industry ② provision of training and consultation for small and medium business proprietors regarding safety & health and worker's accident compensation insurance ③ implementation of a joint enterprise of labor and management for enhancing the awareness of pending Occupational safety issues and safety & health consciousness.

Sympathizing with the reassignment of roles among the government, KOSHA, and the private organizations, the representatives of labor/ management/ public interests pointed out that there was a problem in KOSHA's conducting enterprises beyond its essential scope. All agreed to the plan to evidently divide the present roles into the government's supervision; KOSHA's technical development and R&D; and private organizations' consultation and to promote relevant activities.

However, with regard to the KOSHA system based on the Occupational accident compensation insurance fund, there were different views on whether it was necessary to divide the enterprise according to the size of a business. The management judged that it would be desirable to give support without dividing companies, while the labor asserted that it would be desirable to conduct the enterprise with emphasis on small and medium companies with a high accident rate.

OSH Policy Forum regarding 「Plan for Advancing the Occupational Safety & Health Legal System」

The Ministry of Labor and the KOSHA held a breakfast forum regarding 「Plan for advancing the occupational safety & health legal system」 at Hoam Professors' Hall, Seoul National University on Thursday, Jun. 12, 2008. About 30 representatives of academic circles,Occupational accident prevention organizations, and the Ministry of Labor attended at the forum. They expressed their views on and discussed the structural limitation of the current Occupational safety & health regulations; the current status of regulation policies based on risk analysis in the OECD countries and the application cases; and plans for activating regulation improvement and policy implementation based on risk analysis.

2008 Academic Convention by the Korean Association for Particle and Aerosol Research

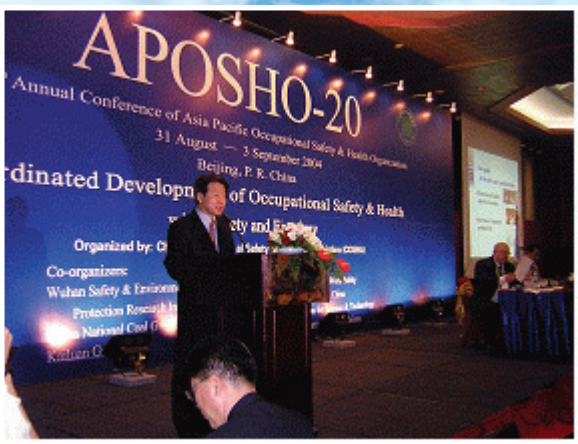
The Korean Association for Particle and Aerosol Research will hold the 2008 Conference on July 3 (Thursday) through 5 (Saturday) at Yongpyeong Resort, Gangweond-do.

Various theses and posters on the field of aerosols and particles including nano particles, automobile exhaust gas particles, air purification, air aerosol, bio-aerosol, micro-pollution material management, and purification, etc. will be presented at the convention, and an exhibition of related equipment and productions will also be held.

International Safety & Health Events

17th World Congress on Ergonomics - IEA 2009	
Date	2008. 8. 9 ~ 8. 14(6days)
Venue	Beijing, China
Hosted by	International Ergonomics Association (IEA)
Related link	http://www.iea2009.org/

Symposium on national strategy to promote OSH research



■ Program

Title	Symposium on national strategy to promote occupational safety and health research		
Date & Venue	Wednesday, July 2, 2008, 09:00~11:00 COEX Conference Center no. 310		
Session	Time	Contents	Speakers
	09:00	Welcome	Chairpersons
	09:05	National Strategy to Promote OHS Research in Japan	MD. Shunichi Araki, JNIOSH, Japan
	09:25	The National Occupational Research Agenda -A framework to bring research into practice in the United States	PhD. Marilyn Fingerhut, NIOSH, United States
	09:45	Singapore's Research Strategy on OSH	Dr. Sweet Far Ho, Ministry of Manpower, Singapore
	10:05	Identification of Research and Transfer Knowledge Priorities in OSH	PhD. Sergio Iavicoli, ISPESL, Italy
	10:25	New OSH Strategy and Policy in the Legal and Management Aspects	PhD. Doo-Yong Park, KOSHA, Korea
	10:45	Discussion and Closing	Chairpersons

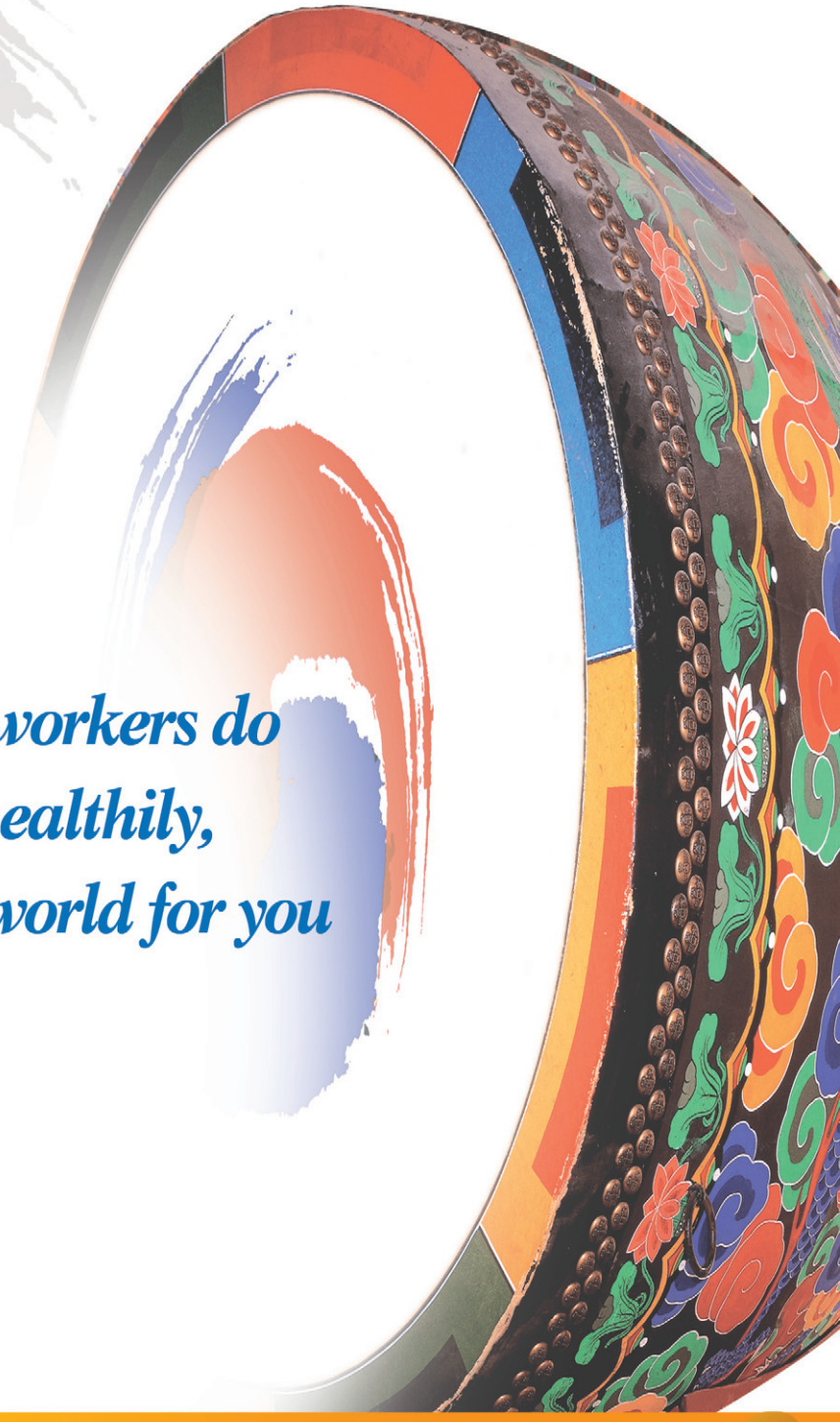
■ **Organizers :** Occupational Safety & Health Research Institute, KOSHA
National Institute of Occupational Safety & Health, JAPAN

■ **URL :** http://www.safety2008korea.org

■ **Language :** Korean, English, Japanese

XVIII World Congress on
Safety and Health at Work

www.safety2008korea.org



A World in which all workers do their jobs safely and healthily, KOSHA creates that world for you

XVIII World Congress on Safety and Health at Work

Safety and health at work : A societal responsibilty

June 29 ~ July 2, 2008 COEX Convention Center, Seoul, Korea

국제노동기구
International Labour Organization

국제사회보장협회
International Social Security Association

한국산업안전공단
Korea Occupational Safety and Health Agency