

# **2005 Annual Report of Labor Safety and Health Research**

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

## Preface

The Institute of Occupational Safety & Health (IOSH), a unit of the Council of Labor Affairs (CLA), is a national agency in charge of safety and health affairs. The tasks of IOSH include analyzing and detecting the hazards in working places and proposing solutions.

Injuries and fatalities in working places have been increasing with Taiwan's economic development. Factors such as the growing number of workers, the use of hazardous or poisonous substances, and the use of large and complicated machines make accidents more likely happen. In 2004 the number of occupational casualties was 38,155, traffic accidents excluded. That is, an average of 4.36 employees were killed or injured in working places each hour. The direct and indirect economic loss thus caused was huge. Obviously, there is much room for the improvement of occupational safety. As changes take place in both Taiwan and the international industrial situation, this issue is becoming more complicated and occupational safety strategies will be chosen to facilitate both industrial development and substantiality. These strategies will conform to the four core administrative principles adopted by the Executive Yuan to promote a comprehensive life safety net. The administrative focus for this year is on "Healthy Taiwan Year" and the goal for the next four years will be on "building a safe working environment and reducing the rate of occupational casualties."

This annual report describes the major projects undertaken and major results achieved in 2005, which, we hope, will provide a good understanding of the efforts and achievements of IOSH.

Chairperson  
Tung-Sheng Shih  
Institute of Occupational Safety & Health

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## Annual Report

### **Section 1 Responsibilities**

The Institute of Occupational Safety & Health (IOSH), a research institute under Cabinet Council of Labor Affairs (CLA) was established in 1992. Since its inception, its mission and responsibilities have been defined as follows:

1. Providing an academic foundation for labor safety and health decision-making and administration.
2. Providing solutions for crucial labor safety and health issues.
3. Providing a reference for the formulation and revision of labor safety and health regulations and management systems.
4. Heightening of technical standards for labor safety and health, and inspection work.
5. Providing information needed for labor safety and health training and consultation.

IOSH carried out a project to analyze occupational accidents that occurred during 2003 and 2004, in which employees were reported disabled or killed; the subjects of the analysis included fishery, fifteen occupations covered by the Labor Safety and Health Law, and non-commuting work-related traffic accidents. The results helped in building local labor safety and health databases, and were also applied to the policies and goals for the prevention of occupational disasters. IOSH furthermore planned a national program mid-term 233 aimed at reducing rate of occupational injuries, and worked with the CLA's four-year project designed to build a safe work environment and reduce injuries. As a policy priority, IOSH assists business in establishing international standards of health and safety, strengthening management, promoting technology application, building domestic data bases and reducing the injury rate in high-risk occupations, occupational injuries, and the fatality ratio.

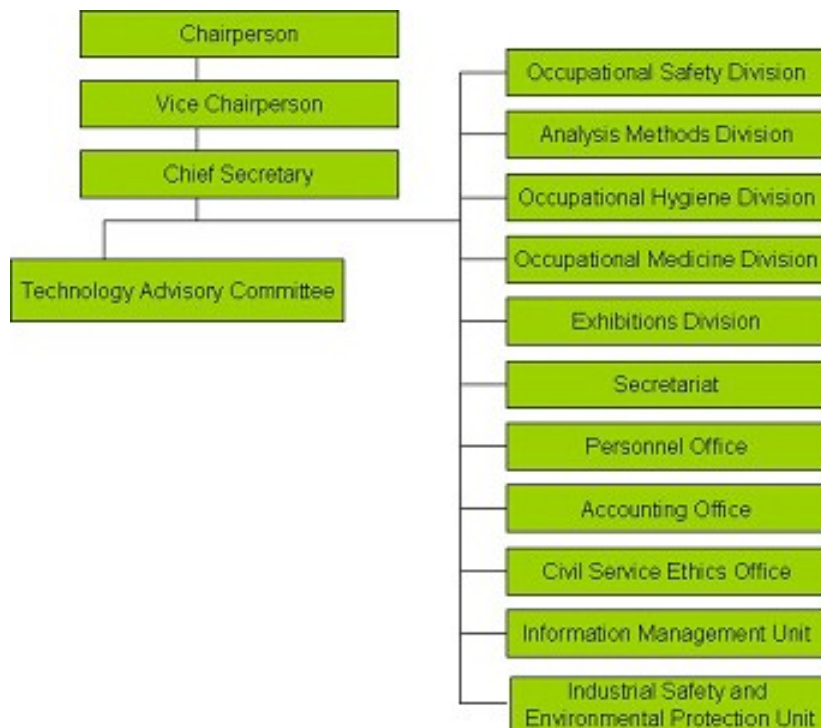
This report encompasses IOSH operations from January to December 31 of 2005, including 88 research projects. IOSH publicized and shared its research results by holding presentations and seminars, publishing magazines and papers, and offering technology transfer. During the year, IOSH published a total of 104 periodicals,

research reports, and technical series; held five exhibitions and 14 seminars; had papers published in domestic and foreign periodicals; presented 66 papers at academic seminars; and received six patents. IOSH's service also extended to help conduct occupational accident surveys and calibrate equipment for inspection organizations.

## Section 2 Organization and Staff

IOSH is headed by a Chairperson, a Vice Chairperson, and one Chief Secretary. It has five divisions with a total of 65 research staff, two contract employees, and 19 alternative national service personnel. The divisions are the Occupational Safety Division, Occupational Health (Hygiene) Division, Analysis Methods Division, Occupational Medicine Division, and Exhibition Division. Administrative units include the Secretariat, Accounting Office, and Civil Service Ethics Office. The organization chart is shown below:

organization chart



### Section 3 Research Budget

Table: IOSH research budget for 2005

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<b>Item</b>	<b>Annual Budget</b>	<b>Unit: NT\$</b>
Occupational Safety Research		169,608,868
Occupational Safety Division		36,754,580
Occupational Health Division		37,371,436
Analysis Methods Division		33,221,842
Occupational Medicine Division		35,628,149
Exhibition Division		26,632,861

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## Section 4 Key Research Projects and Results

To reach its plan targets, IOSH focused on the following key tasks in 2005: strengthening of high-risk workplace disease prevention and consultation, occupational safety management and integration, and technological research in disaster reduction. In addition, IOSH made great efforts to promote occupational health, boost the health and safety of disadvantaged groups in the workplace, upgrade the efficiency of service in training and consultation, and enlarge the scale of health and safety education and international exchange.

IOSH conducted the following projects in 2005:

1. Provision of consultation service for the establishment of hazards-reduction management systems in high-risk occupations, and cooperation with agencies in the establishment of safety and health mechanisms so as to improve the health of workers:
  - (1) Twenty makers of medical devices were assisted in establishing autonomous safety and health management systems. The amount of ethylene oxide ( $C_2H_4O$ ) detected has been reduced 56%, from 8.86ppm to 3.92ppm. Other improvements were made in the work process of  $C_2H_4O$  sterilization and the ventilation of worksite and storage areas, and experiences were shared through management training and wrap-up presentations.
  - (2) In a project designed to reduce silica dust in foundries, IOSH assisted 32 manufacturers in establishing autonomous safety and health management systems. The implementation of the project has reduced the level of breathable dust by 18%, from  $1.141mg/m^3$  to  $0.938mg/m^3$ .
  - (3) Training in Self-compliance and health management systems was completed for 76 small and medium manufacturers in the synthetic leather, foam, and tape industries. Also, IOSH provided technical services for the improvement of deficiencies in pollution control systems and other areas. This has resulted in an 11-59% reduction in exposure to hazardous substances, benefiting 16,659 employees.
  - (4) In the food service industry, exposure to PAHs (polycyclic aromatic hydrocarbons) has been lowered to 65% and health and safety awareness has

been raised to above 90%. IOSH also provided a manual for the prevention of ergonomic damage and worked with the Food Service Association in promoting it.

- (5) To reduce noise from blast machines, IOSH developed new-technology and machines to help shipbuilding plants with noise problems. These new machines reduce noise caused by sand blasting by more than five decibels.

## 2. Development of safety and health equipment for industrial use:

- (1) IOSH developed software for disaster simulation and expert management for application in the planning of emergency response measures by petrochemical plants and the Southern Taiwan Science Park. IOSH will continue working on complete supporting expert systems for the Southern Science Park, the Taiwan Responsible Care Association, and large-scale petrochemical plants.
- (2) IOSH introduced its newly developed air classifier of particulate material on three major occasions in 2005—the American Industrial Hygiene Conference & Expo in May, 17<sup>th</sup> World Congress on Safety and Health at Work in September, and Workshop of Building International Program in November.
- (3) A new porous metal denuder was developed for use in sampling harmful gases like acid gas, aerosol, and toluene diisocyanate. This technology is offered free to relevant testing organizations. It has been granted a Taiwan patent, and a U.S. patent is pending.
- (4) A Taiwan patent application is being pursued for a new method of personal exposure monitoring and testing, which is used in conjunction with a wireless positioning system and toxic chemical detector for the precise measurement of worker exposure to hazardous materials.
- (5) IOSH has transferred its new patented hood technology to the National Taiwan University of Science and Technology. The new hood was scheduled to be displayed in vent2006 and to be extended to chemical laboratories in schools.
- (6) A new air curtain device has been patented and is being promoted with a food service guidance program.
- (7) IOSH has developed a low-noise blasting machine, and has applied for a patent for it. The new device has been introduced to related companies.
- (8) IOSH developed localized work samples for the evaluation of mentally and physically challenged people, and transferred them to the Vocation Evaluation



Center in southern Taiwan and seven other social welfare foundations. Some of the testing devices, such as those for wiping and assembling skill testing, are patented.

3. Based on the BSL system from the U.S., and using insurance compensation data, IOSH completed the compilation of statistical data on occupational injuries and diseases in Taiwan. This statistical record can be used with internet databases to provide a more comprehensive record of worker health conditions.

(1) Based on 2004 health insurance compensation data, IOSH analyzed the causes of occupational injuries, disabilities, and fatalities according to age, location, company size, and job. The resulting data are included in an internet database that offers a total of 23,837 items for retrieval.

(2) Work was continued on the establishment of hearing, blood lead level, needlestick injury, and pressure change surveillance. For needlestick injury prevention, IOSH joined the “EPINet network” and sent information to the Center for Medical Employee Safety and Health, where the data are compiled and annual needlestick injury rates are published. This further contributes to the construction of a domestic occupational disease surveillance system. Data on labor insurance payments and occupational disease checkups are analyzed annually to pinpoint high-risk groups in each profession, which are listed for priority inspection. IOSH also produced an annual report on the hazardous workplace noise surveillance system, which was put online and sent to various administrative agencies.

(3) The connection between work category and heart Cardio-Vascular Disease was explored, based on clinical classification and statistical data from labor insurance payments. Scholars and experts were invited to form a task force on overstress and offer suggestions and programs for use in future policy-making and research. Using research results from Taiwan and Japan, IOSH assisted in formulating diagnostic proof-criteria for job-related acute myocardial infarction and coronary events.

4. Research for application in revising laws and improving systems:

(1) IOSH studied and compared construction hazard prevention mechanisms and improved project bidding under the Government Procurement Law. IOSH also proposed improvement in the bidding system and in methods of safety training

and education in the construction industry for use by the CLA.

- (2) IOSH worked out design guidelines for brackets and made proposals for regulations and inspection standards for scaffolds used in construction.
- (3) The results of research on batch reactors and organic peroxide storage technology can be used in the explanation of Article 28 of the Major Accident Hazard Prevention Regulation, and in the revision of the peroxide storage rules in a Article 197 of the Regulation.
- (4) IOSH made a comparison of the dangerous equipment management systems of other countries. The results were applied in drafting safety regulations and inspection standards for compressed air.
- (5) Analysis was conducted on the cause and effect of occupational diseases; IOSH also constructed accident reduction models for use in the “233 occupational accident reduction program”.
- (6) Results of a study of risk evaluation of chemical exposure in the workplace can be used by the National Council for Sustainable Development for the analysis of occupational health risk, and for revision of the Regulation for Permissible Exposure Limits of Airborne Hazardous Substances in the Working Environment. It was found that under  $0.01465\text{mg}/\text{m}^3$ , LCP(lifetime cancer potency) goes to  $6.67(\text{mg}/\text{kg}\cdot\text{day})$ . The permissible exposure to hexavalent chromium calculated in this way is  $5.99\times 10^{-3}\text{mg}/\text{m}^3$ . According to the Regulation for Permissible Exposure Limits of Airborne Hazardous Substances in the Working Environment, the safe level for hexavalent chromium is  $0.1\text{mg}/\text{m}^3$  for an eight-hour day.
- (7) IOSH collated data on permissible exposure limits for eight hazardous chemicals: methyl tert-butyl ether (MTBE), chromate, sodium chromate, lead chromate, strontium chromate, and calcium chromate. Data on permissible concentrations of hazardous substances were provided to the Safety and Health Division for use in reviewing the suitability of the Regulation for Permissible Exposure Limits of Airborne Hazardous Substances in the Working Environment.
- (8) IOSH completed sampling methods for five hazardous chemicals: cyanide, sec-butyl acetate, tert-butyl acetate, and *p*-tert-butyl toluene. Among them, the methods applied to the analysis of cyanide can be used to analyze more than ten chemicals. These research results have been approved by the Technical Committee for Workplace Environment Monitoring and are now available on

the internet for downloading and use as a reference in carrying out work environmental monitoring work.

- (9) An evaluation of ergonomics for heavy physical work suggested the necessity of reviewing categories and definitions of heavy physical work in order to provide a reference for revising protection measures for those involved in heavy work. In addition, equipment and methods for the assessment of vibration exposure have been worked out to serve as a reference in revising the Labor Safety and Health Law.
- (10) IOSH established a simple method for assessing smoking area ventilation. With the enforcement of the Tobacco Hazard Prevention Act, this method will be provided to companies for use in the establishment of smoking areas, to inspection agencies for use in determining the effectiveness of ventilation, and to the Department of Health for reference.
- (11) Methods for the assessment of biological safety cabinets (BSCs) were established; they have been accepted by Chinese National Standards (CNS), and are in the process of inspection. The Center for Disease Control, ROC will refer to these methods in the revision of related laws.
- (12) A comparative study was carried out on how different countries manage return to work following occupational injury, and the results are used by the CLA in planning its own rehabilitation mechanism.
- (13) IOSH conducted a survey on physical fatigue and workload among employees with flexible work hours. Work fatigue was determined using fatigue measurement methods, and the results were provided for use in policy evaluation.
- (14) Information on health care programs from other countries was collected so as to improve the quality of designated health exam facilities. An understanding of current conditions was gained through self-evaluation and hospital inspection visits, and suggestions were given to the CLA for reference in conducting quality control and assessment of medical organizations.

##### 5. Study of new technologies and data for application by industry:

- (1) Strategies were proposed for the prevention of needlestick injury and exposure to blood. On March 24, 2005 IOSH held a demonstration of an accident reporting and tracking system in hospitals, and introduced the system to medical staff.

- (2) IOSH worked out measures for the prevention of biological hazards in national defense affairs. With the cooperation of the Medical Affairs Bureau of the Ministry of National Defense, IOSH extended these measures to military hospitals.
- (3) Considering the need for protection against chemical colorants, IOSH proposed the use of suitable gloves by hairdressers and barbers and provided occupational illness prevention manuals for reference.
- (4) IOSH worked out measures for overstress reduction and prevention in high-technology industries. By holding seminars on occupational stress management, IOSH shared and promoted its stress-related evaluation methods and experiences in health improvement. The beneficiaries of these activities included personnel in the fields of nursing, human resources, and safety and health inspection. The simplified online stress self-check form was updated for use in the monitoring of stress in organizations and companies. IOSH also promoted its overstress norms, a brief version of the work stress scale, and pressure evaluation scale by producing optical disc versions of automatic stress testing scales. The results of a study of overwork among high-technology employees were provided to ten optoelectronic companies in the Southern Taiwan Science Park for future use in stress management. In addition, self-checking stress scales were given to enterprises and organizations for overstress prevention.
- (5) Standards for the evaluation of physical fitness for work requiring constant standing were mapped out and methods for the prevention of standing-work were proposed to the Taiwan Retailers Association, Nurses Association, Taiwan Occupational Health Nursing Association, and enterprises. IOSH also cooperated with three department stores in conducting a 10-week health exercise program, with above 100 reception staff, sales staff, and administrators participating. The program also included training for seed trainers.
- (6) Guides for the prevention of occupational accidents in the assembly, food, and electronic industries were formulated, and technical guides for hazard evaluation and monitoring for safety and health personnel were established. On October 28 and November 3, IOSH, together with the Central Region Labor Inspection Office and the Occupational Safety Office of the Kaohsiung City Labor Affairs Bureau, held two seminars on disaster prevention in companies and organizations. These seminars were designed to introduce concepts of risk management and

systemization to small and medium enterprises. The total of 300 participants included safety and health personnel, on-site operators, academics, and plants and other interested parties.

- (7) Studies were carried out on prevention and control of titanium filler-caused fires in petrochemical plants and IOSH offered educational materials for the prevention of titanium-caused fires, especially in the petrochemical and chemical manufacturing industries. The research results will be released at IOSH's wrap-up presentations, and will be sent as reference to organizations including the Chung-shan Institute of Science and Technology, the 202nd and 203rd Arsenal of the Ministry of National Defense, the Taiwan Regional Metal Smelters Association, and the Petrochemical Industry Association of Taiwan.
- (8) A survey and analysis of standards for flameproof electrical apparatus for combustible dust explosion prevention which meets the standards of the International Electrotechnical Commission (IEC) and Underwriters Laboratories (UL), as well as related Japanese standards, was carried out, and a guide was established for the adoption of dust-explosion prevention apparatus. Related research results will be released at IOSH wrap-up presentations and will be sent to petrochemical enterprises, the Electrical and Electronic Manufacturers Association, and the Taiwan Provincial Farmers' Association for use as a reference in the selection of electrical apparatus.
- (9) IOSH completed a safety culture diagnostic chart for the petrochemical industry and constructed a related website (IP address: 140.135.49.3). Individuals and groups in the industry can carry out online assessments of safety training, commitment, communication, principles, supervision, and systems. The assessment results can be compared with the industrial safety culture norms set up on the website to gain an understanding of the safety standards of the assessed parties.

#### 6. Presentation and application of research results:

- (1) IOSH produced electronic files of its publications and made them available on the internet for free downloading. The website recorded more than 1 million hits in 2005, and 110,000 browsers downloaded IOSH publications.
- (2) IOSH provided publications for the reference of scholars, experts, government agencies, enterprises, and labor safety and health workers: issues one to four of volume 13 of the IOSH Journal of Occupational Safety and Health, at 1,050

copies each, and issues 64-74 of the labor safety and health newsletter, at 5,000 copies each. These publications serve as helpful resources for scholars, government agencies, and related officials.

- (3) IOSH held exhibitions in its own Exhibition Hall and mounted traveling exhibitions with the cooperation of the Kaohsiung County, Taipei County, and Taipei City governments. The Exhibition Hall received 24,300 visitors and 27 mobile exhibitions were held in schools and companies, allowing around 46,300 people to experience the importance of work safety.
- (4) On the April 28 "Day of Mourning", IOSH held a "zero occupational accident" activity at the Taipei County Government with displays including the use of tripods, protective equipment, and brief wrap-up presentations.
- (5) In its ongoing work for the establishment of a digital museum of occupational safety and health, IOSH produced multimedia vide clips on fire and explosion prevention, and produced edited video news clips of 16 occupational accidents.
- (6) IOSH sent 10,000 pieces digital museum CDs on disaster prevention to elementary and high schools.
- (7) A safety and health teachers training camp was held from July 18 to 29. Participators included more than 100 teachers from universities and vocational high schools, and doctoral candidates from safety and health departments.
- (8) IOSH, the CLA Division of Occupational Safety and Health, and the Ministry of Education together held three basic training sessions with 359 people participating.
- (9) IOSH expanded the scale of its wrap-up presentations on research in exposure, electromechanical and chemical engineering safety, construction safety & monitoring, and biological hazards. Response has been enthusiastic and there has been great improvement in domestic safety and health.
- (10) From May 18 to 20, IOSH held a "zero accident" event in Ping hen City, Tao Yuan County. The event featured the display of research results and personal protection equipment.
- (11) The results of four research projects were disseminated. The results of one of the projects, involving mask filter testing technology, was adopted by a textile center.
- (12) Income from Patent licensing and technology transfer of the IOSH respirable dust samplers and safety coupling has increased rapidly rising from NT\$150,000 in 2002, to NT\$1.05 million in 2003, NT\$1.12 million in 2004, and NT\$1.65 million

in 2005. This income will continue to be spent on related research and the promotion of research results next year.