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Prevention of Occupational and Environmental Diseases by Implementation of ISO 14000 and BS 8800 for Industries

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Rapid industrialization usually brings both economic development and environmental pollution, which often produces occupational diseases in the workplace and environmental diseases in the nearby community. From experience of documenting 17 occupational diseases, we found that they resulted from a lack of a comprehensive hazard communication system. The spillage of such unknown chemical hazards also produced environmental diseases for the neighbouring factories and community. Because the general treatment of occupational and environmental diseases must include the identification of hazard and taking preventive procedures to avoid further exposure, it is essential to recognize and control the hazard at the start of an industry. Thus, implementation of the life cycle assessment in ISO (International Organization of Standardization) 14000 series will guide an industry to identify and minimize the use of hazardous chemicals. A similar practice of risk assessment and reduction for every unit operation in the production process proposed by BS (British Standard) 8800 will also help to improve occupational health. Although implementation of such systems is a voluntary compliance, actual practice demands the same systems in related or satellite factories and has a strong market implication.

Introductiom

During the past three decades, Taiwan has been under a rapid industrial and economic development. As people's living standard has enjoyed a tremendous improvement from an annual GDP (gross domestic product) of 2.8 billion $US in 1965 (DGB, 1986) to 272.3 billion $US in 1996 (DGB, 1997), such a fast industrialization has also brought pollution, occupational and environmental diseases. This review summarizes our painful experiences in documenting occupational diseases during the past 15 years and shows that they arose from a general lack of hazard recognition and communication, which also frequently spilled over to nearby factories and communities and produced environmental diseases. Second, we argue that such a tragedy can be effectively prevented by implementation of life cycle assessment of ISO (International Organization of Standardization) 14000 series and risk assessment and reduction of BS (British Standard) 8800 series, and that they may help companies in developing countries to open a wider market.

Significance of Hazard Communication System for Workers and Community People—Painful Experiences in Taiwan

The fast industrialization during the past several decades has pumped approximately 1000 types of new chemicals into the workplace and ecological environment every year (Ames, 1979). The use and manufacture of hazardous chemical compounds may also be increasing in developing countries, as they are in the process of industrialization and must import similar manufacturing processes and raw material. Before

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1993, there was no regulation for a comprehensive system of hazard communication, eg MSDS (material safety data sheet), in Taiwan. Both workers and community people were relatively unaware of any hazardous chemical to which they were exposed. Even employers were ignorant about obtaining such information. Thus, workers suffering from occupational diseases and community people contracting environmental diseases were often ignored or went unnoticed. It was not until the mid 1980s that some occupational physicians conducted epidemiological studies at the workplace to document occupational diseases (Wang, 1991). Table 1 summarizes the painful experience of Taiwan. No one in the factories knew what types of chemicals were being used in the manufacturing process at the time of each outbreak of five occupational diseases. Thus, everybody was exposed at the workplace because there were no precautionary or preventive measures, and almost everyone developed the same diseases. For example, 17 of 20 persons who worked in rooms using the same air conditioning system were found to have abnormal liver function, because in one of these rooms carbon tetrachloride was used as a special cleaning agent (Deng *et al*., 1987). Similarly, 12 of 13 press proofing workers, who slept at the workplace to enjoy the cooling effect of the air conditioning, developed polyneuropathy since *n*-hexane was used inside the printing room, and no one knew what chemical was being used (Wang *et al*., 1986).

In eight additional cases, only employers or some engineers who were responsible for quality control or chemical analysis knew the major composition of the chemicals, but they did not obtain information on the adverse health effects of such compounds. Thus, no proper preventive actions were taken, and occupational diseases occurred. For example, the local exhaust ventilation system of a ferromanganese smelting plant went out of order and remained unfixed for about 8 months (Figure 1), then six overt cases of Parkinsonism developed (Wang *et al*., 1989). Had the employer known the detrimental health effect of manganese exposure, he would have fixed the system earlier to prevent the tragedy. Had the workers known the danger of chronic manganism, they would have refused to continue working there until occupational hygiene had been improved.

Importance of Recognizing Health Effects of Exposed Chemicals

If both the employer and workers only knew the name of the chemical but were ignorant of or failed to recognize its health effects, then preventive action was usually not taken and occupational disease would still occur. For example, employers and workers of all six electroplating shops knew that they were using dichromates, but no one was aware that it would cause a perforation of the nasal septum. It was not until we conducted a health survey with an otorhinolaryngologist

Table 1. Occupational diseases documented in Taiwan during the past 15 years and importance of hazard communications for prevention

Agent	Manufacturing process	Occupational disease	Awareness of agent		Reference
			Workers	Employers Engineers	
Carbon tetrachloride	Cleaning agent for printing	Hepatitis	No	No	Deng *et al*., 1987
n-Hexane	Press proofing	Polyneuropathy	No	No	Wang *et al*., 1986
Lead	Tile glazing (pigment)	Polyneuropathy	No	No	Yip *et al*., 1988
Mixture of solvents	Paint manufacturing	Impaired neuropsychological function	No	No	Wang and Chen, 1993; Tsai *et al*., 1997; Chen *et al*., 1997
TDI (toluene diisocyanate)	Velcro (adhesives)	Asthma	No	No	Wang *et al*., 1988
Bipyridyls	Paraquat manufacturing	Skin cancer and Bowen’s disease	No	Yes	Wang *et al*., 1987; Kuo *et al*., 1993; Jee *et al*., 1995
Dimethyl formamide	Synthetic leather	Hepatitis	No	Yes	Wang *et al*., 1991
Kerosene	Ball bearing	Dermatitis	No	Yes	Jee *et al*., 1996
Isothiazolinone	Paint manufacturing	Dermatitis	No	Yes	Jee *et al*., 1985
Lead	Battery recycling	Polyneuropathy and anaemia	No	Yes	Wang *et al*., 1998
Manganese	Ferromanganese smelting	Parkinsonism	No	Yes	Wang *et al*., 1989
Organophosphorus	Pesticide formulation	Reduction of cholinesterase activity	No	Yes	Wu *et al*., 1989
Vinyl chloride	Polyvinyl chloride manufacture	Hepatocellular carcinoma	No	Yes	Du and Wang, 1998; Du *et al*., 1995
Asbestos	Cement tile, fireproof textile	Lung function impairment	No/Yes	Yes	Chen *et al*., 1992
Chromate	Electroplating	Nasal septum perforation	Yes	Yes	Lin *et al*., 1994
Mercury	Chloro-alkali	Impaired neural functions	Yes	Yes	Chang *et al*., 1995
Pesticides	Spraying	Dermatitis	Yes	Yes	Guo *et al*., 1996

Figure 1. Workplace full of fumes in a ferromanganese smelter. Because the local ventilation system was out of order, the surfaces of the walls and electricity meters were covered with a thick layer of dust. The workers were unable to breathe if they wore a respirator with a high efficiency filter. Because nobody knew that manganese is neurotoxic and because the ventilation system was not fixed early enough six employees working in this environment developed Parkinsonism.

that perforations in 16 persons were found (Lin *et al*., 1994). Among these victims, two were employers and one was an employer's wife who was rarely directly involved in electroplating. However, these were family owned businesses and the couple (and another employer) were directly exposed to chromate mists because their offices were near the electroplating tanks which were neither enclosed nor had exhaust hoods. Similarly, although fruit farmers knew the names of the pesticide they used, the labels pasted on the containers did not provide any toxicological information on skin contact. Thus, 30% of the exposed workers developed hand dermatitis (Guo *et al*., 1996). In a third case, workers exposed to mercury inside chloro-alkali plants knew that they were exposed to mercury but were unaware of its neurotoxic effect. As the main concern of the whole factory seemed to be productivity only, they were found to have a prolonged neural conduction time of the central nervous system when they were examined (Chang *et al*., 1995). In the last case, workers and employers in asbestos textile and cement factories knew that they were handling asbestos fibres, but they were not convinced that asbestos causes lung cancer and asbestosis because the latency periods were too long (>15 years) and there had been no reported case in Taiwan before 1992. Thus, relatively few effective preventive measures were implemented and the workers were found to have developed dose-related impairment of lung function when we conducted the health survey (Chen *et al*., 1992).

Thus, a chemical inventory and the MSDS of each compound should be prepared for every unit operation in the manufacturing process of a product. The material safety data sheet must include detailed information on the acute and chronic health effects and suitable preventive measures. Then this information should be comprehensively communicated to the employer and employees involved in and around the process to preserve worker's right-to-know (ILO, 1994), and effective monitoring and control measures must be implemented.

Relevance of Community Right-to-know

Without proper control of hazardous chemicals, they may spill over to the nearby community and result in environmental diseases, as shown in Table 2. For example, the outbreak of lead poisoning in 48% of workers of a lead battery recycling factory also caused not only an increased lead absorption among workers of a neighbouring forging factory (Chao and Wang, 1994) but also an impairment of IQ (intelligent quotient) among nearby kindergarten children (Wang *et al*., 1998; Soong *et al*., 1999). The blood lead measurements are summarized in Table 3 showing that both outdoor workers in the neighbouring factory and children in a nearby kindergarten had a significant increase of blood lead. As the general treatment of mild lead poisoning is to identify the source of lead intake and take appropriate preventive measures to avoid further absorption, we recommended that the recycling factory enclosed its plate cutting and smelting processes and that the kindergarten move at least 2 km away immediately. Two and half years later, our follow

Table 2. Environmental hazards (EH) documented in Taiwan during the past 15 years and importance of community right-to-know

Agent	Circumstance of exposure	EH	Awareness of agent		Reference
			Community people	Company	
Lead	Herbal medicine	Abdominal colic, anaemia and polyneuropathy	No	No	Hoa *et al*., 1994
Asbestos	Nearby community	Lung cancer and mesothelioma (?)	No	Yes	Chang *et al*., 1999
Ethylene glycol	Use as cathartic	Acute renal failure	No	Yes	Chen *et al*., 1992
Lead	Nearby kindergarten and elementary school	Impairment of IQ (intelligence quotients)	No	Yes	Wang *et al*., 1998; Rabinowitz *et al*., 1991; Soong *et al*., 1999
Lead	Neighbouring factory	Increased lead absorption	No	Yes	Chao and Wang, 1994
Lead	Parental	Increased lead absorption	No	Yes	Wang *et al*., 1989
Mixture of chlorinated hydrocarbons	Underground water	Liver cancer (?)	No	Yes	Lee *et al*., 2000

Table 3. Blood lead levels ($\mu g\ dl^{-1}$) of the employees in a battery recycling smelter, the workers in neighbouring factory and the children in the nearby kindergarten: A case of simultaneous occupational and environmental pollution (Wang *et al*., 1998; Soong *et al*., 1999)

Employees of battery recycling smelter		Workers of neighbouring factory		Children of nearby kindergarten blood lead median (range)
Job category	Blood lead (mean ± 1 SD)	Working place	Blood lead median (range)	
Furnace	87 ± 14 ($n = 19$)	Working indoor		Before moving
Maintenance	82 ± 8 (n = 3)	Total ($n = 11$)	11 (6–21)	
Dissecting	69 ± 16 ($n = 10$)	Male ($n = 6$)	15 (6–21)	15.1 (7.7–31.7) ($n = 32$)
Refining	64 ± 16 ($n = 6$)	Female ($n = 5$)	11 (9–14)	
Crane operator	64 ± 11 ($n = 6$)	Working outdoor		After moving
Field cleaner	95 ± 35 ($n = 4$)	Total ($n = 25$)	24 (10–49)	8.5 (5.0–15.0) ($n = 28$)
Office cleaner	48 ± 5 ($n = 6$)	Male ($n = 24$)	23 (10–49)	
Office guard	38 ± 4 ($n = 5$)	Female ($n = 1$)	40	
Salesman etc.	8 ± 6 ($n = 5$)	New employees or truck drivers ($n = 5$)	8 (3–14)	

up measurements of blood lead and IQ for the same children showed a sound recovery (Soong *et al*., 1999).

Moreover, lack of knowledge of the ecological impact and/or bioaccumulation effect of toxic chemicals may also result in irresponsible dumping of these compounds which may pollute underground water and eventually damage human health. For example, an electronic appliances manufacturing company dumped used solvents which contained chlorinated hydrocarbons onto its own backyard ground during 1970–90. The company closed its operation in the early 1990s, and was purchased by another big company, which spent millions of dollars digging a big hole trying to clean the contaminated soil and water, as shown in Figure 2. However, our recent investigation found that the underground water taken from the surrounding residential area was still contaminated with such toxic solvents as shown in Table 4. An MOR (mortality odds ratio) study revealed that liver and stomach cancer were increased for the downstream residents compared with those who lived upstream (Lee *et al*., 2000). Although the mortality data could not allow for control of potential confounding by other determinants such as hepatitis virus B and/or C infection, the possible causal association can not be ruled out. Had the company known that these solvents were so soluble, toxic and difficult to eliminate from the contaminated ground soil and water, they would have taken proper precautions to treat them carefully and to prevent this tragedy.

A similar problem occurred for asbestos factories in Taiwan. Asbestos was used widely in manufacturing cement, insulation and friction material, as well as fireproof textile products from the 1960s (Chen *et al*., 1992). People were using and dumping its waste without knowing that exposure can produce lung cancer and/or mesothelioma. Figure 3 taken in the late 1980s showed that the waste was dumped as a regular house garbage at the backyard of a textile factory. In the early 1990s, we were concerned about the risk to the nearby community people of developing lung cancer and mesothelioma. Ambient levels of asbestos fibres were determined by transmission electromicroscopy and the

Figure 2. A hole dug inside a factory. The company which had previously dumped solvents containing chlorinated hydrocarbons spent millions of dollars digging a hole measuring 2012 $m^2 \times 5.5$ m (depth) for cleaning contaminated soil and underground water. However, ground water outside the factory still showed persistent pollution.

Table 4. Concentration ranges of the tested volatile organic compounds (VOCs) in groundwater samples collected from 49 civilian wells around a closed electronics-manufacturing factory

	VOCs Solubility in water (mg l^{-1}, at 25°C)	EPA drinking water standard		Concentration range (μg l^{-1})	
		MCLG[a] (μg l^{-1})	MCL[b] (μg l^{-1})	Number of wells above MCL	Highest level
1,1-Dichloroethene	2500	7	7	12 (26.5%)	1240.4
cis 1,2-Dichloroethene	3500	70	70	9 (18.4%)	1376.0
Tetrachloroethene	150	0	5	24 (49.0%)	5228.3
1,1,1-Trichloroethane	1495	200	200	5 (10.2%)	1504.4
Trichloroethene	1100	0	5	32 (65.3%)	5479.7

[a]Maximum contaminant level goal (MCLG): The maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health effect of persons would occur, and which allows for an adequate margin of safety. MCLGs are non-enforceable public health goals. EPA stands for Environmental Protection Agency of the United States.
[b]Maximum contaminant level (MCL): The maximum permissible level of a contaminant in water which is delivered to any user of a public water system. MCLs are enforceable standards. The margins of safety in MCLs ensure that exceeding the MCL slightly does not pose significant risk to public health.

numbers of residents living within a 200 m diameter, between 200–399 m, and between 400–599 m, for each factory were verified by local policemen. Dose response models for lung cancer and mesothelioma were adopted from epidemiological studies and excess risks were calculated and summarized in Table 5 (Chang *et al*., 1999). The total estimated increased lifetime risk for people living within a diameter of 600 m were about 5 excess deaths of lung cancer. Such a danger could have been effectively prevented, if knowledge of the health effect of asbestos had been communicated to people both inside and outside the factory and proper control procedures taken (ILO, 1984). As the treatment of all occupational and environmental diseases always requires that the pollution source be identified and effectively controlled to prevent further intake of toxic chemicals, it is essential for a company to recognize these potential hazards at the planning and/or beginning stage of a factory. Then, appropriate preventive actions can be taken at each step of the life cycle of the product. Such precautionary procedures should also include a comprehensive hazard communication to the workers and community people (US CFR, 1998), so that they knew how to react properly in the case of an emergency spill. In other words, a responsible company should proactively consider improving both occupational and environmental safety and health throughout the life cycle of a product or

Figure 3. Asbestos waste of a cement factory. An asbestos cement factory carelessly dumped its waste in the backyard without notifying the community. The pollution could spread extensively to the neighbourhood after a typhoon, a subtropical storm encountered frequently in west Pacific area.

service, which actually can be implemented as an integrated portion of ISO 14000 series and BS 8800 (see below).

ISO 14000 and BS 8800—A Systematic Approach for the Whole Company to Conduct Hazard Recognition, Risk Assessment and Pollution Prevention

The International Organization for Standardization (ISO) is an organization affiliated with the United Nations, which provides standards for voluntary compliance. It requires votes from three-quarters of the member states of ISO to formally approve a standard. The ISO 9000 series were approved in 1987, which integrated the concept of life cycle into the quality management system. Similarly, the ISO 14000 series passed in 1996 integrated environmental protection systematically into every step of the life cycle. A typical life cycle of a product or service considers every single step from cradle to grave, which includes marketing and market research, product design and development, process planning and development, purchasing (raw material), production or provision of service (unit operations in each manufacturing process), verification (quality control), packaging and storage, sales and distribution, installation and commissioning, technical assistance and servicing, after sales, disposal recycling at the end of useful life (ISO, 1994). To comply with ISO 14000, a company must create an EMS (environmental management system) inside the company, which is to demonstrate its commitment to continuous improvement in environmental protection and pollution prevention, and to show that it is in com-

Table 5. Estimation of factory-specific excess deaths of lung cancer resulted from 74-year exposure of airborne asbestos among residents in Taiwan by using the asbestos concentration estimated from geometric mean (GM) (Chang *et al*., 1999)

Type of asbestos manufacturing	No. of Factory		Distance from factory		
			<200 m	200–399 m	400–599 m
Cement	21	Lung cancer	0.177	0.714	1.320
		Mesothelioma	0.003	0.011	0.021
Friction	13	Lung cancer	—	—	—
		Mesothelioma	0.002	0.008	0.006
Textile	3	Lung cancer	0.397	1.601	0.835
		Mesothelioma	0.001	0.004	0.002
Ground tile	2	Lung cancer	0.024	0.025	0.319
		Mesothelioma	<0.001	<0.001	0.005
Insulation	1	Lung cancer	0.006	0.014	0.010
		Mesothelioma	<0.001	<0.001	<0.001
Refractory	1	Lung cancer	<0.001	0.001	0.001
		Mesothelioma	<0.001	<0.001	0.002
Total	41	Population	2190	7753	21055
		Lung cancer[a]	0.604	2.355	2.486
		Mesothelioma	0.006	0.024	0.035

[a]People living around asbestos-friction factories were excluded. The authors assumed that friction manufacturing caused no excess lung cancer.

pliance with the environmental statutes and regulations of the countries in which it does business. To accomplish this goal, the EMS is based on the following five general principles: (1) commitment and policy, (2) planning, (3) implementation, (4) measurement and evaluation, and (5) review and further implementation (Murray, 1999). In other words, since the ISO 14000 series stipulate that the top management should make a public policy announcement for environmental protection, the company seeking to be accredited must express its commitment publicly to both workers and the community people. Then, the actual toxic substance control or reduction can be achieved by risk assessment at every step and/or unit operation of the life cycle as proposed in BS (British Standard) 8800 (BSI, 1996), which was later consolidated to OHSAS (occupational health and safety administration system) 18000 and was presumed to be the primary draft for the ISO 18000 series. A typical risk assessment usually takes four steps: hazard recognition, exposure assessment, dose-response relationship and risk characterization (US EPA, 1996). Thus, all types of toxic chemicals involved in the life cycle and their potential adverse health effects will be identified at the beginning of hazard recognition. Then, exposure assessment can be carried out and the result can be used to estimate the probability of risk and the number of expected cases according to the dose-response curve multiplied by the population-at-risk. If the procedure is conducted at the planning stage, one can still try to obtain exposure information from any current existing or similar work environment to get a rough estimate. After risk assessment is performed for different unit operations in the life cycle, cost-effectiveness and priority analysis for alternative options of risk reduction should follow. Proper actions to minimize health risk and waste can be taken after the above careful evaluation, as summarized in Figure 4.

Successful Example of a Dyestuff Factory

A company producing dyestuff proactively consulted our occupational and environmental health team in the National Taiwan University to provide guidance for pollution prevention in 1991. After some research of the production processes and a walk-through survey at the work environment, we found that the plant was still manufacturing benzidine, a carcinogenic aromatic amine. Moreover, they usually cleaned the reaction tank after each batch job of production. In fact, they washed the tank three times per week. To protect workers from direct exposure to the dyestuff, they applied a water jet from outside the tank, which actually increased the production of waste water. Although they once considered building another treatment plant for waste water, they opted for an alternative solution because of the high cost of acquiring the land.

To reduce the occupational risk of developing bladder cancer, we recommended that they should immediately phase out the production of benzidine and other related aromatic amines. In addition, we asked them to plan each production line to reduce the need for a washing tank. For example, we recommended a careful design and assignment for the reaction tank based on the customer's order within the next month so that each tank could be repeatedly used without washing. The goal could be easily achieved by arranging to use the same tank for manufacturing dyestuff of the same type and/or the same colour. We further recommended that they set up monitoring systems for water and energy at each production unit or department.

This advice was well received. The manager even invited every engineer and production worker to participate in a one-day workshop for pollution prevention. Everyone on the production line was encouraged to suggest new ideas to decrease the amount of water

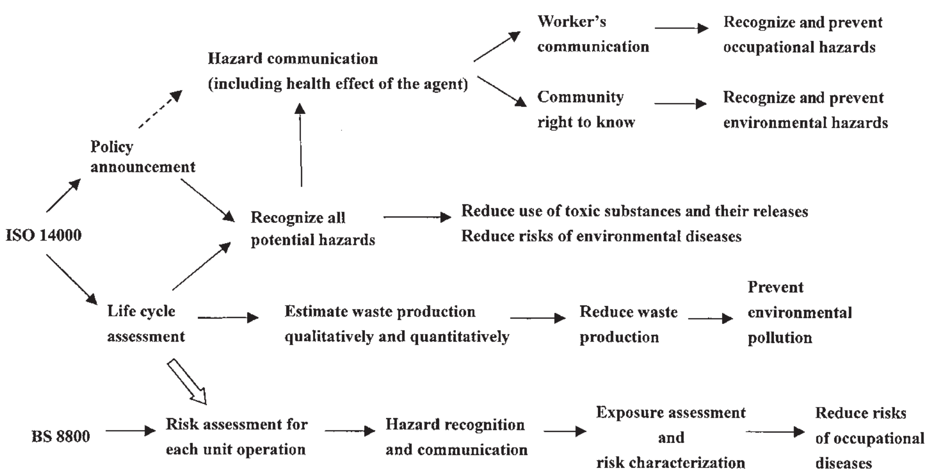

Figure 4. Integrated implementation of ISO 14000 series and BS 8800 regulation will enhance life cycle assessment, recognition of hazards and risk assessment, which will certainly provide empirical information for prevention of occupational and environmental diseases.

and energy consumed, whilst still producing the same amount of dyestuff with an equal or better quality. However, since the problem-oriented advice from any consultant may only provide a piece meal improvement and have a short term effect, we recommended that they should adopt the process standards of ISO 14000 system to continually improve environmental protection in every aspect of the life cycle of the dyestuff. The manager agreed and the whole company had a dramatic change in creating an EMS to implement the environmental policy commitment. To promote the concept and process, the management set up a bonus system for competition among different production lines. The EMS seems to have successfully changed the culture of the whole company to environmental protection. From 1991 to 1998, the amount of waste water and COD (chemical oxygen demand) per ton of product have been consistently reduced as summarized in Table 6. During the past 8 years, there were two major threats to the market of dyestuff production: one was the restriction of aromatic amines imposed by countries of EU (European Union) beginning in 1994. Another was the shrinkage of the Southeast Asian market because of the economic crisis after July 1997. However, the company has continued to thrive and its productivity and profit have increased steadily. In fact, production has increased 5–6 times during this period. Therefore, we believe that the principles of pollution prevention still work in the industry of a developing country, and that they can be implemented effectively by adoption of the concept of pollution prevention and integration of systems proposed by ISO 14000 series and BS 8800.

Limitation of Such Standards

Although ISO 14000 and BS 8800 series may be perfect guidelines for industry to adopt to accomplish their goal of prevention of occupational and environmental health problems, they are only a process standard instead of a performance standard. As they do not set a minimal regulatory standard, these standards can not be a substitute for governmental performance standard, and some critics have expressed concern that the adoption of the ISO 14000 series may undercut efforts to develop and strengthen performance requirements (Stenzel, 2000). Moreover, these standards are completely voluntary and there is no mechanism for incorporating public or non-governmental participation into its activities. The overall performance mainly depends on self-chosen management goals and priorities. Thus, certification to these standards should not exempt a company from governmental enforcement of performance standard. Instead, these standards do provide an excellent supplement to governmental regulations.

Table 6. Trends of the waste reduction of a dye-manufacturing factory in Taiwan after step-by-step improvements of production processes based upon principles of pollution prevention

Year	Product (ton)	Waste water (ton)	Waste water per ton of product	COD per ton of product
1991	1792	80910	45.2	
1992	2230	68976	30.9	
1993	3679	152280	41.4	
1994	5412	162364	30.1	
1995	6606	181880	27.5	0.279
1996	8844	186272	21.1	0.224
1997	11729	173671	14.8	0.125
1998	11880	138012	11.6	0.091
1999	11113	109022	9.8	0.062

Conclusion

Occupational and environmental diseases frequently arise from a general lack of hazard communication in developing countries. Even if the workers and employer know what types of chemical are used in the production process, it is crucial that they are informed about adverse health effects of these compounds in order to take appropriate preventive measures. We have argued that the integrated implementation of ISO 14000 and BS 8800 series can guide a company toward effective prevention of occupational and environmental diseases. After making a public announcement of a company's commitment to environmental protection and occupational health, the company must identify all chemicals involved in the life cycle of a product or service, conduct risk assessment for every step or unit operation, prioritize the options for risk reduction, and choose proper action to minimize both waste and health risk. To be consistent with the ISO 14000 guidelines, a company should purchase raw material or assembly parts from another company which is also accredited with the same standard. Therefore, such movements can be a non-tax barrier for a non-accredited company, but they also imply an opportunity for an accredited company from a developing country. As the global resource is limited and our common future decided by how we manage the earth today, we recommend that all people work together toward implementation of such standards for pollution prevention and public health.

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