

# 2008 Annual Report of Labor Safety and Health Research



Institute of Occupational Safety and Health, Council of Labor Affairs Executive Yuan, Taiwan

## Foreword

The Institute of Occupational Safety and Health (IOSH), a unit of the Council of Labor Affairs (CLA), is Taiwan's top agency for occupational safety and health. Our main tasks at IOSH include detecting and analyzing hazards in the workplace, and proposing solutions to those hazards.

The scope of IOSH has evolved. Initially it focused on the implementation of surveys, the establishment of basic data, and the introduction of methods and techniques. Over the years, it then expanded to strengthened research in the prevention of occupational injuries, the grasping of special safety and health issues, and the development of evaluation, management, and protective gear techniques and technologies. In 2008, IOSH managed to meet the administrative needs of CLA to “protect the safety of workers in their workplaces” and pursue the presidential policy of “reducing the percentage of occupational injuries to below 4/1000.” Taking safety and health as the major challenges in establishing a safe working environment, IOSH has endeavored to achieve the objectives of developing various accident-reduction measures, and of promoting a healthy and comfortable work environment. Examples of IOSH's significant achievements are: (1) guiding high-risk industries such as foundries, resin manufacturers and coating manufacturers to establish occupational health techniques; (2) promoting preventive techniques against hazardous exposure for medical device manufacturers and reaching an improvement rate above 75%; (3) developing health and safety facilities for industries such as an air curtain-isolated biosafety cabinet; (4) collecting and analyzing 2,660,000 pieces of data in the database of occupational diseases and injuries as well as advanced nations' accident-reduction strategies for use by CLA as a reference in revising laws and regulations, improving systemic applications, and setting standards; (5) compiling a handbook of public construction operational risk management and disaster prevention, and providing technical services; (6) publishing of occupational safety and health periodicals and disseminating know-how through collaboration with museums and safety health exhibitions throughout this country; and finally (7) providing occupational safety and health databank download and consultation services to more than one million person-times.

This Annual Report covers the major projects undertaken and important results achieved during the period of Jan. 1 through Dec. 31, 2008. By elaborating the different tasks and activities that were carried out in 2008 in line with CLA's core administrative focus of “equality, humanity, safety, and dignity,” we will be able to facilitate a better understanding of IOSH and its work.

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Chairperson, IOSH

# Contents

Foreword .....	i
Annual Report	
Section 1 The IOSH Mission .....	1
Section 2 Organization and Personnel .....	3
Section 3 Research Budget .....	4
Section 4 Key Research Projects and Results .....	4



# Annual Report

## Section 1 The IOSH Mission

The Institute of Occupational Safety and Health (IOSH) was established under the Council of Labor Affairs (CLA), Executive Yuan in August 1992 and has become Taiwan's top occupational safety and health research agency. Its mission is to create a safe, healthy, and comfortable working environment by upgrading safety and health standards in the workplaces nationwide, encouraging workers to pay more attention to safety and health in the workplace, reducing occupational accidents, and preventing occupational disease. The IOSH charter sets forth the following research goals:

1. Provision of a scientific basis for decision-making and administration in the field of occupational safety and health.
2. Provision of solutions to crucial labor safety and health issues.
3. Provision of reference data for the formulation and revision of labor safety and health regulatory standards and management systems.
4. Heightening of technical standards of labor safety and health, and of inspection operations.
5. Provision of information required for training and consultation in labor safety and health.

To gain a thorough understanding of occupational injury and illness, and establish a localized safety and health databank, IOSH employed scientific techniques to focus on CLA's medium-term (2005-2009) administrative plan and take "extensive assurance of worker safety" as its strategic performance goal in pursuit of CLA's administrative vision, "equality, humanity, safety, and dignity." IOSH has disseminated the results of its safety and health research among enterprises to help them establish international standards of safety and health as well as reinforce their safety and health management. At the same time, it has also worked with the private sector to disseminate safety and health technology, and to achieve a continued reduction in the incidence of occupational disease, disability, and death in high-risk jobs. The ultimate goal is to prevent injury and disease among workers, improve their physical and mental health, and meet the standards of the advanced countries.



This Annual Report covers the research work carried out by IOSH from Jan. 1 through Dec. 31, 2008, during which period 99 research projects were completed. The Institute promoted application of its research findings by holding presentations, transferring technology, producing publications, issuing research papers, offering Internet inquiry services, and organizing exhibitions and seminars. These efforts included the publication of 109 periodicals, research reports, and a series of technical publications; the holding of 31 academic seminars; the publication of 36 IOSH research reports in domestic and foreign periodicals; the presentation of 54 reports at domestic and overseas academic conferences, and the transfer of 8 patents and technologies. In addition, IOSH also assisted with 63 occupational injury and disease surveys, and provided consulting and technical services related to safety and health in 210 cases.

## Section 2 Organization and Personnel

IOSH is headed by Chairperson, Vice Chairperson, and Chief Secretary, who together oversee and direct the operations of the Occupation Safety Division, Occupational Health (Hygiene) Division, Analysis Methods Division, Occupational Medicine Division, and Exhibition Division. The research staff totals 67, including two contract employees and 21 alternative national service personnel. There are also four administrative units: Secretariat, Accounting Office, Personnel Office, and Civil Service Ethics Office. The organization chart is shown as Figure 1 below.

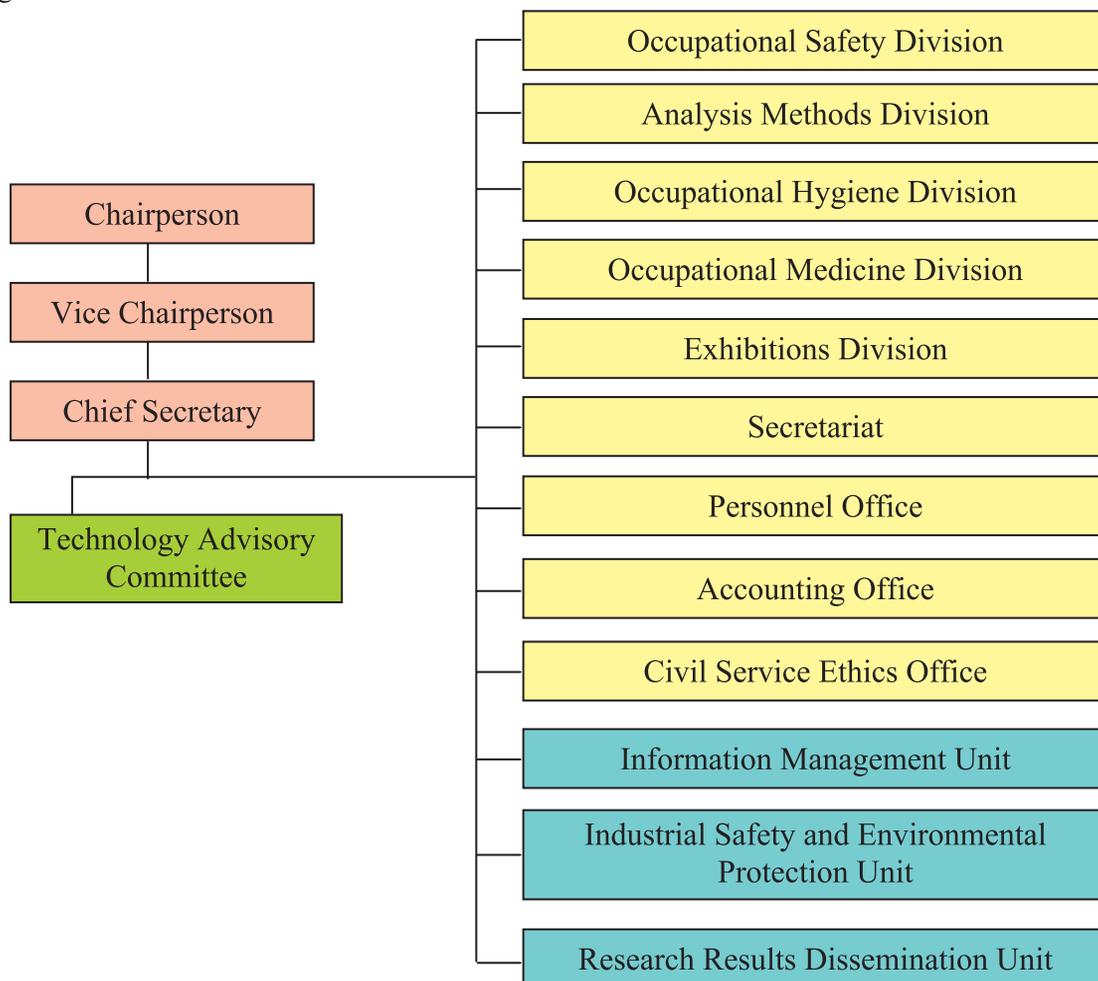


Figure 1. IOSH Organization

## Section 3 Research Budget

IOSH Research Budget for 2008:

Budget Item	Annual Budget
Occupational Safety and Health Research	NT\$212,919,984
Occupational Safety Division	NT\$42,943,776
Analysis Methods Division	NT\$36,152,811
Occupational Health (Hygiene) Division	NT\$58,746,391
Occupational Medicine Division	NT\$44,891,171
Exhibition Division	NT\$30,185,835

## Section 4 Key Research Projects and Results

IOSH focused on the following tasks in order to meet the targets of its administrative plan for 2008: (1) to strengthen surveying of high-risk operational exposure and guidance for improvement; (2) to reinforce the prevention of occupational accidents and research in safety management techniques; (3) to enhance the monitoring of occupational injuries and diseases, protection of labor health, and occupational health promotion; (4) to reinforce the prevention and management of occupational health hazards, and research in control and prevention technology; (5) to promote, exhibit, and exchange internationally IOSH's achievements in safety and health technology..

IOSH carried out the following tasks in 2008:

### **1. Conducting pf working-environment surveys of high-risk occupations, and promoting and improving related technologies**

To fulfill its commitment to "assurance of worker safety," and work in coordination with the strategy of "inspection, education, and guidance," IOSH guided and assisted high-risk enterprises such as foundries, resin manufacturers, and coating manufacturers in establishing occupational health techniques. As of now, these enterprises' compliance with the laws and regulations is more than 75% in terms of occupational health. IOSH also worked with large enterprises to

promote and establish occupational safety and health management systems, and helped them pass TOSHMS certification. The puncture injury reporting system that had been operating for many years lowered the puncture injury rate by 34%, benefiting several tens of thousands of workers.

- (1) IOSH assisted in the training of safety and health management staff for 10 medical device manufacturers, and of occupational safety instructors for medium and small enterprises in each county and city. With better danger evaluation capabilities and assistance from IOSH, five medical device manufacturers adopted measures to improve exposure to ethylene oxide. The personal exposure concentration to ethylene oxide was lowered by 75%. A CD-ROM for educating workers in medical device manufacturing about the hazards of ethylene oxide was also published.



Seminar for safety and health management staff of medical device manufacturers

- (2) IOSH completed a model study on exhaust in highly respirable dust exposure areas (vibration grinding areas), and helped five foundries to implement measures to improve exposure to crystalline free silica and lower the respirable dust exposure concentration by 7.8%. IOSH also published technical documents and digital CD-ROMs detailing the control and prevention of crystalline free silica.
- (3) IOSH guided three resin manufacturers in improving their occupational health systems. After these improvements, compliance with relevant laws and regulations rose to an average rate of 97.4%, 6.2% higher than the original 91.2%. Moreover, IOSH established techniques to improve ventilation throughout resin manufacturing processes at three resin manufacturers. With these improvements in place, the average concentration of harmful particles in the air was reduced by 86.9%. Additionally, a *Practical Handbook of Occupational Health for Resin Manufacturers* was published.



Seminar commending resin manufacturers for excellent occupational health and presenting the achievements of guidance and assistance

- (4) IOSH guided three coating manufacturers in improving their occupational health systems, after which their compliance with relevant laws and regulations was upgraded to an average rate of 95.3%. That meant a difference of 16.2% from the previous 79.1%. IOSH also established techniques to improve ventilation throughout the manufacturing process at three coating manufacturers; with the improved techniques in place, the average concentration of harmful particles in the air was decreased by 96.1%. A “*Practical Handbook of Occupational Health for Coating Manufacturers*” and a DVD titled “*Prevention of Occupational Health Hazards for Coating Manufacturers*” were also published.



Seminar for commending coating manufacturers for excellent occupational health and presenting the achievements of guidance and assistance

- (5) IOSH conducted an ergonomic evaluation of heavy-labor work, and assisted related enterprises in making improvements using illustration plates. A total of 20 cases were

improved. After analyzing the degree of satisfaction before and after improvements were made, 19 cases were changed from “not ideal” to “very satisfactory,” and one case was improved from “not ideal” to “satisfactory.” Due to the change of posture, production efficiency was increased significantly. These on-site cases were compiled into a booklet as a reference for related enterprises.

- (6) IOSH collaborated with large enterprises to encourage their central-satellite factories or supply chains to increase willingness to adopt occupational safety and health management systems and raise the operational efficiency of management systems. A total of five manufacturers passed Taiwan Occupational and Health Management System (TOSHMS) certification. IOSH also completed 26 of three-scale safety and health management documents (including four-scale sheets) and one item of risk-evaluation software for the electronic and electrical machinery industries.



National Guide to Occupational Safety and Health Management System (<http://data2.iosh.gov.tw/TOSHMS/>)

- (7) Forty-seven hospitals participated in the reporting of puncture injuries at medical care institutions and in on-site guidance and assistance for improvement; a total of 2,123 cases were reported. This reporting and improvement system lowered the overall puncture injury rate from 4.4 person-times per 10,000 inpatient-days in 2004 to 2.9 person-times per 10,000 in 2007.

## 2. Developing data on safety and health equipment for industrial use:

Labor inspection reports show that the manufacturing industry lost a total of 623,144 work-days due to occupational accidents and 7,201 people suffered disabling injuries in 2007. These

are the highest figures of all industries in Taiwan. Major types of injuries result from clipping, rolling, stabbing, cutting, scraping, and falling down; unsafe machines or facilities were found to be the main cause. For example, if an interface has an improper safety design, an accident is likely to result. IOSH has developed various types of safety protection and monitoring techniques as well as disaster monitoring and prevention equipment for high-risk machines and facilities. IOSH has also produced a main engine for fire simulators, drawn up a simulation area and model of emergency response area, and produced educational videos and other materials concerning fire accidents. Furthermore, RFID has been applied to the safety management of construction contractors, and this can also be used in education and training for related enterprises. Occupational health focuses not only on the prevention of occupational injuries and diseases, but also on the promotion of labor health, safety design, and comfortable workplaces as well as the maintenance of a good level of labor health, fitness, and productivity. In 2008, the finance and insurance industries were guided and assisted in implementing a “Workplace Stress Management Service Program.” An ergonomic risk exposure database was established and ergonomic workplace on-site improvements were carried out using this 3D ergonomic database.

- (1) IOSH studied the impact of flow calibrator accuracy on measurement by respirable dust samplers. Six commercially available respirable dust samplers were examined. The two samplers developed by IOSH were found to be able to control sampling error within  $\pm 10\%$ , but the other four samplers exceeded the  $\pm 10\%$  range. These research results can be used in promoting the particle samplers developed by IOSH.
- (2) Physiology-based toxicokinetic models were established, including models for dimethylformamide and PBPK of phthalate esters. These models can be offered for use in industry.
- (3) In a study of the effect of protection from skin exposure to 2-ethoxyethyl acetate, the wearing of Silver Shield/4H<sup>®</sup> gloves and the application of protection cream was found to reduce exposure to 2-ethoxyethyl acetate by 37.1% and 33.5% respectively. These results can be used by IOSH as a reference in reducing the danger of exposure to 2-ethoxyethyl acetate.
- (4) The development of event-reading software and hardware, the design of chemicals and their sample management system software, and the establishment of an event-driven

database for embedded radio-frequency identification (RFID) were completed. The research results can be introduced to analytical laboratories in Taiwan for use in improving their management quality.

- (5) IOSH established methods for evaluating the skin exposure of workers to nano-silver in Taiwan, and interviewed and investigated relevant factories. The research results can serve as suggestions for sampling and monitoring methods used in future research.
- (6) IOSH compiled a technical handbook for accident cause investigation, as an option for enterprises to use in investigating the causes of accidents.
- (7) A study of storage safety of inorganic oxides was conducted on sodium carbonate peroxyhydrate, sodium persulfate, and sodium nitrate. The resulting safety data on the nature of these inorganic oxides can serve as a reference for relevant enterprises and labor inspection units in preventing the danger of inorganic oxide reactions. The research results can also provide inorganic oxide experimentation and hazard evaluation data to relevant enterprises to use in mixed storage and planning, and to investigation agencies to use in evaluation work.
- (8) An installation guide for positive-pressure protective anti-dust-explosion electrical apparatus was completed. The guide can be used by the Council of Labor Affairs and other inspection institutions as a standard for determining the compliance of electrical installations and circuits (anti-dust-explosion electrical apparatus) with the regulations stipulated in Article 239 of the Regulations for Labor Safety and Health Facilities.
- (9) In accordance with the standard technical requirements of ANSI/ESD S20.20 and IEC 61340-5-1, a technical guide to the prevention and control of static electricity hazards in the electronics industry was completed to serve as a reference for relevant enterprises in planning, checking, and controlling static electricity hazards.
- (10) The strength and safety of horizontal decks used in industry were tested and evaluated. A horizontal deck testing machine was designed in compliance with the requirements of CNS. The Bureau of Standards, Metrology and Inspection, the Taiwan Association of Construction Rack Development, and relevant enterprises can use the machine to test the safety of horizontal decks.
- (11) A risk-control dynamic information system for construction safety was tested and evaluated, and the results can be provided to construction enterprises for use in the

installation of the system.

- (12) IOSH applied RFID to the safety management of construction contractors and developed a personal warning device that tracks the status of workers' safety protection, and their location, when they are on duty. This device can be used to monitor the safety of areas with high-risk operations, and to avoid occupational accidents.
- (13) IOSH published a *Practical Handbook for Improving Occupational Safety Culture for Employers, Work Supervisors, and Labor Safety Staff*. This handbook can serve as a guide for strengthening the culture of safety at different enterprises. IOSH also installed safety assessment software and built up a safety culture website (<http://140.135.49.3>) for companies to use in assessing to assess their factory safety culture.



Culture of labor safety website (<http://140.135.49.3>)

- (14) The disaster prevention and monitoring system developed by IOSH was put into use by the Powership Semiconductor Corporation, Southern Taiwan Science Park Administration, and Lee Chang Yung Chemical Industry Corporation. The Southern Taiwan Science Park Administration of the National Science Council modified the system and applied it to the management of the general practices and emergency response of more than 200 companies in the park.
- (15) IOSH completed handbooks on basic and specific requirements for the quality control systems of dangerous machinery and equipment. These handbooks can serve as a basis for the CLA to use in inspecting the quality of manufacturers that have passed formal qualification.

- (16) IOSH established a steel platform structure for the testing of its winding fall prevention gear under ISO 10333 standards, and proposed a draft standard for winding fall prevention gear to the Bureau of Standards, Metrology and Inspection.
- (17) A night-vision robot for handling disasters was also developed, and it will be used for handling emergency response by relevant enterprises.
- (18) IOSH completed the planning and review of a virtual reality function and the formulation of a smart evacuation system, both of which will be provided to relevant enterprises for use in establishing emergency response and decision support systems.
- (19) An operations manual for nano-metal explosion proofing and nitrogen deactivation was completed as a reference for companies to use in preventing nano-dust explosions as well as for inspection institutions to use in conducting inspections.
- (20) The safe gas delivery speed of nano-metal dust was analyzed, and the results will be provided for companies to use as a reference in the prevention of nano-dust explosions.
- (21) *A Practical Handbook of Safety and Health Risk Evaluation for the Petrochemical Industry* was published as a reference for relevant enterprises and inspection institutions to use in conducting risk evaluation at the petrochemical plants.
- (22) IOSH completed risk analysis for stone material processing, worked out strategies to prevent processing risk, drew up safe operating procedures, and calculated the strength of safety hooks. Based on the results of this research, stone material manufacturers will be given recommendations to install revolving spindles on A-shaped racks and to extend L-shaped racks.
- (23) A stress management service model was established, and *Workplace LOHAS - Solutions to Work Stress, Overwork and Depression* was published. A total of 174 people from 92 enterprises attended two promotion seminars, and 56 professional personnel were trained to assist various types of industry (finance and insurance, transport services, and electronics) in launching a “Workplace Stress Management Service Program.”



Workplace LOHAS - Solutions to Work Stress, Overwork, and Depression DVD

- (24) Healthy exercise training was carried out for 200 porters from the freight transport industry, and tests of their physical fitness were conducted before and after the training. As many as 1,000 sets of *Moving for Fun Exercise* DVDs, booklets, and posters, as well as the *Prevention of Muscular and Skeletal Injuries and Diseases and Moving for Fun Exercise* technical operators handbook, were provided for use by seed promotion staff.



Prevention of Musculoskeletal Injuries and Diseases and Moving for Fun Exercise DVD

- (25) Questionnaire interviews with hospital caregivers were conducted, with 300 questionnaires completed. Information was collected about the respondents' physical fitness tests, examinations, and health and work risk factors. The research results will be provided to relevant institutions such as the caregivers' union.
- (26) An investigation of electric welders' exposure to metal nano-substances and health indicators was carried out, resulting in the finding that liver, respiratory tract, and

cardiovascular diseases are their major health problems. The results show enterprises that smoking is hazardous to their employees, and can serve as a reference for their safety and health management and the prevention of occupational diseases.

- (27) A study of the health impact of bacteria and fungi on employees at medical care institutions suggested a close association between fungal contamination and the health of hospital employees. The hospital environment can affect microbial growth and further endanger workers' health; it is suggested that hospitals carry out microbial disinfection regularly, and that they control microbial growth by controlling indoor humidity so as to meet the goal of protecting labor health.
- (28) Secondary data analysis of female workers, including department store employees, flight attendants, nurses, and highway toll collectors was conducted. Focus seminars were held to gain an understanding of work conditions and factors that may affect female menstrual health. The resulting information will be provided to relevant industries for the creation of menses-friendly workplaces for females.
- (29) A new ventilation system for capturing dust pollution was developed. It will be provided to relevant industries once patent protection is obtained.
- (30) IOSH completed the development of new ventilation design and quality monitoring techniques, and of full-frequency, low-weight, high-soundproof bafflers. It also established standards and indicators for overall ventilation function in operating environments. An antibacterial module targeting porous substances in ventilation channels was developed as well. These results will be provided to relevant industries for use in planning, improving, and controlling the utilization of ventilation systems.
- (31) IOSH developed a stove that generates little sound, saves energy, and increases burning efficiency for restaurants.
- (32) A database showing the correlation between ergonomic hazards and upper-limb injuries and diseases was established for relevant enterprises to use in the determination of occupational diseases.
- (33) A handbook for the prevention of leg fatigue in standing operations was compiled for relevant enterprises.
- (34) A handbook for the control of infection with hypochlorous acid was written for medical care institutions.

### **3. Researching Regulatory Provisions, and Strategies for System Promotion:**

In coordination with the needs of the CLA's policy research, IOSH's annual research results are presented to CLA for use in the amendment of laws and regulations, the formulation of labor inspection strategies and policies, establishment of labor insurance and national health insurance data, formulation of preventive strategies, planning of safety and health policies, establishment of exposure databases, and promulgation of sampling analysis reference methods. IOSH also provides suggestions about the revision and modification of national standards. In 2008, IOSH provided references for mapping out strategies for the reduction of occupational accidents and for the amendment of related laws and regulations. It analyzed and established data about major occupational accidents in the construction industry during the past few years (2000~2007). It helped with the evaluation of operational safety and health management systems in the construction industry, and gave suggestions for the amendment of relevant laws and regulations. In addition, it drew up a draft horizontal deck design standard. Achievements were made in strengthening the monitoring of occupational health and diseases of workers in Taiwan, continuing the establishment of databases including puncture injury, labor-insurance health checkups for the prevention of occupational diseases, causes of worker mortality, and payment of labor insurance. An integrated active monitoring system for occupational diseases and injuries was established, and data were classified into the new categories of type of industry, sex, and city/county for online inquiry. Moreover, IOSH focused on policy research intended to reduce accidents among minority groups such as indigenous peoples, fishermen, and foreign workers. The research results will be taken as a reference in the formulation of disaster-reduction policies. The sample population of the aging indicator database was increased, and information about the payment of labor insurance was checked and audited before it was presented to the CLA for use in determining the retirement conditions of disabled personnel and in mapping out strategies for health promotion.

- (1) A data warehousing system for data on occupational accidents was established and a statistical analysis information platform was completed, with a total of 1,500,000 items of statistical data on occupational accidents. This system and its statistical data will be provided to the CLA Department of Labor Inspection for use as a reference in conducting targeted labor inspections, labor safety promotion activities in cities and counties, and accident-reduction strategies and promotion among minority groups (indigenous peoples,

foreign workers, and fishermen).

- (2) A study was conducted of biological indicators of acrylamide exposure. The results indicated that the average concentration in plants producing the chemical (the average concentration in individual samples was  $0.034 \pm 0.028 \text{ mg/m}^3$  and in regional samples was  $0.055 \pm 0.056 \text{ mg/m}^3$ ) is higher than that in factories using it (with an average concentration individual samples of  $0.010 \pm 0.009 \text{ mg/m}^3$  and in the regional samples of  $0.009 \pm 0.008 \text{ mg/m}^3$ , with a tolerable concentration of  $0.03 \text{ mg/m}^3$ ). The study also found that the internal dosage of metabolite in urine is a more appropriate indicator of chemical exposure than is the external dosage of acrylamide in air.
- (3) IOSH collected information on the reporting systems for new chemicals in the USA, Canada, Japan, Korea, and China, and drew up procedures, documents, and mechanisms that are suitable for the current situation in Taiwan. Taking into consideration the opinions of manufacturers in Taiwan about the reporting of new chemicals," IOSH then offered suggestions relating to the control of chemicals in Taiwan to the CLA Department of Labor Safety and Health.
- (4) The investigation of worker chemical factors, physical factors, biological factors, and exposure and ergonomic hazards was carried out at 757 enterprises. The results will be provided to IOSH and to academic circles as a reference in planning research on the prevention of exposure hazards.
- (5) IOSH completed the measurement of the level of phthalate esters in the urine of workers at three plastics-related manufacturers and in the air of their operating environment, and carried out an evaluation of the health risk involved. Suggestions for improving the exposure situation will be provided to the CLA for use as a reference in policy-making.
- (6) IOSH collected and analyzed data on exposure to hazardous substances in the air of operating environments, and completed the establishment and testing of an Access database platform (items included and data sheet design). IOSH will continue collecting and analyzing data collected in the past about the exposure concentration of hazardous substances in the workplace, and will provide the resulting data as a quick reference for determining future policies and research directions.
- (7) About 66% of all nail polish sold in the market was found to contain phthalate esters. Analysis showed a very low level of phthalate esters in the air, but very high levels of the

metabolites diethyl phthalate and butyl phthalate in manicurists' urine. Improvement of ventilation and avoidance of the accumulation of the contaminants is recommended. IOSH has provided appropriate suggestions about improving exposure to CLA.

- (8) IOSH introduced or verified six sampling and analytical methods, targeting asbestos and other fibers, isopropyl acetate, respirable dust, respirable crystalline ionized silicon dioxide, total dust of crystalline ionized silicon dioxide, and ethyl formate, and proposed them to the CLA for promulgation.
- (9) IOSH completed a survey of foreign workers' understanding of occupational safety and health in the textile industry, metal product manufacturing industry, and plastic product manufacturing industry. IOSH also visited the representative offices of Vietnam, the Philippines, Thailand, and Indonesia in Taiwan to offer assistance. The survey results will be used as a reference by the CLA in formulating policies for the reduction of occupational accidents among foreign workers and in the strengthening of inspections work.
- (10) IOSH used operating environmental measurement and worker biological specimen analysis to gain an understanding of shipbuilding workers' exposure to manganese fumes during welding tasks, and of their health conditions. It is suggested that workers wear protective gear, and that employers should regularly carry out safety and health education. The results of the study will be submitted to the CLA or IOSH as a reference in formulating health protection strategies and in strengthening supervision, inspection, and guidance.
- (11) IOSH analyzed the composition of gas in paper pulp tanks and related cases of occupational accidents. Research was conducted to gain an understanding of the root causes of these occupational accidents, which have a high rate of incidence. Relevant technical handbooks were also produced. The research results will be used as a reference in preventing occupational accidents in the paper pulp industry, and will be submitted to the CLA for use as a reference in formulating policies and conducting inspections. The goal is to lower the incidence rate of related occupational accidents.
- (12) IOSH completed an investigation of exposure to polybrominated diphenyl ethers in the operating environment of the resin manufacturing and application industries. It is suggested that the collection and processing of scattered dust during the manufacturing process be strengthened. Workers should wear breathing protection gear, such as dustproof masks containing active carbon, to protect them from gaseous and solid forms of

polybrominated diphenyl ethers. The wearing of appropriate protective gear can reduce exposure and assure health. The results of the investigation will be provided to the CLA as a policy-making reference.

- (13) IOSH completed eight occupational health improvement tasks, including exposure to hazardous substances, and improvement of 21 safety shortcomings at five printed circuit board manufacturers. After guidance and assistance were given, the qualification rate for the manufacturers in regard to their autonomous management system, the labeling of dangerous and hazardous substances, health management system, appropriateness of protective worker gear, and worker understanding of hazards topped 90%. These companies also reduced the exposure concentration to hazardous substances in their operating environments by 40%. They saved NT\$9 million worth of electricity and energy, and spent NT\$4,292,000 to improve safety and health (for a work safety investment ratio of 47.6%). A seminar on occupational safety and health, and energy-saving guidance for printed circuit board manufacturers, was held with a total of 90 attendees.
- (14) IOSH collected data on regulatory trends for the protection of female workers' health in many countries and international organizations, and completed a review of the literature on menstrual leave in Japan and other countries. This data and information will serve as a reference in establishing policies and formulating laws and regulations to protect female workers in Taiwan.
- (15) IOSH reviewed the literature on occupational safety and health of the WHO, ILO, Japan, and Canada, hosted four expert conferences, visited two workplaces, and completed a "Workplace Health and Safety Self-Management Checking/Evaluation Scale."
- (16) IOSH carried out research on the correlation between shift work by women and the incidence of breast cancer. The results indicated that the concentration of urinary melatonin is highly associated with the risk of contracting breast cancer. It is suggested that women in Taiwan should pay attention to promoting workplace health and maintaining good sleeping quality by avoiding sleep interruption, lowering the lighting in their sleeping environment, and maintaining a normal daily life routine.
- (17) In the development of tools for evaluating the psychological health of workers, IOSH has identified factors in work stress, verified the validity of intervention programs, and completed an initial model of work stress management. Information on the recognition

of work stress in five countries—Australia, Japan, Finland, the United Kingdom, and Canada—was collected for reference in the formulation of relevant laws and regulations in Taiwan.

- (18) A data warehousing system was established for data on occupational accidents, and a statistical analysis information platform was completed. The statistical data will be provided to the CLA Department of Labor Inspection as a reference in conducting targeted worker inspections, labor safety promotion activities in cities and counties, and accident-reduction and promotion strategies for minority groups (indigenous peoples, foreign workers, and fishermen).



### Indigenous Peoples Occupational Accident Prevention Website

- (19) IOSH continued the analysis of causes of labor mortality that had been launched in 2007, and issued a related news release. In addition to continually being used in the formulation of research guidelines, the resulting data were also made available to the public.
- (20) The sample population in the aging indicator database was increased, and information about the payment of labor insurance was checked and audited. IOSH completed 300 survey questionnaires and physical fitness tests on 100 disabled workers, and analyzed the difference between insurance payments for occupational injuries and diseases to disabled workers and those to the general workers. The results were presented to the CLA

for determining disabled people's retirement conditions and setting strategies of health promotion.

- (21) IOSH collected regulations on disabled workers operating cranes in the USA and Japan, and gathered the relevant opinions of experts and social welfare institutions. This information will be used as a reference in making policies in regard to the handling of dangerous machines by disabled workers.
- (22) IOSH completed investigations of workplace safety and health for two special groups of people--females and middle-aged/senior workers. The investigations analyzed and studied the reasons why these two groups of people may experience exhaustion or occupational injuries or diseases. Based on the results, future efforts can be made to improve working conditions for these two groups.
- (23) Research was carried out on the indemnity mechanism for occupational accidents and the determination of occupational cancer, and recommendations were made for standards of annuity and indemnification payments for occupational injuries and diseases according to the extent of disability caused by occupational accidents and disease. The study resulted in a suggestion to establish a national occupational cancer reporting system.
- (24) Referring to international workplace rehabilitation programs, IOSH drew up a workplace rehabilitation program suitable for Taiwan, and produced guidelines and a checklist for employers and workers. The guidelines and checklist cover occupational disaster reporting units, legal interests and rights of employers and workers, and workplace rehabilitation programs (including return-to-work programs and injury management programs).
- (25) Referring to the safety inspection and control authority on tank trucks in the UK, USA, and Japan, IOSH suggested modifying the control system for tank trucks in Taiwan to serve as a reference for the CLA to use as a basis in modifying "dangerous machinery and equipment subject to the application of foreign standards."
- (26) Structural and test standards for major components of steel tube construction scaffolding, including vertical racks, horizontal decks, triangle brackets, central braces, and advancing guardrails, were proposed to the Bureau of Standards, Metrology and Inspection of the Ministry of Economic Affairs along with suggestions for modifications of and additions to national standards. Various scaffolding inspection standards were also established and submitted to the CLA as a reference in carrying out inspections.

- (27) IOSH presented checklists and key inspection points for the construction of bridges crossing over other bridges to the CLA Department of Labor Inspection and to construction personnel working on such bridges for their reference. The results will be provided for use in the reporting mechanism for major construction projects of the Ministry of Transportation and Communications, and will be used by the safety supervision and inspection teams for major construction projects.
- (28) An occupational disaster knowledge platform for the construction industry was built up to help relevant enterprises and inspection institutions understand the results of occupational disaster trends using the platform's real-time analytical function. The results can be taken as a reference in planning inspections and a policy-making system for disaster prevention and training.
- (29) IOSH completed a study on the implementation of systemic safety inspection techniques in the manufacturing facilities of petrochemical plants, and presented criteria for the determination of non-corrosiveness. These criteria can be used by the CLA Department of Labor Inspection and other inspection agencies as a basis of determination stipulated in Article 110 of the Regulations for the Safety Examination of Dangerous Machinery and Equipment. The criteria can also serve as a reference for the Department of Labor Inspection in modifying its "notes on the substitute inspection of dangerous equipment."
- (30) To expand communication with the public as well as to encourage the participation of workers, employers, and the government, IOSH held 11 seminars (four expert seminars, four consulting conferences for workers, employers, and the government, two seminars for senior high-tech industry managers, and one policy discussion and common consensus conference).
- (31) An evaluation system targeting pre-installation, post-installation, and functional maintenance of local exhausters was established and provided as a reference for enterprises to use in installing and maintaining the functions of local exhaust equipment.
- (32) IOSH collected information from the USA, Germany, Japan, and Korea about the design, formulation, and reformation of systems and legislation, and completed an analysis and comparison of relevant insurance correlations. IOSH suggested that laws and regulations about occupational disaster insurance be enacted independently in Taiwan, and also advised on regulatory revisions appropriate to the island.

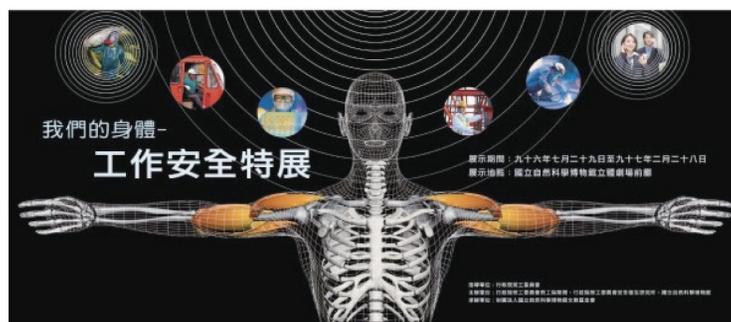
- (33) A “Draft Regulations for Operating Environment Control and Management in the Nano-technology Industry,” based on international information and field visits, were drawn up. Appropriate dustproof masks and local exhaust equipment were found to be able to provide effective protection from exposure to nano-particles. This information was provided for use as a reference for operating safety and health in nano-technology companies in Taiwan, in order to protect operating personnel from possible risk.
- (34) Hotel housekeeping personnel were found to incur a relatively high risk of musculoskeletal injuries while making beds. In addition to improving their work environment, appropriate enhancement of personal muscular strength was found to be able to prevent or reduce musculoskeletal injuries. The results will be taken as a reference in developing policies to prevent occupational injuries and diseases.
- (35) The association between vibration exposure and ergonomics was studied via the completion of 120 on-site measurements of vibration exposure level and data analysis. The results can serve as a reference in modifying regulations governing labor safety and health facilities.
- (36) Investigations of the use of new materials by four industries in the Central Taiwan Science Park and the Southern Taiwan Science Park were conducted. The investigations found that 22 kinds of hazardous substances have not yet been made subject to control or risk evaluation. Further study is required to develop risk prevention strategies so as to avoid potential risks from new materials.

#### **4. Strengthening of safety and health technology information services, and provision of download and inquiry services for data on labor safety and health technology:**

To strengthen the promotion and application of the results of technological research, IOSH publishes occupational safety and health periodicals, and disseminates safety and health knowledge through safety and health exhibitions. In 2008, information on 105 research achievements was published and the entire texts made available for browsing and downloading on the IOSH website. Approximately 2.8 million people have browsed these articles, and 1.79 million have downloaded them. Safety and health technology information from IOSH was disseminated to more than 30% of Taiwan’s total labor population. A sustainable momentum for safety and health was cultivated by holding occupational disaster prevention exhibitions and promotion activities throughout the country, and a wide range of teacher training and promotion

activities, conferences, and research presentations were also held. The IOSH-produced 3D animated film, *The Nick of Time*, won first prize for an international safety and health film at the 18th World Congress on Safety and Health at Work. Later on the film was re-edited and translated into seven foreign languages, including Thai, Vietnamese, and Indonesian, and was distributed to enterprises and vocational schools for use as a tool for the teaching of occupational safety and health to workers and students. By December 2008 it had been viewed by 100,000 people. IOSH also attended international seminars and presented research reports to enhance its international visibility.

- (1) Publications released in 2008 included six Newsletters, four “Work Safety Warnings,” four issues of the *Labor Safety and Health Research Quarterly*, 91 research reports, and nine technical collections.
- (2) IOSH participated in labor safety and health exhibitions, national exhibition tours, special exhibitions, and major promotional events. In 2008 IOSH received 310,000 visitors to these events, including 70,000 visitors at fixed and traveling exhibitions and 247,000 visitors at work safety exhibitions. IOSH was selected by the CLA as a finalist in the 2008 National Workplace Safety and Health Week Achievements Awards.



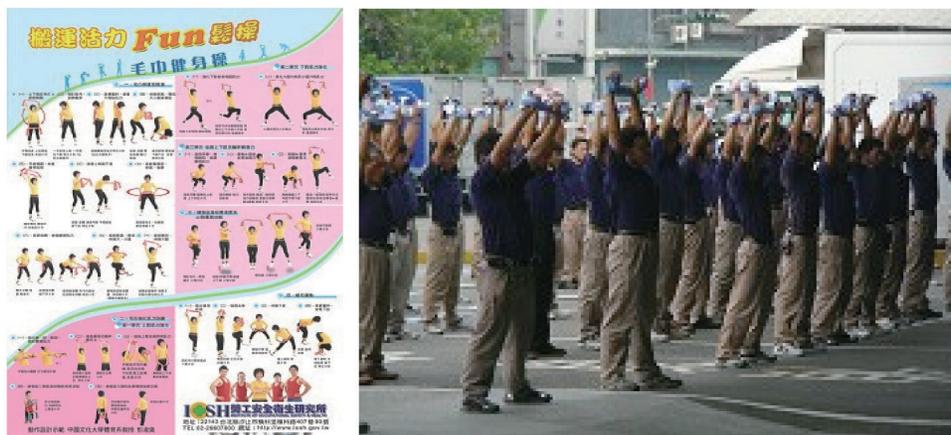
A illustration from the “Our Body - Work Safety Exhibition”

- (3) One IOSH introductory film, five IOSH research achievement films, and 15 news images of occupational disasters were produced and incorporated into the IOSH digital collection.
- (4) A sustainable program of disaster prevention through safety and health knowledge was carried out. To reinforce safety and health training, three interpreter training sessions were held and 170 interpreters were trained.
- (5) Occupational disaster prevention promotional tours for indigenous peoples were carried out, with 10 events held to train basic teachers at churches.



Basic safety and health teacher training classes at aboriginal churches

- (6) IOSH organized two primary training courses in occupational health promotion to help the transport industry carry out a health and physical fitness program for porters. An exercise DVD and prevention handbook for porters were produced and made available to the public.



“Moving for Fun” exercise leaflet and physical fitness training

- (7) IOSH held four occupational safety and health promotion events, one each in Taipei, Taoyuan, Taichung County, and the Central Taiwan Science Park, with a total of 3,200 participants.



Promotional events in Taipei County and Taoyuan County

- (8) IOSH hosted three research presentation seminars in 2008, one each at the Central Taiwan Science Park Administration in Taichung, the Taipei County Government, and the National Science and Technology Museum. During these events, the achievements of 27 research projects were presented to 700 people.



2008 Research Presentation Seminars

- (9) Together with academic institutions, IOSH co-hosted several conferences related to safety and health. These included The 2008 IOHA International Scientific Conference, International Conference on Aerosol Science and Technology, Conference of Environmental and Analytical Chemistry, and Conference of Occupational Medicine and Industrial Health. In particular, at the 2008 IOHA International Scientific Conference (IOHA 2008), which was attended by 500 participants from different countries, IOSH was



The 2008 IOHA International Scientific Conference

- (10) IOSH completed 100 3D illustrations of human body size measurements to be displayed at workplaces, and held two application and promotion events as well as 30 guidance and consulting activities to help various industries improve their workplace design.



### On-site ergonomic improvement and physical fitness promotion for heavy-duty workers

- (11) An air-curtain hood was developed, and was patented in Taiwan and the USA. The relevant technology has been transferred to manufacturers for production, and has been applied by 20 enterprises to reduce their workers' exposure to hazards.
- (12) Using ventilation evaluation techniques, hospitals were assisted, in 30 cases, in checking the ventilation and negative pressure of negative pressure isolation rooms and vans.



Figure 16 Inspection of negative pressure isolation rooms

- (13) The 3D animated film, *The Nick of Time*, won first prize for international safety and health films at the 18th World Congress on Safety and Health at Work. The prize was awarded in Seoul. A total of 4,500 international safety and health experts from 125 countries, plus representatives from industries, private organizations, and government, attended. It was the first time for Taiwan to win the first prize for a major international work safety promotion film. Since Taiwan attended the congress and won the prize as an official government entity, the responsible IOSH personnel were commended by the President.



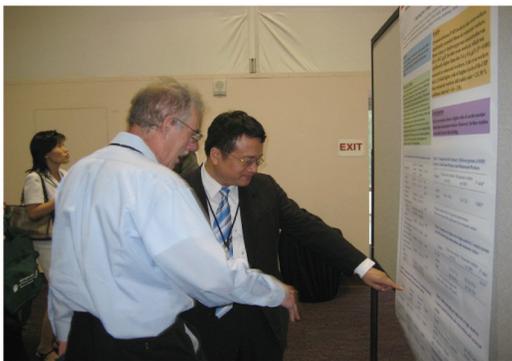
Certificate of award for *The Nick of Time*; IOSH personnel commended by President

- (14) IOSH personnel attended the 11<sup>th</sup> Conference of International Indoor Air Quality in 2008, and visited the Institute of Occupational Safety and Health Research in Denmark. At the



The 2008 Conference of International Indoor Air Quality

- (15) IOSH personnel attended the 2008 ISEA/ISEE International Conference in Pasadena, California, where they presented two research papers. Questions were raised by experts



Experts view displays at the 2008 ISEA/ISEE International Conference

- (16) IOSH personnel attended the 9<sup>th</sup> Conference of Injury Prevention and Safety Promotion in Mexico. The IOSH participants communicated with representatives from other countries about relevant work areas and research trends, and collected the research results and planning directions of other countries in regard to safety issues.



The opening ceremony of the 9th Conference of Injury Prevention and Safety Promotion

- (17) Income from several patents, including “air curtain-isolated biosafety cabinet,” “material filling system,” “detection methods of worker exposure time,” “wearable items and warning systems,” and “air-isolator fume hood,” and from the transfer and application of technology, such as the design of “booth-type hoods,” “air curtain-isolated biosafety cabinet,” “porous denuders,” and “management system software of occupational labor exposure evaluation database,” has increased significantly in the past few years, reaching NT\$1.93 million in 2008. This income will be used to fund relevant research and technical promotion in the succeeding year.

