A Project Consigned of the Ministry of Environment in 2003

Overseas Environmental Measures of Japanese Companies (China- Beijing /Tianjin area)

Research Report on Trends in
Environmental Considerations related to
Overseas Activities of Japanese Companies
FY 2003

March 2004

Global Environmental Forum

Preface

Japanese companies are engaged in business operations throughout the Asian region and are expected to seriously address environmental issues both at home and abroad. Wherever they operate, Japanese companies' innovative environmental practices and environmentally friendly activities are watched with close interest by the wider community.

Against this backdrop, since fiscal 1996, Japan's Ministry of the Environment has commissioned the Global Environmental Forum to conduct a research program into the environmental awareness of Japanese companies in their overseas activities, and to prepare information and case studies country by country to assist Japanese companies working in Asia with the implementation of environmental practices. Research has already been completed for the Philippines (1996), Indonesia (1997), Thailand (1998), Malaysia (1999), Vietnam (2001), and Singapore (2002). The country-specific guidebooks prepared from the results of this research have been widely distributed to Japanese companies, primarily those already operating in the area, to provide interested parties with pertinent environmental information.

This report, the seventh in the series, presents the findings of a survey carried out in the People's Republic of China in fiscal 2003 on behalf of the Ministry of the Environment. China, a huge country about 26 times the size of Japan, has widely differing social conditions (economic, environmental, and administrative) between regions. In particular, the economic disparities between the hinterland and coastal areas are notable. As it would have been difficult to undertake nationwide surveys and produce a single research report, the research area this year was limited to Beijing and Tianjin. The primary reason for choosing these two areas was the potential for gathering good examples of outstanding environmental initiatives from the large number of Japanese companies with a presence in Beijing, the capital of China, and in neighboring Tianjin, one of the four municipalities directly under the central government. Moreover, Beijing would enable access to information about the environmental policy of the national government, and Tianjin, with its high administrative capability and relatively strict laws and regulations in force, would provide a representative example of local environmental governance. As such, Beijing and Tianjin were selected as sources of useful reference material for the future environmental programs of Japanese companies.

Currently, there are as many as 20,000 Japanese companies working in China. In the future, too, it is anticipated that a large number of Japanese companies will pursue thriving corporate activities throughout the country, and play a major role in stimulating the Chinese economy. We hope that the up-to-date information about China (Beijing and Tianjin) contained in this report will enable Japanese companies already operating in China to implement even better environmental practices, and will serve as a useful resource for other companies contemplating a future move into China. We hope that this report will be of some help for further development of industrial pollution control measures in China.

We wish to acknowledge the Japan Chamber of Commerce and Industry, and the Japanese Chamber of Commerce and Industry in China, for all their support and help including kind introduction to Japanese companies willing to participate in this research. We are grateful to all those who generously gave their time and assistance to our field studies and information gathering, including many Japanese companies in Beijing and Tianjin, the State Environmental Protection Administration, Tianjin Environmental Protection Bureau, and the Sino-Japan Friendship Center for Environmental Protection. We sincerely thank everyone for their cooperation.

Global Environmental Forum

Contents

■ How to Use This Book

This book consists of two chapters and appendices. Chapter 1 describes China's environmental administrative framework. Chapter 2 presents case studies illustrating the practical environmental measures being taken by Japanese companies in China (Beijing and Tianjin areas). The appendices provide material for a deeper understanding of Chapters 1 and 2. Note that the term "Japanese companies" as used in this book refers to member companies of the Japanese Chamber of Commerce and Industry in China, without regard to equity percentage invested from Japan or any other such criteria. It should also be noted that because the Japanese companies participating in field studies for this research were manufacturing companies in the main, this book focuses primarily on environmental practices in the manufacturing sector.

This book is designed so that each chapter and section can be read independently, allowing the reader to select the necessary environmental information according to the company's particular circumstances in implementing environmental practices.

Specifically, this book is organized as follows.

Chapter 1 provides up-to-date information about China's evolving system of environmental laws and regulations. This chapter is divided into the following six sections.

Section 1: Environmental Administration and Legislation in China
Section 2: Air Pollution Management
Section 3: Water Pollution Management
Section 4: Industrial Waste Management
Section 5: Soil Pollution Management
Section 6: Efforts by Local Environmental Administration -- Tianjin Case Study --

Section 1 describes the historical development and distinctive features of environmental policy in China. This is followed by an overview of the laws and regulations related to industrial pollution, the system of environmental legislation, and the administrative framework, all of which is essential knowledge for Japanese companies in their environmental programs. The environmental laws and regulations are discussed in detail, by specific category, in the subsequent sections.

Section 2 to Section 5 describe in detail the legislative framework and control standards in the four areas of air pollution, water pollution, industrial solid waste, and soil contamination.

At the end of the chapter, Section 6 presents the example of Tianjin, and devotes a few pages to outlining the environmental efforts of the local environmental administration and to explaining the regulatory controls specific to Tianjin.

The information in Chapter 1 was compiled mainly from interviews with officials at the State Environmental Protection Administration (SEPA) and the Tianjin Environmental Protection Bureau (TianjinEPB).

In Chapter 2, Section 1 summarizes the features of the environmental measures implemented by Japanese

companies in China. This introduction is followed by 14 case studies of progressive environmental practices being carried out by the companies studied in the field research. The case studies are divided into three sections.

Section 2: Case Studies of Advanced Measures to Reduce Discharge of Pollutants
Section 3: Case Studies of the Relationship of Environmental Management Systems to Improvements in Management
Section 4: Case Studies of Improvements Designed for Other Than Environmental Protection

A wide variety of Japanese companies are conducting business activities in China, and the examples of environmental measures gathered in the course of our research are also wide-ranging. Section 2 looks at the manufacturing sector and gives examples of companies taking innovative initiatives beyond conventional measures for controlling wastewater, waste gas, and solid waste. Section 3 illustrates companies' efforts to utilize ISO 14001 and other environmental management systems to improve their business management practices. Section 4 outlines examples of companies in non-manufacturing sectors, and small and medium-size companies, that are working hard in various ways to incorporate environmental measures as part of their corporate programs.

The appendices at the end of this book contain the following reference materials.

Appendix 1: Environmental Protection Law of the People's Republic of China, effective December 26, 1989 (complete text)
Appendix 2: Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution (complete text)
Appendix 3: Law of the People's Republic of China on the Prevention and Control of Water Pollution, revised 1996 (complete text)
Appendix 4: Implementation of the Law of the People's Republic of China on Water Pollution Prevention and Control (State Council of the People's Republic of China, Law No.284) (complete text)
Appendix 5: Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boiler (Tianjin local standard DB12/151-2003) (complete text)
Appendix 6: Contacts for Environmental Information in China and Japan

In Appendix 1, a translation of the complete text of the Environmental Protection Law is provided for a better understanding of the explanation given in Section 1 of Chapter 1. Appendices 2 and 3 contain the complete translated text of the law for preventing air pollution and the law for preventing water pollution. The complete translated text of the rules for practical implementation of the latter law is given in Appendix 4. Appendix 5 is the complete translated text of the local standard enacted by Tianjin.

The currency conversion rate used in this book is approximately 15 Japanese yen to one Renminbi (RMB; yuan), the exchange rate as of January 2004.

Chapter 1

Overviews of Environmental Issues and Environmental Conservation Measures in China

This chapter is divided into six sections, containing information about China's environmental laws and regulations and other basic information required by Japanese companies when developing appropriate environmental measures for their business operations in China.
Section 1 describes the development of China's environmental policy, provides an overview of the environmental legislative system, and explains China's environmental administrative framework. Sections 2 to 5 deal with environmental controls related to air pollution, water pollution, industrial waste, and soil contamination, as the principle concerns for Japanese companies engaged in business operations in China. The discussion covers environmental laws and regulations, including specific emission standards, essential to each type of environmental control. Section 6 discusses the efforts of the Tianjin Environmental Protection Bureau (TianjinEPB) as an example of China's local environmental protection bureaus, which are the first point of contact for Japanese companies in day-to-day procedural matters relating to environmental regulations.
To augment the discussion in this chapter, the Appendices to this report contain translations of the Environmental Protection Law, on which China's environmental policy is based, and three other laws and regulations pertinent to specific environmental controls -- the Law on the Prevention and Control of Atmospheric Pollution, the Law on the Prevention and Control of Water Pollution, and the Implementation of the Law on Water Pollution Prevention and Control. In addition, a translation of Tianjin's Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boiler is provided as an example of a more stringent standard implemented by a local environmental administration.
It should be noted that as field studies could only be conducted in Beijing and Tianjin, the information contained in this report basically pertains to those two areas only.

Section 1
Environmental Administration and Legislation in China

This section describes the features of China's environmental policy and outlines the environmental legislative and administrative framework. Readers should note that the field studies for this project were limited to Beijing and Tianjin only. Since Beijing is the capital of China, and neighboring Tianjin is one of the four municipalities directly under the central government, these two areas rank alongside the Shanghai region as having the highest level of economic development and administrative capability. The information herein therefore applies only to these two areas; it should not be assumed that the same environmental measures are being implemented nationwide.

1. China's Environmental Policy: Development and Distinctive Features

Environment protection as one of China's state policies

Along with population control, as represented by the one-child policy, China has made environmental protection one of its state policies and shows a determination to take positive action on environmental conservation. Environmental protection became a state policy as a result of a statement to that effect by Li Peng, then Vice-Premier of China, at the Second National Conference on Environmental Protection held in 1983. Since 1979, China has maintained a high rate of economic growth following its adoption of economic reform policies, opening up to the outside world, and transition to a market economy. One of the repercussions of this fast growth is a number of environment problems which cannot be ignored. Specifically, rapid economic growth has caused pollution of increasingly serious concern, including water and air pollution, waste problems, and natural disaster resulting from the destruction of nature caused by excessive logging and other economic activities. It is true that the growing gravity of China's environmental problems could soon hamper its economic growth.

The situation has raised alarm in the Chinese government. While holding environmental protection to be a state policy, China had previously emphasized economic development above all else. In recent years, the government has again started to promote environmental controls as a key policy. As well as strengthening the regulations on pollution, through the establishment of relevant legislation and a more robust administrative framework, the government has also started looking seriously at ways of preventing pollution before it becomes apparent. Such preventive measures include the enactment of the law to promote cleaner production, regulations on chemical substances, and plans to implement recycling laws.

According to figures released in January 2004 by the National Bureau of Statistics of China, the country's gross domestic product (GDP) for 2003 showed continuing strong growth, up 9.1% over the previous year, with per capita GDP topping US$1,000 for the first time. As a result, the Chinese government is trying to strike a balance between economic growth and environmental protection. At the Tenth National People's Congress held in March 2004, Premier Wen Jiabao himself cited "all-round, balanced and sustainable development of the economy and society" as one of the key tasks for fiscal 2004. He mentioned several specific policies, such as: (1) strict control over pollutant emissions by stepping up law enforcement, and speedy resolution of environmental problems that threaten public health and safety; (2) development of a recycling-based economy and promotion of cleaner production; (3) building of a society that conserves resources. While touching on these policies, Premier Wen reiterated and assured both national and international audiences that the government has every intention of taking positive action on environmental issues.

China's admission to the World Trade Organization (WTO) in December 2001 is accelerating the enactment of environmental legislation. This is because WTO membership requires the establishment and transparent operation of a basic legal framework.

Three founding environmental policies; nine environmental management regimes
China's environmental controls are founded on three environmental policies and nine environmental management regimes. In brief, the three environmental policies are:

(1) Prevention should be paramount, integrated with end-of-pipe treatment;
(2) The polluter should be responsible for treating pollution, developers should be required to protect the environment, and those who cause pollution (environmental destruction) should be penalized;

(3) Environmental management should be strengthened.

These three policies spell out the three fundamental principles behind China's environmental policies -- namely, pollution prevention, the "polluter pays" principle, and reinforcement of direct environmental controls through legislation.

The nine environmental management regimes based on these three environmental policies are as follows:

(1) Environmental impact assessment
(2) The "three synchronizations" (三同时), which requires that the design, construction, and operation of pollution treatment facilities be integrated into the overall design of projects;
(3) Pollutant discharge fees (pollution levies) (排污费);
(4) Responsibility for achieving targets;
(5) Quantitative evaluation of the urban environmental infrastructure;
(6) Centralized treatment of pollutants;
(7) Emission registration and licensing;
(8) Regime of pollution control deadlines;
(9) Corporate auditing of environmental protection.

The third of these regimes, the system of pollutant discharge fees, imposes emission charges (environmental penalties) on any organization that discharges pollutants, and is an environmental measure based on economic instruments. This system was already incorporated in the Environmental Protection Law of the People's Republic of China (Trial Version), enacted in 1979. Although the system of pollutant discharge fees was subsequently amended, it is noteworthy that China, then a developing country, adopted economic measures, in a form combined with a direct environmental regulatory scheme, a quarter of a century ago.

Progressive development of an environmental legislative and administrative framework

China's first efforts to develop proper environmental policies at the national level grew out of the First National Conference on Environmental Protection, held in 1973. The impetus for this conference was the attendance of a Chinese delegation at the United Nations Conference on the Human Environment (UNCHE), held the previous year in Stockholm, Sweden, as well as a number of major incidents of water pollution. The conference considered basic policy regarding environmental protection, and acknowledged "a number of regulations relating to protecting and improving the environment," which was subsequently notified as China's first environmental regulations by the State Council the same year. In 1974, China's first environmental administrative body, the Leading Group for Environmental Protection, was initiated under the State Council.

Environmental protection provisions were incorporated in the constitution when China revised it in 1978. Article 11 of the Constitution of the People's Republic of China (1978) states that "the State protects the environment and natural resources and prevents and eliminates pollution and other hazards to the public," a clear signal that initiatives on environmental protection are a responsibility of government. The following year, in 1979, China enacted the Environmental Protection Law of the People's Republic of China (for Trial Implementation), which was followed by a succession of laws, ordinances, and implementation regulations.

The 1982 amended constitution currently in force incorporates a substantial number of additional provisions relating to the environment, and to the protection of natural resources in particular. Among others, these provisions stipulate that "the State protects and improves the living environment and the ecological environment, and prevents and remedies pollution and other public hazards," and "the State organizes and encourages afforestation and the protection of forests," and "the appropriation or damage of natural resources by any organization or individual by whatever means is prohibited." That is, the government's responsibilities in protecting natural resources and cultural assets are laid down in law.

China's environmental administrative framework has also been given greater authority and clout. In 1982, the Leading Group for Environmental Protection became the State Environmental Protection Bureau

(SEPB), under the Ministry of Urban and Rural Construction and Environmental Protection. In 1984, the SEPB was restructured as the State Environmental Protection Commission (SEPC). In 1988, as China progressively established a broad framework that would unify environmental administration nationwide, the SEPC became an agency directly under the State Council.

The Environmental Protection Law, implemented on a trial basis in 1979, was enacted as a full-fledged law in 1989, establishing most of the aforementioned nine environmental management regimes in the statute books. Thus, around the same year as the Environmental Protection Law was enacted, China's framework environmental legislation and administrative organization had been largely completed.

Subsequently, in 1998, the SEPC was elevated to the status of State Environmental Protection Administration (SEPA).

The Environmental Protection Law at the heart of China's environmental legislative system

The foundation of China's system of environmental legislation is the Environmental Protection Law of the People's Republic of China, enacted on a trial basis in 1979 and re-enacted in revised and augmented form in 1989. Under this law, seven other separate laws have been enacted for controlling industrial pollution. These are the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, the Law of the People's Republic of China on the Prevention and Control of Water Pollution, the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste, the Marine Environment Protection Law of the People's Republic of China, the Law of the People's Republic of China on the Environmental Impact Assessment, the Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise, and the Law of the People’s Republic of China on the Promotion of Clean Production. Other independent laws relating to wildlife protection and forestry conservation have also been established under the Environmental Protection Law.

In addition to these individual laws, numerous administrative regulations have been enacted by the State Council to give teeth to the environmental legislation. There are three types of regulations: (1) by-laws drafted to augment the individual laws; (2) ordinances, provisions, and notices covering areas not provided for in the individual laws; and (3) decisions and decrees that give guidelines and principles on specific measures to protect the environment. Among the by-laws concerned with industrial environmental controls are the Implementation of the Law of the People's Republic of China on Atmospheric Pollution Prevention and Control and the Implementation of the Law of the People's Republic of China on Water Pollution Prevention and Control. Environmental ordinances include the Ordinance on Levying for Discharge, and environmental decisions include the Decisions of the State Council on Several Issues Concerning Environmental Protection.

Precedence of local emission standards

As well as the national environmental legislation discussed above, China has a large number of related regulations laid down by local administrative bodies, such as provinces and government-controlled municipalities (similar to cities specially designated by the government ordinance in Japan). Local environmental regulations are said to number more than 1,000. There are several different types of regulations, including those equivalent to a basic environmental law that applies to specific provinces and government-controlled municipalities, corresponding to the Environmental Protection Law at the national level. Local regulations also include ordinances and rules for handling specific environmental problems and environmental practices in a manner distinctive to that locality. Tianjin (one of China's four municipalities directly under the central government), where field studies for this report were conducted, has a large number of environmental regulations in place. They include the basic environmental law, the Tianjin Environmental Protection Ordinance, together with the Tianjin Air Pollution Prevention Ordinance and the Tianjin Management Measures for the Environmental Protection of Building Projects.

In China, the emission standards governing discharge of factory pollutants, which most affect the environmental practices of Japanese companies, are prescribed separately, not under the provisions of the Law on the Prevention and Control of Atmospheric Pollution or the Law on the Prevention and Control of Water Pollution. Under Article 9 of the Environmental Protection Law, the State Environmental Protection Administration (SEPA) may determine emission standards at the national level, and the governments of provinces, autonomous regions, and government-controlled municipalities may determine emission standards at the local level. Under Article 10, local governments may establish their own standards for items not specified in the national standards, and may set pollutant emission standards which exceed the national standards. The Environmental Protection Law therefore provides for extension of the range of application and greater stringency in emission standards at the local level. Consequently, both national and local emission standards may sometimes coexist. Moreover, where emission standards are prescribed at both national and local levels, the local standard takes precedence.

Among the national emission standards currently in place that have a significant bearing on industrial environmental practices are the Integrated Emission Standard of Air Pollutants and the Integrated Wastewater Discharge Standard, which indicate the allowable emission levels for each type of pollutant. Tianjin, where field research was conducted, has implemented emission standards for boiler flue gases and odors that are more stringent than the national standards.

Vital role played by long-term environmental protection plans

While China has sought to establish an environmental legislative system and administrative framework, it has also set explicit goals relating to environmental protection in each of its Five-Year Plans for National Economic and Social Development since the Sixth Five-Year Plan announced in 1982. Based on these stated goals, over recent years China has prepared several long-term plans related to environmental issues. In 1993, China's Environmental Action Plan (1991-2000) was announced. In 1996, the Ninth Five-Year Plan for National Environmental Protection and the Long-Term Targets for the Year 2010 were issued. The Tenth Five-Year Plan for National Environmental Protection was announced in 2001. These plans play an important role in directing government strategy for environmental protection over a set length of time. They state the objectives and basic thrust of the environmental policies to be implemented during the period, and the areas that will be a particular focus of environmental efforts.

In the Ninth Five-Year Plan for National Environmental Protection issued in 1996, the stated objectives are to establish environmental management and legislative systems, and to curb pollution and worsening ecological destruction. Among the specific initiatives covered in the plan are the prevention and improvement of industrial pollution (emphasizing air and water pollution measures, but also directing efforts toward the control of solid wastes, noise, and radioactive contamination), environmental protection measures for specific regions (key watershed areas), and building and strengthening environment management capacity through environmental structures established at the county level.

The State Council Decision on Problems Regarding Environmental Protection, issued in August 1996, about the same time as the Ninth Five-Year Plan, sets forth 10 mechanisms for achieving the plan's environmental objectives. These mechanisms include: (1) Clearly defined improvement targets and implementation of a system of environmental administrative responsibilities; (2) Clearly defined key issues and drastic solutions to regional environmental problems (three rivers, three lakes, two air pollution control zones, and one municipality are designated as key environmental control areas); and (3) strict inspection and firm pollution control by strengthening the "three synchronizations"(三同时) system.

China subsequently began a number of environmental initiatives based on the Ninth Five-Year Plan. For example, a variety of measures targeted to the end of 2000 were implemented under the banner of “one control and double attainments”(一控双达标). The "one control"(一控) in this slogan means that the total emission loads of major pollutants in all regions nationwide should be kept within State-specified levels (1995 standards). The "double attainments"(双达标) requires that pollutant emissions from all industrial sources nationwide should meet both national and local standards by the target date. In addition, by the end of 2000, general air and water quality in centrally-governed municipalities, provincial capital

cities, cities within special economic zones, open coastal cities, and major tourist cities should meet the relevant national standards applicable to the particular city.

The Tenth Five-Year Plan for National Economic and Social Development and Tenth Five-Year Plan for National Environmental Protection, announced in 2001 and currently in force, is aimed at significant improvement of the quality of the environment in cities, rural towns, and particularly in large and medium-sized cities by 2005. It contains specific initiatives, including target values, such as: (1) Reducing the total emission pollutant load (air pollution, water contaminants, and solid waste) by 10% from 2002 levels; (2) Building sewage treatment facilities in all cities and treating 45% of urban sewage water by 2005; (3) Implementing an air pollution control project in the "two control zones" (acid rain control zone and sulfur dioxide (SO_2) control zone), and reducing the total SO_2 emission load in these two control zones by 20% from 2000 levels by 2005; and (4) Establishing regulations on sources of industrial pollution, and powers to shut down any enterprise responsible for severe pollution that damages public health.

Keywords for understanding the distinctive features of China's environmental policy

In order to understand China's environmental policies and regulations, readers need to know several keywords, including the names of China's special environmental management systems and distinctive slogans or jargon.

(1) Keywords related to environmental management regimes

- Three synchronizations (三同时)
  A concept applied to factory construction, expansion, and renovation projects, requiring facilities for preventing anticipated environmental pollution to be designed, constructed, and put into operation at the same time as each stage of the planning, construction, and operation of the main construction project.

- Pollutant discharge fees (pollution levies) (排污费)
  Basically, a regime that imposes emission charges on any enterprise or organization that discharges pollutants (effluents, waste gas, or solid wastes), embodying the "polluter pays" principle. This regime originally applied to pollutants in excess of the emission standards. It was revised in July 2003, however, due to criticisms that the fees paid were less than the cost of implementing the policy. The amended regime now penalizes any emission of air pollutants or water contaminants even if the level does not exceed the standards.

- Responsibility for achieving targets
  A system that sets forth the practical environmental targets to be attained by the heads of provincial, municipal, and county governments during their term of office. The signing of a written statement of responsibility for achieving those targets is required.

- Quantitative evaluation of the urban environmental infrastructure
  A set of indicators for quantitatively evaluating the environmental performance and infrastructure of major cities according to a points system.

- Centralized treatment of pollutants
  A system aimed at efficient, centralized treatment of pollutants through centralized urban sewage treatment, and the construction and operation of effluent treatment facilities by cooperation between related industries.

- Emission registration and licensing
  The emission registration system requires organizations emitting pollutants to register with the environmental administrative authority in the area, and give details about their facility, the types of emissions, volumes and concentrations, and other such data. This basic data serves as the basis for levying pollutant discharge fees and is useful in assessing the organization's environmental

circumstances. Under the emission licensing system, a license is granted if the organization emitting pollutants adheres strictly to the emission standards and if the total emission load is appropriate, given the environmental capacity of the region. The system thus serves as a basis for implementing quantitative management and total emission control of pollutants.

- Pollution control deadlines
  A regime that requires any enterprise that exceeds the emission standards to improve its performance within a set period of time. Steps are taken if the enterprise is unable to comply. For example, the enterprise may be fined, its operations suspended, or its factory shut down.

(2) Other terminology

- Three wastes
  Waste gas, wastewater, and solid wastes.

- 33211
  Represents three rivers (Huaihe, Haihe, and Liaohe), three lakes (Taihu, Chaohu, and Dianchi Lake), two air pollution control zones (SO_2 control zone and acid rain control zone), one city (Beijing), and one marine area (Bohai Sea). These are priority regions where the Chinese government is focusing its environmental efforts.

- Two-control zones
  SO_2 control zone and acid rain control zone.

- Zero-hour (0 a.m.) campaign
  The enforcement of emission regulations on factories in key regions according to stipulated time limits (by 0 a.m. on a specified date).

2. Legislation Related to China's Industrial Environmental Measures

Four anti-pollution laws of particular relevance

China's environmental legislative system is based on the 1982 revised constitution as the highest level of authority. Under the constitution is the founding law on environmental policy, the Environmental Protection Law (1989). Under this law there are separate laws aimed at preventing specific categories of pollution, such as air and water pollution, and other laws for protecting natural resources, such as the Law on the Protection of Wildlife. Implementation by-laws have been enacted in response to these individual environmental laws, and a body of administrative regulations comprising ordinances, provisions, and directives have been issued in regard to areas not covered in the statutes. The State Council and State Environmental Protection Administration (SEPA) have also issued a large number of decisions, rules, and circulars to publicize guidelines and principles relating to specific issues. In addition, China has set emission standards and enacted a number of national laws in response to specific international environmental treaties, such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Besides these environmental statutes at the national level, more than 1,000 local environmental regulations applicable only to a specific region are in force nationwide. These huge number of environmental regulations form a pyramid of legislation with the constitution at the top.

Among the laws with particular relevance to industrial environmental measures are the Environmental Protection Law, the four pollution control laws (the Law on the Prevention and Control of Atmospheric Pollution, the Law on the Prevention and Control of Water Pollution, the Law on the Prevention and Control of Environmental Pollution by Solid Waste, and the Law on Prevention and Control of Pollution from Environmental Noise), related by-laws and ordinances, and general air and water emission standards. The same category of local environmental regulations enacted by the people's governments of the various provinces should also be noted. Outside the area of industrial pollution, China has recently started to beef

up controls on chemical substances and soil contamination. The Regulations on the Environmental Administration of New Chemical Substances (effective October 2003), the Management Methods for the Prevention and Control of Pollution from Production of Electronic Information Products (due to come into effect in 2005), and the Environmental Quality Risk Assessment Criteria for Soil at Manufacturing Facilities issued by SEPA in 1999 may also have a bearing on the industrial environmental practices of Japanese companies.

Although not directly regulating pollutants, the Law on Environmental Impact Assessment (enacted in October 2002 and in force since September 2003), and the Law on the Promotion of Cleaner Production (enacted in June 2002 and in force since January 2003) are also very relevant to industrial environmental practices. China's implementation of the latter law will be watched with interest. As well as encouraging companies to take action on matters such as conserving resources and using them effectively, the Law on the Promotion of Cleaner Production requires companies to disclose environmental information and to undergo official certification of their cleaner production standards. In 2004, China is expected to enact a Household Appliance Recycling Law (provisional title) to promote the reuse of used electrical products. In parallel with overhauling legislation focused on traditional anti-pollution measures that target the "three wastes," China is also starting to construct a new legal framework aimed at building a recycling-based society, as in developed countries.

The Environmental Protection Law: Aimed at balancing environmental and economic interests

The present Environmental Protection Law of the People's Republic of China forms the basis of China's environmental policy and results from a complete revision in December 1989 of the old Environmental Protection Law (EPL) enacted and enforced on a trial basis in 1974. An English translation of the newer EPL is contained in Appendix 1. The law consists of six chapters. Its purpose, as stated in Article 1, is "protecting and improving people's environment and the ecological environment, preventing and controlling pollution and other public hazards, safeguarding human health and facilitating the development of socialist modernization." In Article 4, the policies under the EPL are required to be "favourable for environmental protection with economic construction and social development."

The EPL also mentions the division of functions between the competent environmental administrative department under the State Council (which actually refers to the State Environmental Protection Administration) and local environmental authorities. For example, the EPL states that "the competent department of environmental protection administration under the State Council shall, in accordance with the national standards for environment quality and the country's economic and technological conditions, establish the national standards for the discharge of pollutants." This statement thus establishes legal grounds that enable local governments to determine more stringent criteria, or an extended range of application, than provided by the national emission standards.

The EPL includes pertinent descriptions about China's basic environment management regimes, such as the environmental impact assessment system, "three synchronizations," emission registration and licensing and pollution control deadlines, and sets forth the grounds for implementing these environmental management regimes. Enterprises wishing to build or renovate a factory are required to deploy production technology that produces minimal pollutants and uses resources with a high level of efficiency. In addition, the EPL recognizes the right of all organizations and individuals to report on or file charges against those who cause pollution.

Nevertheless, the Environmental Protection Law consists of just 47 provisions in total, and goes no further than indicating general principles. Specific environmental regulations are executed in accordance with the various pollution prevention laws, administrative provisions, and emission standards established individually under this basic law.

Regulations related to the "three wastes" central to China's environmental controls

China's environmental controls are grounded in anti-pollution measures based on the "three wastes"

(waste gas, effluents, and solid wastes). Statutes related to these concepts include the Law on the Prevention and Control of Atmospheric Pollution, the Law on the Prevention and Control of Water Pollution, the Law on the Prevention and Control of Environmental Pollution by Solid Waste. The first two of these laws are further amplified by another two regulations, the Implementation of the Law on Atmospheric Pollution Prevention and Control and the Implementation of the Law on Water Pollution Prevention and Control. Emission standards based on these laws stipulate the actual limits on factory emissions and are separately enacted. These are the Integrated Emission Standard of Air Pollutants, Emission Standard of Air Pollutants for Coal-Burning Oil-Burning Gas-Fired Boilers, and the Integrated Wastewater Discharge Standard, all of which have particular relevance for Japanese companies.

Apart from these statutes at the national level, environmental regulations have been enacted in many regions in the form of ordinances, directives, and decrees pertaining to air pollution, water contamination, and solid wastes. As already mentioned, local environmental regulations take precedence where relevant regulations exist in the locality in which a factory is sited. It is therefore required to carefully gather information about pollutant emission standards specific to a region, since they are often more stringent or have greater scope than the national standards.

(1) Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution

The Law on the Prevention and Control of Atmospheric Pollution was enacted in 1987 and amended twice, in 1995 and 2000. The 2000 revision was determined by the Standing Committee of the Ninth National People's Congress in April of that year, and the revised law came into effect in September 2000. An English translation of this law is contained in Appendix 2. The law includes basic provisions about the requirements and procedures for conducting an environmental impact assessment when constructing or extending a factory or other facility that emits air pollution, the implementation of pollutant discharge fees (pollution levies) and a system of total emission control for air pollutants, the right of environmental administrative authorities to make on-site inspections, measures for preventing air pollution caused by coal burning, measures for preventing waste gas, dust and odors, and the penalties imposed on polluters. Incorporated in the 2000 revision are a number of robust provisions relating to, in particular, air pollution from coal burning, and the designation of key cities for the control of air pollution (centrally-governed municipalities, provincial capitals, and open coastal cities).

Section 2 in this chapter provides more detailed information, including specified emission limits, regarding the two emission standards (Integrated Emission Standard of Air Pollutants and Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boilers) that have direct relevance to the air pollution prevention measures implemented by Japanese companies.

(2) Law of the People's Republic of China on the Prevention and Control of Water Pollution

The Law on the Prevention and Control of Water Pollution is aimed at preventing water contamination, another major form of environmental pollution in China. It came into effect following its adoption by the Standing Committee of the Sixth National People's Congress in 1984, and was revised in 1996. An English translation of the revised law is contained in Appendix 3. The law applies to surface waters (rivers, lakes, canals, irrigation channels, reservoirs, etc.) and groundwater. Marine pollution is regulated separately, under the Marine Environment Protection Law of the People's Republic of China (enacted 1982, revised 1999). The Law on the Prevention and Control of Water Pollution incorporates a wide range of provisions regarding the prevention of water pollution, including the establishment of environment water quality standards and water contaminant discharge standards governing appropriate levels in the water environment, the implementation of environmental impact assessments at construction projects, promotion of centralized urban sewage treatment, measures to protect domestic and drinking water resources, prevention of surface and groundwater pollution, and penal provisions.

Provisions relating to corporate activities include the implementation of environmental management regimes such as the "three synchronizations" system for preventing water pollution, pollutant discharge

fees (pollution levies), and emission registration. In regard to pollutant discharge fees, the law states that "enterprises and institutions that discharge pollutants into a water body shall pay a pollutant discharge fee in accordance with State regulations; if the discharge exceeds the limits set by the national or local standards, they shall pay a fee for excess discharge according to State regulations" (Article 15). That is, the polluter is required to pay fees even if the emission standards are not exceeded. The law also states that environmental administrative authorities are empowered to conduct on-site inspections. Other features of this law include the requirement that the opinions of the people living in the vicinity of a construction project should be included in the environmental impact report, the recognition of the right of any party affected by water pollution to claim damages, and the effective utilization of water resources.

Section 3 in this chapter provides more detailed information, including specified emission limits, regarding the Integrated Wastewater Discharge Standard, which has direct relevance to the air pollution prevention measures implemented by Japanese companies. An English translation of the Implementation of the Law of the People's Republic of China on Water Pollution Prevention and Control is contained in Appendix 4.

(3) Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste

China is pursuing measures on waste management under the Law on the Prevention and Control of Environmental Pollution by Solid Waste, which was enacted in 1995 and came into effect in 1996. Aimed at preventing pollution caused by waste, the law sets forth provisions relating to solid waste management infrastructure, and solid waste collection, storage, transportation, and treatment. As China has made the promotion of waste reduction and "comprehensive reuse" (recycling) of resources one of its key policies, a number of provisions to this end are incorporated in the law, including the three principles of solid waste treatment (waste reduction, decontamination, and recycling), and responsibilities and obligations regarding recycling and management of solid waste.

Under this law, solid wastes are classified into three types: (1) solid and semi-solid wastes generated by industrial activity (industrial waste); (2) waste generated in daily life and consumer activities (domestic waste); and (3) dangerous waste included in industrial and domestic wastes (hazardous waste). Of these three types, the hazardous wastes that are relevant to the environmental measures of Japanese companies can be found in the National Catalogue of Hazardous Wastes. Substances that are highly toxic or carry a high environmental risk, and wastes that are difficult to treat or dispose of by ordinary means, such as PCBs, medical waste, and fly ash emitted from waste incinerators, are listed as scheduled hazardous wastes.

The provisions of the law also make enterprises responsible for treating any industrial solid waste that they generate. However, as China is said to have, at present, only one facility (in Tianjin) that is capable of comprehensively treating and disposing of hazardous waste, it may be some time before all industrial solid waste can be treated in accordance with the legislation.

The Law on the Prevention and Control of Environmental Pollution by Solid Waste is currently in the process of revision. The revised law is expected to come into force in 2004.

(4) Other statutes relating to industrial waste management

Among other laws relating to pollution prevention and of direct relevance to Japanese companies' environmental practices is the Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise, enacted in 1996 and effective since 1997. This law regulates all environmental noise generally, but includes a chapter specifically about the prevention of industrial noise.

Under this law, where noise is generated from stationary equipment, the factory must report details about that noise source, and about the noise levels during normal work conditions, to the competent local environmental administration. Factories must also meet the Industrial Enterprise Boundary Noise Standard, which came into effect in 1990. Under this standard, the specified noise limits for a factory

located in an industrial zone, for example, are 60 dB(A) Leq (equivalent continuous sound level) for the daytime period (6 a.m. to 10 p.m.) and 55 dB(A) Leq for the night period outside these hours. Fines are imposed on violators, who are required to pay pollutant discharge fees in accordance with the degree of violation, based on the Ordinance on Levying for Discharge discussed below.

The Ordinance on Levying for Discharge puts into practice one of China's distinctive environmental controls, the system of pollutant discharge fees (pollution levies). The ordinance is a revision of the Interim Measures on the Collection of Pollution Discharge Fee, enacted in 1982, and came into effect in July 2003. The Measures for the Administration of the Charging Rates for Pollutant Discharge Fees, an order that states how actual charges are to be calculated, came into effect at the same time as the 2003 ordinance. Under these regulations, pollutant discharge fees are levied for four types of waste (wastewater, waste gas, solid waste and hazardous waste, and noise). Of these four types, discharge fees are levied for entire discharge volumes of wastewater and waste gas, according to the pollutant type and volume, and an excessive discharge fee is additionally levied for wastewater discharge that exceeds the emission standards. Further, pollutant discharge fees are levied if waste or noise violates any statutes in force. In regard to waste, in particular, payment of fees is obligatory for waste that fails to meet related standards, whether or not storage and disposal facilities are available.

The Law of the People's Republic of China on the Environmental Impact Assessment was enacted in 2002 and came into effect in 2003. China had formerly conducted environmental impact assessments (EIAs), of new factories and other construction projects, on the basis of the provisions in the Environmental Protection Law. The Law on Environmental Impact Assessment put China's EIA system on a sound legal footing and clarified its scope of application. The law provides for three stages of assessment, according to the extent to which a construction project affects the environment, and sets forth requirements for drafting EIA documents. An environmental impact statement must be prepared if the project potentially has a major environmental impact, or an environmental impact report form if the environmental impact is likely to be slight. Where the environmental impact is expected to be very minor, instead of carrying out an EIA, the company is required to fill in an environmental impact registration form. In addition, the law prescribes the particulars that must be noted in environmental impact statements, and the procedures to be followed by the competent authorities in examining EIA documents.

Since an environmental impact assessment is basically required for all construction projects that affect the environment, including new construction, renovation, and expansion of existing facilities, the same requirement naturally applies to the construction of factories or additional facilities by Japanese companies. However, the assessment procedure is simplified considerably if the project being undertaken is located in an industrial park (generally known as an "economic development zone") where environmental impact assessments have already been conducted.

The Law on Environmental Impact Assessment also requires a classification and management list relating to the environmental impact assessment of construction projects to be drawn up separately by the State Environmental Protection Administration (SEPA). However, partly because this research was conducted just a few short months after the law came into force, it was not possible to obtain the list.

(5) Drafting environmental statutes from a new standpoint

A number of laws will become fully operative in the years ahead, including the aforementioned Law on the Promotion of Cleaner Production (effective January 2003) and the Regulations on the Environmental Administration of New Chemical Substances (effective October 2003), which is the counterpart of Japan's Chemical Substances Control Law (otherwise known as the Law concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances). Meanwhile, new types of environmental statutes are due to come into effect in the near future, including the Management Methods for the Prevention and Control of Pollution from Production of Electronic Information Products, promulgated in response to the EU directive banning the use of certain hazardous substances in electronic and electrical equipment, and the Household Appliance Recycling Law (provisional title). In the future, an environmental legislative system built from a new standpoint, and based on the same concept of creating

a "recycling-based society" as in Japan, is expected to be established in China at a rapid pace. Japanese companies, too, will be required to take new initiatives that go beyond mere compliance with end-of-pipe pollution controls.

Promoting policies that encourage companies to gain ISO 14001 certification

In tandem with environmental measures based on the various environmental laws and regulations discussed above, China is also moving forward with policies that will act as incentives for companies to voluntarily build environmental management structures. A typical example is the introduction of an environmental management system that draws on the ISO 14001 series of international environmental management standards. The aim is to give greater clout to industrial environmental controls generally, by encouraging enterprises to adopt a positive stance on addressing environmental issues. The demand for management methods based on international standards, driven by a developing market economy, also appears to have had an indirect bearing on China's present approach.

As of December 2003, the number of companies in China with ISO 14001 certification had reached 5,064, the second highest number in the world after Japan, which has 13,000 ISO 14001-certified companies. Given that China ranked just tenth in the world, with roughly 1,000 certified companies, two years ago at the end of 2001, it becomes apparent how quickly the number is rising. The Chinese government has put tax incentives in place to encourage further companies to achieve certification.

ISO 14001 certification was first achieved in China in 1997 by four companies, including a Japanese electrical products manufacturer. In 1998, China introduced a national approval scheme for ISO 14001 certification and initiated a system of examination of certification entities by a national accreditation body and national registration of auditors. At present, the China National Accreditation Board for Certifiers (CNAB), established under the Certification and Accreditation Administration of the People's Republic of China (CNCA), is an accreditation body corresponding to the Japan Accreditation Board for Conformity Assessment (JAB) in Japan. Under the CNAB there are 118 certification entities, counting those for ISO 9000 certification. Most of these were established with some sort of backing from governmental agencies. They are said to include seven or eight foreign certification agencies operating in a joint venture form.

During our field study, we had the opportunity to visit the Environmental Certification Center of the State Environmental Protection Administration (SEPA). The center is a certification body that was established in 2003 by incorporating four certification agencies already in existence under the supervision of SEPA. It is one of the largest certification bodies in China. Although "SEPA" appears in its name, the center is run as a financially independent private company. It has a staff of about 60, of whom 40 are qualified ISO 14001 auditors. In addition, there are about 300 people nationwide who serve as auditors in conjunction with other work, such as researchers in research organizations.

Over the past year, the Environmental Certification Center processed approximately 200 applications for ISO 14001 certification. These were primarily fast-growing, small and medium-size Chinese companies, with Japanese companies accounting for around 10%. The standard screening fee for acquiring ISO 14001 certification at the center is RMB30,000 (approximately JPY 450,000), which is roughly one seventh of the fees required in Japan.

Many Japanese companies in China are working hard to obtain ISO 14001 certification. Of the 12 Japanese companies visited in this survey, five have already qualified. All these companies decided that implementing a properly constructed in-house environmental management system would be helpful as a preventive measure to avoid contravening emission standards and so on, and would be advantageous from a business point of view.

3. China's Environmental Administration

China's administrative structure is organized into five levels: the national (central) level, provincial level (provinces, autonomous regions, and municipalities directly under the central government), city level,

county level, and town and village level. The structure of environmental administration follows the same five-level hierarchy. At the national level is the State Environmental Protection Administration (SEPA), which is directly under the State Council. The local administrative structure consists of Environmental Protection Bureaus (EPBs) set up at the provincial, city, and county levels.

State Environmental Protection Administration at the center of China's environmental administrative framework

China's first national environmental administration, the Leading Group for Environmental Protection, was established under the State Council in 1974. It later evolved into the State Environmental Protection Bureau under the Ministry of Urban and Rural Construction and Environmental Protection (established in 1982), and then into the State Environmental Protection Commission (established in 1984). The present national environmental administration, the State Environmental Protection Administration (SEPA), was launched in 1988.

SEPA consists of 10 departments, including the Department of Policies, Laws and Regulations, Department of Pollution Control, and Department of Environmental Impact Assessment. As well as responsibilities related to environmental protection in general, SEPA is charged with managing nuclear safety. It has 210 employees.

SEPA has a wide scope of responsibility, as prescribed by the Environmental Protection Law. Major responsibilities include: (1) Supervising and managing environmental protection activities throughout the country; (2) Establishing national standards for environmental quality and for pollutant emissions; (3) Building and managing environmental monitoring systems; (4) Preparing environmental news bulletins; (5) Drafting and implementing plans for environmental protection; (6) Approving environmental impact reports; (7) Inspecting facilities that discharge pollutants; (8) Making inspections in regard to the "three synchronizations" system and approving pollution treatment facilities; (9) Collecting and registering pollution discharge data; (9) Levying pollutant discharge fees; (11) Enforcing penalties on polluters and applying to the People's Court for compulsory enforcement.

For Japanese companies, the first point of contact in regard to environmental measures is normally the local Environmental Protection Bureau (EPB), described in the following paragraph. In some cases, however, SEPA is directly responsible for approval of new large-scale projects, such as cement plants and steel plants, involving certain types of industrial pollution.

While SEPA and the EPBs have a vertical relationship, SEPA has no authority over the personnel or financing of EPBs at the provincial level. The relationship is more akin to a loose, cooperative association, with SEPA providing operational guidance only.

Environmental Protection Bureaus handling routine procedural matters

In principle, Environmental Protection Bureaus (EPBs) are set up within local administrations at the provincial level, city level, and county level. In the course of this research, however, it was not possible to verify whether an EPB is in place in every local administration from the county level upward. At least in Tianjin, where we were able to conduct field studies, we found that all 21 city districts and counties had an EPB.

EPBs are charged with a wide range of responsibilities. Except for establishing environmental quality and pollutant emission standards, and for building environmental monitoring systems, EPB’s functions are similar to those of the State Environmental Protection Administration (SEPA). For Japanese companies, the local EPB is a familiar entity with which close contact is required in the course of assessing the environmental impact of factory construction projects, and for various procedural matters such as day-to-day environmental monitoring, payment of pollutant discharge fees, and so on.

As mentioned above, local administrations in China can set emission standards that are more stringent than the national standards, or that regulate pollutant parameters not covered in the national standards. EPBs have no authority to formulate emission standards, which is granted only to local governments at the provincial level and above.

4. China's Environment Policy: Challenges for Future Development

Over the past quarter of a century, China has achieved enormous economic growth through an economic development policy that emphasizes industrialization. On the other hand, the rapid increase in air and water pollution, and in the volumes of waste generated particularly in urban areas, is causing serious damage to the environment. Any further worsening of China's environmental problems could become constraining factors on sustained economic growth. In 1979, dubbed as China's "first year of high economic growth," the Chinese government enacted the Environmental Protection Law of the People's Republic of China (for Trial Implementation) and embarked on building the environmental regulatory system and administrative framework described earlier in this section. In fact, however, these environmental policies, and the measures based on them, failed to stop China's environmental problems from growing worse.

With the Beijing Olympics opening in 2008, and the World Expo 2010 to be held in Shanghai, China's high economic growth is expected to continue over the coming years. However, regional disparities such as the various differences between urban and rural areas, and the economic gap that exits between the coastal region, which has achieved relatively high economic development, and the hinterland, which failed to catch the wave of development, are becoming problems of increasing proportions that will likely impact on the future development of environmental policy in China.

Since the various environmental regulations that apply to Japanese companies are handled in principle by Environmental Protection Bureaus (EPBs), the emerging regional disparities will necessarily produce differences in capacity between the various EPBs. Very effective environmental regulations are being implemented by local governments in the economically developed coastal regions. Having a certain amount of financial discretion and administrative clout at their disposal, they can develop specific measures of their own, such as adopting emission standards that are more stringent than required by the national environmental policy. In the economically backward hinterland, however, insufficient funding and a lack of professional staff hamper local governments from implementing State-issued environmental statutes, and factory pollution regulations are far from being carried out in any adequate way.

Staff at SEPA, which we visited in the course of this research, acknowledge these problems and said that although the anti-pollution regulations apply everywhere in China, it is true that regional discrepancies exist in practice in environmental management. The main reason, they said, is lack of expert staff.

To date, Japanese companies have established production bases predominantly in coastal areas, particularly around Shanghai, and in areas such as the Yangtze River Delta area, Guangdong, Jiangsu, Liaoning, and Tianjin. More recently, however, a growing number of Japanese companies are choosing to locate in the hinterland to take advantage of the ample labor supply. If this trend continues, the disparities in capabilities among EPBs will have a major impact on the environmental practices of Japanese companies. They will need to take a high level of voluntary action on environmental matters to make up for the inadequate administrative capability.

Although the various challenges that China faces rule out any immediate change, it is to be hoped that a transparent administrative framework will be put in place as soon as possible, enabling the environmental policies and discharge controls determined by the central government to be applied uniformly across the whole country, and that environmental controls without regional disparities will soon be implemented.

Section 2
Air Pollution Management

1. China's Air Pollution Regulations

Air pollution control focused on sulfur dioxide

Air pollution caused by sulfur dioxide (SO_2), nitrogen oxides (NOx), particulate matter (where particulate matter less than 10 microns in size is measured as total suspended particulate matter (TSP)), and other pollutants is becoming a serious problem throughout China. The environmental regulations give high priority to controlling waste gas. Regulations are currently in force for total emission control of three types of air pollutants -- sulfur dioxide, industrial particulate dust, and sooty smoke. To strengthen controls on pollution caused by sulfur dioxide, areas specially designated as "SO_2 control zones" and "acid rain control zones," where controlling sulfur dioxide is given particular emphasis, were set up in 1998. The combined area of these two control zones is roughly 1.1 million km^2, amounting to just 11% of China's total territory, but they are estimated to account for more than 60% of sulfur dioxide emissions nationwide.

Sulfur dioxide and dust are caused primarily by burning coal, which has a high sulfur content and is widely used as fuel in China. Consequently, the Chinese government is pressing forward with air pollution controls and has introduced various measures as part of its emission control program. These measures include prohibiting the use of high-sulfur coal, banning the construction of coal-fired power plants in urban areas, and requiring thermal power plants to install desulfurization equipment. However, air pollution from the rapidly increasing numbers of motor vehicles and other mobile sources is becoming serious, and the pollution problem is not getting any better. According to recently published measurements for 2003, acid rain was recorded in more than half of the cities in China.

China's air pollution controls are based fundamentally on the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, revised in September 2000. Among the provisions of this law are requirements for environmental impact assessment when constructing a new factory that is likely to produce air pollution, an environmental management regime for collecting pollutant discharge fees (pollution levies), and controls governing the total emission load of specific air pollutants. In addition, the law provides for national air pollution emission standards to be set by the State Environmental Protection Administration (SEPA), and for region-specific air pollution emission standards to be set by local people's governments at the provincial level and above. The law incorporates provisions not only about controlling air pollution from stationary sources, but also about curbing air pollution from mobile sources such as automobiles and ships, and about preventing offensive odors.

China's legislative system prescribes only principles in law, while emission standards and other specific environmental controls are given in by-laws and a large number of ordinances, directives, decrees, and other regulations. Similarly, the Law on the Prevention and Control of Atmospheric Pollution lays down basic principles only regarding air pollution control, while particulars about implementing the controls are given in related regulations. Numerous ordinances and decrees are prescribed at the local level, too.

Two pieces of legislation directly affect the day-to-day air pollution measures of Japanese companies. These are the Integrated Emission Standard of Air Pollutants and the Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boilers. These standards define emission standards for air pollutants from factories, and are laid down by SEPA, based on the Law on the Prevention and Control of Atmospheric Pollution. Details about these standards are described below, but it should be remembered that these are emission standards at the national level. Note also that, as mentioned above, emission standards that are more stringent than the national standards may be drafted by the local government of a particular region and, if so, the local standards apply.

2. Specific Waste Gas Controls Applicable to Factories

China's emission standards relating to air pollutants can be divided into two categories: those for a particular industry or particular type of pollution, and general standards specified in the Integrated Emission Standard of Air Pollutants. The former are prescribed for five types of stationary sources

(boilers, thermal power plants, industrial kilns and furnaces, coke ovens, and cement plants), two types of mobile sources (motor vehicles and motorcycles), and eight types of facilities that discharge malodorous substances. All other air pollutant emission sources, including factories in general, are subject to the emission standards in the Integrated Emission Standard of Air Pollutants. Since Japanese companies are mainly manufacturing industries, the emission standards of greatest relevance to their day-to-day business activities are the integrated standards and the emission standard for boilers. The following explanation is therefore limited to these two standards only.

(1) Integrated Emission Standard of Air Pollutants

China's Integrated Emission Standard of Air Pollutants was enacted in 1996 and came into effect in 1997. The standard prescribes two sets of emission limits, one set for new facilities installed on or after January 1, 1997, and another set for existing facilities installed prior to that date. Table 1-2-1 lists the emission limits for new facilities (installed on or after January 1, 1997), as these would be the most relevant standards for Japanese companies going to operate in China.

As many as 33 air pollutants are covered in the integrated standard, ranging from general pollutants, such as sulfur dioxide and nitrogen oxides, through to hazardous heavy metals and organic chemical compounds, and to non-methane hydrocarbons, which produce photochemical oxidants. Pollutant emission levels are regulated according to three measurement categories: concentration (mg/m^3) at a standard state of 0°C and pressure of 1 atmosphere, emission rate per hour (kg/h), and concentration of monitored fugitive emissions. Emission rates are specified by stack height and by the air quality level applicable to the location of the emission source. The air quality levels are divided into Class II and Class III, where the Class II standard is a lower level of pollution than Class III, the stricter standard. No emission limits are set for Class I because installation of new facilities in an area ranked as Class I is not permitted by law. As new plants are required to meet both the emission concentration standard and the emission rate standard, dilution by air is not permitted.

The standards also cover the concentration of monitored fugitive emissions, released into the atmosphere without passing through a smokestack. Fugitive emissions are measured at the perimeter of the factory site. The point of maximum concentration changes as the prevailing wind changes direction; thus, the stipulated limit applies to the measurement where the emission concentration is highest among a number of measurements taken at different points. Methods employed to analyze gases and measure their emission rates must comply with SEPA regulations.

Where a concentration limit can be compared with a Japanese standard, the comparable limit under Japan's Air Pollution Control Law is indicated in the "Maximum allowable concentration" column of Table 1-2-1. China's concentration limits are roughly on a par with Japan's. In Japan, however, a range of limits is prescribed for each specific type of facility. In China, since there are fewer categories of facilities, the specified limit may be stricter, depending on the particular facility.

For example, in Japan, a maximum of 300 mg/m^3 is permitted for particulate matter generated by plants that manufacture activated carbon. This is a more lenient standard than in China, where particulate matter comes under the “others” category and has a maximum allowable concentration of 120 mg/m^3. For hydrogen chloride emissions, Japan permits a maximum of 700 mg/m^3 for waste incinerators. In China, the hydrogen chloride limit is a uniform 100 mg/m^3 for all facilities, a far more stringent standard than in Japan. For zinc and its compounds, a standard of 0.7 mg/m^3 is set in China, whereas zinc is unregulated in Japan. This should be noted as zinc is likely to be emitted from a large number of facilities. Under Japan's control standards for designated substances, benzene is regulated to a range of 50 - 600 mg/m^3, depending on the type of facility, but is set to a uniform 12 mg/m^3 in China. In Japan, the benzene emission limit is 600 mg/m^3 for benzene storage tanks; the Chinese standard for the same type of equipment can therefore be said to be extremely strict.

Table 1-2-1: Waste gas emission standards
(for new facilities constructed on or after January 1, 1997)

No	Pollutant	Maximum allowable concentration (mg/m^3)	Maximum allowable emission rate (kg/h)			Maximum concentration for monitored fugitive emissions	
			Emission stack height (m)	Class II	Class III	Monitoring site	Concentration (mg/m^3)
1	Sulfur dioxide	960 (Production of sulfur, sulfur dioxide, sulfuric acid, and other sulfur compounds)	15	2.6	3.5	Highest concentration point outside perimeter[1)]	0.40
			20	4.3	6.6		
			30	15	22		
			40	25	38		
			50	39	58		
		550 (Use of sulfur, sulfur dioxide, sulfuric acid, and other sulfur compounds)	60	55	83		
			70	77	120		
			80	110	160		
			90	130	200		
			100	170	270		
2	Nitrogen oxides	1400 (Production of nitrates, chlorine-based fertilizers and explosives)	15	0.77	1.2	Highest concentration point outside perimeter	0.12
			20	1.3	2.0		
			30	4.4	6.6		
			40	7.5	11		
		240 (Use of nitrates, nitrites, etc.)	50	12	18		
			60	16	25		
			70	23	35		
			80	31	47		
			90	40	61		
			100	52	78		
3	Particulate matter	18 (Coal dust and dye dust)	15	0.51	0.74	Highest concentration point outside perimeter	Not detectable by the naked eye
			20	0.85	1.3		
			30	3.4	5.0		
			40	5.8	8.5		
		602 (Fiberglass dust, quartz powder dust, mineral wool dust)	15	1.9	2.6	Highest concentration point outside perimeter	1.0
			20	3.1	4.5		
			30	12	18		
			40	21	31		
		120 (Other) (Japanese standard: 30-300 for industrial dust, depending on facility type and outflow location)	15	3.5	5.0	Highest concentration point outside perimeter	1.0
			20	5.9	8.5		
			30	23	34		
			40	39	59		
			50	50	94		
			60	85	130		
4	Hydrogen chloride	100 (Japanese standard: 80 for chlorine reaction and absorption facilities; 700 for waster incinerators)	15	0.26	0.39	Highest concentration point outside perimeter	0.20
			20	0.43	0.65		
			30	1.4	2.2		
			40	2.6	3.8		
			50	3.8	5.9		
			60	5.4	8.3		
			70	7.7	12		
			80	10	16		

5	Chromium oxide mist	0.070	15 20 30 40 50 60	0.008 0.013 0.043 0.076 0.12 0.16	0.012 0.020 0.066 0.12 0.18 0.25	Highest concentration point outside perimeter	0.0060
6	Sulfuric acid mist	430 (Gunpowder plants) 45 (Others)	15 20 30 40 50 60 70 80	1.5 2.6 8.8 15 23 33 46 63	2.4 3.9 13 23 35 50 70 95	Highest concentration point outside perimeter	1.2
7	Fluorides	90 (General calcium plants) 9.0 (Others) (Japanese standard: 1.0 - 20.0, depending on facility)	15 20 30 40 50 60 70 80	0.10 0.17 0.59 1.0 1.5 2.2 3.1 4.2	0.15 0.26 0.88 1.5 2.3 3.3 4.7 6.3	Highest concentration point outside perimeter	20μg/m^3
8	Chlorine gas	65 (Japanese standard: 30 for chlorine reaction and absorption facilities)	25 30 40 50 60 70 80	0.52 0.87 2.9 5.0 7.7 11 15	0.78 1.3 4.4 7.6 12 17 23	Highest concentration point outside perimeter	0.40
9	Zinc and its compounds	0.70	15 20 30 40 50 60 70 80 90 100	0.004 0.006 0.027 0.047 0.072 0.10 0.15 0.20 0.26 0.33	0.006 0.009 0.041 0.071 0.11 0.15 0.22 0.30 0.40 0.51	Highest concentration point outside perimeter	0.0060
10	Mercury and its compounds	0.012	15 20 30 40 50 60	1.8 x 10-3 3.1 x 10-3 10 x 10-3 18 x 10-3 28 x 10-3 39 x 10-3	2.8 x 10-3 4.6 x 10-3 16 x 10-3 27 x 10-3 41 x 10-3 59 x 10-3	Highest concentration point outside perimeter	0.0012
11	Cadmium and its compounds	0.85 (Japanese standard: 1.0 for cadmium pigment manufacturing equipment, baking furnace in zinc manufacturing, etc.)	15 20 30 40 50 60 70 80	0.050 0.090 0.20 0.50 0.77 1.1 1.5 2.1	0.080 0.13 0.44 0.77 1.2 1.7 2.3 3.2	Highest concentration point outside perimeter	0.040

12	Beryllium and its compounds	0.012	15 20 30 40 50 60 70 80	1.1 x 10-3 1.8 x 10-3 6.2 x 10-3 11 x 10-3 15 x 10-3 23 x 10-3 33 x 10-3 44 x 10-3	1.7 x 10-3 2.8 x 10-3 9.4 x 10-3 16 x 10-3 25 x 10-3 35 x 10-3 50 x 10-3 67 x 10-3	Highest concentration point outside perimeter	0.0008
13	Nickel and its compounds	4.3	15 20 30 40 50 60 70 80	0.15 0.26 0.88 1.5 2.3 3.3 4.6 6.3	0.24 0.34 1.3 2.3 3.5 5.0 7.0 10	Highest concentration point outside perimeter	0.040
14	Tin and its compounds	8.5	15 20 30 40 50 60 70 80	0.31 0.52 1.8 3.0 4.6 6.6 9.3 13	0.47 0.79 2.7 4.6 7.0 10 14 19	Highest concentration point outside perimeter	0.24
15	Benzene	12 (Japanese suppression standard: 50-600, depending on facility)	15 20 30 40	0.5 0.9 2.9 5.6	0.8 1.3 4.4 7.6	Highest concentration point outside perimeter	0.40
16	Toluene	40	15 20 30 40	3.1 5.2 18 30	4.7 7.9 27 46	Highest concentration point outside perimeter	2.4
17	Xylene	70	15 20 30 40	1.0 1.7 5.9 1.0	1.5 2.6 8.8 15.0	Highest concentration point outside perimeter	1.2
18	Phenol	100	15 20 30 40 50 60	0.10 0.17 0.58 1.0 1.5 2.2	0.15 0.26 0.88 1.5 2.3 3.3	Highest concentration point outside perimeter	0.08
19	Formaldehyde	25	15 20 30 40 50 60	0.26 0.43 1.4 2.6 3.8 5.4	0.39 0.65 2.2 3.8 5.9 8.3	Highest concentration point outside perimeter	0.20

20	Acetaldehyde	125	15 20 30 40 50 60	0.05 0.09 0.29 0.50 0.77 1.1	0.08 0.13 0.44 0.77 1.2 1.6	Highest concentration point outside perimeter	0.04
21	Acrylonitrile	22	15 20 30 40 50 60	0.77 1.3 4.4 7.5 12 16	1.2 2.0 6.6 11 18 25	Highest concentration point outside perimeter	0.60
22	Acrolein	16	15 20 30 40 50 60	0.52 0.87 2.9 5.0 7.7 11	0.78 1.3 4.4 7.6 12 17	Highest concentration point outside perimeter	0.40
23	Hydrogen cyanide	1.9	15 20 30 40 50 60 80	0.15 0.26 0.88 1.5 2.3 3.3 4.6	0.24 0.39 1.3 2.3 3.5 5.0 7.0	Highest concentration point outside perimeter	0.024
24	Methanol	190	15 20 30 40 50 60	5.1 8.6 29 50 77 100	7.8 13 44 70 120 170	Highest concentration point outside perimeter	12
25	Aniline	20	15 20 30 40 50 60	0.52 0.87 2.9 5.0 7.7 11	0.78 1.3 4.4 7.6 12 17	Highest concentration point outside perimeter	0.40
26	Chlorobenzenes	60	15 20 30 40 50 60 70 80 90 100	0.52 0.87 2.5 4.3 6.6 9.3 13 18 23 29	0.78 1.3 3.8 6.5 9.9 14 20 27 35 44	Highest concentration point outside perimeter	0.40
27	Nitrobenzene	16	15 20 30 40 50 60	0.05 0.09 0.29 0.50 0.77 1.1	0.08 0.13 0.44 0.77 1.2 1.7	Highest concentration point outside perimeter	0.04

28	Chloroethylene	36	15 20 30 40 50 60	0.77 1.3 4.4 7.5 12 16	1.2 2.0 6.6 11 18 25	Highest concentration point outside perimeter	0.60
29	3,4-Benzo(a)pyrene	0.3 x 10-3 (Production and processing of asphalt and carbon products)	15 20 30 40 50 60	0.05 x 10-3 0.08 x 10-3 0.29 x 10-3 0.50 x 10-3 0.77 x 10-3 1.1 x 10-3	0.08 x 10-3 0.13 x 10-3 0.43 x 10-3 0.76 x 10-3 1.2 x 10-3 1.7 x 10-3	Highest concentration point outside perimeter	0.008 μg/m^3
30	Phosgene	3.0	25 30 40 50	0.10 0.17 0.59 1.0	0.15 0.25 0.88 1.5	Highest concentration point outside perimeter	0.08
31	Asphalt	140 (Blown asphalt) 40 (Melting and dip coating) 75 (Mixing for building)	15 20 30 40 50 60 70 80	0.18 0.30 1.3 2.3 3.6 5.6 7.4 10	0.27 0.45 2.0 3.5 5.4 7.5 11 15	No visible fugitive emissions are permitted from production equipment.	
32	Asbestos dust	1 fiber/m^3 or 10 mg/m^3	15 20 30 40 50	0.55 0.93 3.6 6.2 9.4	0.83 1.4 5.4 9.3 14	No visible fugitive emissions are permitted from production equipment.	
33	Non-methane hydrocarbons	120 (Use of solvent gasoline or use of other mixed hydrocarbons)	15 20 30 40	10 17 53 100	16 27 83 150	Highest concentration point outside perimeter	4.0

1) The "highest concentration point outside perimeter" is generally set within 10 meters outside the perimeter of the facility, downwind from the emission source. If the expected highest point of ground-level concentration of fugitive emissions is more than 10 meters from the perimeter, the monitoring site may be moved to that position. For details, see Appendix C. Same applies to the following.
2) All types of industrial dust containing 10% or more of free silica.
3) Height of stack emitting chlorine gas must be at least 25 m.
4) Height of stack emitting hydrogen cyanide must be at least 25 m.
5) Height of stack emitting phosgene must be at least 25 m.

Source: The information being made public on the website of the Sino-Japan Friendship Center for Environmental Protection (http://www.zhb.gov.cn/japan/) was edited and other information added based on the data published by SEPA.

(2) Specific emission standard for boilers

The emission standard (waste gas standard) specifically for air pollutants from boilers was promulgated in November 2001 and is defined in the Emission Standard of Air Pollutants for Coal-Burning Oil-Burning Gas-Fired Boilers, which came into force in January 2002. As shown in Table 1-2-2, for soot emission limits, boilers are categorized by fuel type as coal-fired, gas-fired, and oil-fired boilers, and by location as Class I, Class II, and Class III. Standards are set separately according to whether the boiler was built and commissioned before January 1, 2001 or after that date. The prescribed emission limits are a relatively low 100-350 mg/m^3 for coal-fired boilers, a low 80-200 mg/m^3 for oil-fired boilers, and 50 mg/m^3 for gas-fired boilers. The indicated concentration limits are at a standard state of 0°C and pressure of 1 atmosphere. The emission limits in the following tables are for the same standard state.

As shown in Table 1-2-3, the emission limits for sulfur dioxide (SO_2) and nitrogen oxides (NOx) are based on similar categories as for soot, but apply to all locations. The SO_2 emission limit for coal-fired boilers built on or after 1 January 2001 is 900 mg/m^3, which is roughly equivalent to the SO_2 concentration in the waste gas when coal with a 0.5% sulfur content is burned. Therefore, if the coal used has a higher sulfur content, a flue gas desulfurization device will be required.

As will be discussed in the second case study in Chapter 2, Tianjin has set an SO_2 emission limit of 650 mg/m^3 as its own local air quality standard. This is far stricter than the national emission standard for SO_2. Meeting this standard means using coal that has a sulfur content of 0.5% or less and carrying out flue gas desulfurization, or using coal with a sulfur content not exceeding 0.3%. Tianjin also regulates the sulfur content of the coal used in coal-fired boilers, and requires factories to use coal containing no more than 0.5% sulfur.

The NOx emission limit is 400 mg/m^3 for both oil-fired and gas-fired boilers. This is equivalent to 195 ppm when converted into a ppm measurement for comparison with the Japanese standard. In Japan, emission standards are prescribed separately for oil-fired and gas-fired boilers. The NOx limit in Japan is 130-180 ppm for oil-fired boilers, depending on the boiler size, and 60-150 ppm for gas-fired boilers. Although China's standard is slightly more lenient, it is roughly on a par with Japan's.

The dust concentration from coal-fired boilers is unavoidably at a higher level when the boiler is first fired up. Soot emission limits are set for these initial concentrations, as shown in Table 1-2-4. Also, as the amount of generated soot varies widely according to the combustion method, separate standards are prescribed for each of three different combustion categories (fire grate, fluidized-bed, and entrained-bed combustion). Fluidized-bed combustion generates the most soot, and therefore has higher specified emission limits.

The minimum stack height is prescribed by boiler capacity, as shown in Table 1-2-5. A minimum stack height of 20 meters is required even for the smallest boilers.

Analysis of the constituents in waste gas requires that the state of air admixture is prescribed. Thus, for coal-fired, oil-fired, and gas-fired boilers, the Chinese standard has an emission rate correction factor for excess air, as shown in Table 1-2-6. In Japan, oxygen concentration in the waste gas is prescribed, which amounts to the same thing. For example, 6% oxygen concentration is prescribed in Japan for analysis of waste gas from coal-fired boilers. If we convert the correction factor ($\alpha = 1.8$) in the Chinese standard, the result is equivalent to an oxygen concentration of 8.8%. In other words, China allows a slightly higher excess air ratio than Japan.

Table 1-2-2: Soot emission standards for boilers

Boiler type	Combustion type or fuel type	Location	Soot concentration (mg/m^3)		Ringelmann Density No.
			Built up to Dec. 31, 2000	Build from Jan. 1, 2001	
Coal-fired	Natural-draft furnace	Class I	100	80	I
		Classes II, III	150	120	
	Other	Class I	100	80	I
		Class II	250	200	
		Class III	350	250	
Oil-fired	Light diesel or kerosene	Class I	80	80	I
		Classes II, III	100	100	
	Other fuel oils	Class I	100	80	I
		Classes II, III	200	150	
Gas-fired	Gas fuel	All locations	50	50	I

Table 1-2-3: Sulfur dioxide and nitrogen oxide emission standards for boilers

Boiler type		Combustion type or fuel type	SO_2 (mg/m^3)		NOx (mg/m^3)	
			Built up to Dec. 31, 2000	Built from Jan. 1, 2001	Built up to Dec. 31, 2000	Built from Jan. 1, 2001
Coal-fired		All areas	1,200	900	--	--
Oil-fired	Light oil or diesel	All areas	700	500	--	400
	Other fuels	All areas	1,200	900*	--	400*
Gas-fired		All areas	100	100	--	400

* Construction of new boilers using heavy oil or residual oil is prohibited in Class I areas.

Table 1-2-4: Soot emission standards for coal-fired boilers at initial combustion

Boiler type		Standard ash content of arriving coal (%)	Soot concentration at initial combustion (mg/m^3)		Ringelmann Density No.
			Built up to Dec. 31, 2000 Building use	Built from Jan. 1, 2001 Building use	
Grate-fired boiler	Natural-draft (< 0.7MW (1t/h))	--	150	120	I
	Other (≤ 2.8MW (4t/h))	Aar ≤ 25%	1,800	1,600	I
		Aar > 25%	2,000	1,800	I
	Other (> 2.8MW (4t/h))	Aar ≤ 25%	2,000	1,800	I
		Aar > 25%	2,200	2,000	I
Fluidized-bed boiler	Circulating fluidized bed	--	15,000	15,000	I
	Other fluidized bed	--	20,000	18,000	I
Entrained- bed boiler		--	5,000	5,000	I

Table 1-2-5: Minimum boiler stack height

Boiler capacity	MW	< 0.7	0.7 - < 1.4	1.4 - < 2.8	2.8 - < 7	7 - < 14	14 - < 28
	t/h	< 1	1 - < 2	2 - < 4	4 - < 10	10 - < 20	20 - ≤40
Minimum permissible height	m	20	25	30	35	40	45

Table 1-2-6: Excess air ratio correction factor

Boiler type	Parameter	Excess air ratio
Coal-fired	Soot at initial combustion	$\alpha = 1.7$
	Soot and SO_2	$\alpha = 1.8$
Oil-fired, gas-fired	Soot, SO_2, and NOx	$\alpha = 1.2$

Source: For Tables 1-2-3 to 1-2-6, the information being made public on the website of the Sino-Japan Friendship Center for Environmental Protection (http://www.zhb.gov.cn/japan/) was edited and other information added and based on the data published by SEPA.

(3) Waste gas monitoring

The amount of SO_2 in the waste gas of coal-fired boilers used to be monitored by local government twice a year. It was difficult to conduct checks more frequently because waste gas sampling requires a high level of technical skill and substantial equipment. China therefore switched to a monitoring system that involves an on-site inspection without prior notice, sampling the coal immediately before it enters the furnace, and checking that the sulfur concentration does not exceed the prescribed amount. This coal sampling check was previously conducted once every two or three months.

At present, although factories themselves are not legally required to monitor waste gas, large-scale facilities such as thermal power plants are now required to install online monitoring equipment.

Section 3
Water Pollution Management

1. China's Water Pollution Regulations

Water pollution as top priority

Water pollution in China, due to increasing volumes of factory effluent and domestic wastewater, is a problem of growing concern. Water bodies in China are categorized by purpose of utilization and protection objectives into five grades, from Grade I (water catchments and water bodies in national nature reserves) to Grade V (water for agricultural use and for general landscaping requirements). According to water quality measurements for 2001, however, 44% of the 752 monitoring stations along China's seven major river systems failed even to meet the water quality standard for the lowest Grade V ranking. Water quality is ranked Grade V or worse in more than 60% of rivers in the three river systems where pollution is particularly bad (Haihe River, Huaihe River, and Liaohe River). The three lakes (Taihu Lake, Chaohu Lake and Dianchi Lake) are all ranked Grade V or lower. Measures to halt eutrophication of the lakes is a pressing issue.

In response, China has taken action on the three rivers and three lakes, implementing measures to prevent water pollution of these key areas through its Ninth Five-Year Plan for National Environmental Protection (targeting the period 1996 to 2000) and through the subsequent Tenth Five-Year Plan for National Environmental Protection (2001 to 2005). Specifically, under these plans total emission controls on chemical oxygen demand (COD) and ammonia nitrogen were introduced, and sewage treatment facilities are being intensively established in these areas. Further, administrative measures are being taken for suspending or closing the operation of small and medium-size factories that have obsolete production equipment and are discharging large amount of water pollutants. However, due to the rapidly increasing volumes not only of industrial effluent but of domestic wastewater as well, no real improvement is being made on water pollution. There is serious water pollution in regions other than the three rivers and three lakes designated as key area. Future water shortages are predicted as the worsening pollution reduces the accessibility of water resources, and measures to combat water pollution will likely become the most important of China's environmental programs.

Water pollution measures are based on the Law of the People's Republic of China on the Prevention and Control of Water Pollution, which was revised in 1996. This law provides for environmental impact assessment of water pollution-related parameters when a factory is constructed, and prescribes environmental management regimes for preventing water pollution, including the "three synchronizations" system, pollutant discharge fees (pollution levies), and emission registration. In addition, the law provides for national wastewater standards to be set by the State Environmental Protection Administration (SEPA), and empowers local people's governments at the provincial level and above to set region-specific wastewater standards. Article 23 of the law states that the State shall forbid construction of any small enterprises, devoid of measures for prevention and control of water pollution, that seriously pollute the water environment, such as chemical pulp mills, printing and dyeing mills, dyestuff mills, tanneries, electroplating factories, petroleum refineries and pesticides manufacturers. As well as pollution of surface waters (rivers and lakes), the law is also aimed at preventing groundwater pollution. Article 41 prohibits companies from discharging or dumping wastewater containing toxic pollutants or pathogens or other wastes into seepage wells or pits, crevices or limestone caves.

Among other provisions, pollutant discharge fees are of particular relevance to companies in addressing water pollution. Article 15 of the Law on the Prevention and Control of Water Pollution states that enterprises and institutions that discharge pollutants into a water body shall pay a pollutant discharge fee in accordance with State regulations; if the discharge exceeds the limits set by the national or local standards, they shall pay a fee for excess discharge according to State regulations.

However, as mentioned in the previous section about air pollution management, the laws in China state fundamental principles only. Specific controls are based on a large number of regulations, primarily the Implementation of the Law of the People's Republic of China on Water Pollution Prevention and Control (revised in March 2000), which is based on the Law on the Prevention and Control of Water Pollution. In regard to pollutant discharge fees, for example, particulars about how charges are to be levied are given in

the Ordinance on Levying for Discharge, as well as in the Measures for the Administration of the Charging Rates for Pollutant Discharge Fees, which is based on that ordinance and came into effect in July 2003.

As with the air pollution regulations, a large number of locally specific provisions related to preventing water pollution are laid down at the local level. Companies must therefore check the requirements in ordinances and other regulations passed by the particular province, municipality, or autonomous region in which the factory is located.

The following describes the system of industrial wastewater controls in China, principally the Integrated Wastewater Discharge Standard, which is the national wastewater standard and has a major influence on the day-to-day wastewater practices of Japanese companies.

2. Specific Wastewater Controls Applicable to Factories

As mentioned above, China's emission standards for industrial wastewater include standards set by the State for the whole country, and local standards set separately by individual local governments at the provincial level and above (e.g. Beijing). If deemed necessary to meet the water quality standards, local governments at the provincial level and above are empowered to set discharge limits that are more stringent than those set by the State, as in Japan, and to regulate pollutant parameters not covered in the national standards. However, due to the difficulty of comprehensively investigating all the wastewater standards set by local governments in China, this section outlines the national Integrated Wastewater Discharge Standard and, by way of example, mentions some local discharge limits, set by the local government of the area in which the company's factory is located, that apply to some of the Japanese companies we interviewed in China.

(1) National wastewater standard set by the Chinese government

China's national wastewater standard consists of two categories of discharge standards. The first category is industry-specific wastewater standards prescribed for 12 industry types: the paper industry, ship and shipbuilding industry, offshore oil development industry, textile finishing and dyeing, meat processing industry, synthetic ammonia industry, iron and steel industry, industries that use aerospace propellant, military industry, phosphate fertilizer industry, caustic soda industry, and PVC-related industry. The other category is the Integrated Wastewater Discharge Standard, which was promulgated in 1996 and came into effect in January 1998 as the wastewater standard for all other industries.

As most of the Japanese companies operating in China are subject to the latter Integrated Wastewater Discharge Standard, the discussion here is limited to the regulations in that standard.

In the Integrated Wastewater Discharge Standard, the regulated parameters are divided into two groups: Class I and Class II pollutants. Class I pollutants cover 13 toxicity parameters, such as total mercury, alkyl mercury, and cadmium. Class II pollutants cover 56 parameters, including acidity (pH), suspended solids (SS), chemical oxygen demand (COD), and biochemical oxygen demand (BOD). Of these parameters, only those likely to be present in the wastewater from a particular factory are set as applicable wastewater control parameters for that factory by the environmental administration, and the factory is legally obliged to comply with those standards. For Class I pollutants, the standard regulates the pollutant concentration in the effluent sampled at the discharge outlet of the particular facility within the factory site. Each individual facility must therefore have dedicated wastewater treatment equipment installed before the discharge outlet. For Class II pollutants, the standard applies to the pollutant concentration at the discharge outlet exiting the factory site. In this case, it is permissible to combine and centrally treat the wastewater from several facilities.

Table 1-3-1a lists the wastewater discharge limits for Class I pollutants, compared with the corresponding Japanese uniform standard for each parameter. Total mercury and total lead have more lenient limits, by one decimal place, than the Japanese standard, but the other parameters are on a par with Japan. Apart from Japan, only China requires a "not detectable" level of alkyl mercury, which is not a regulated

parameter in Europe or the United States. China also has discharge limits for six parameters that are not controlled in Japan, including total nickel, total silver, and 3,4-benzo(a)pyrene. The requirement for nickel should be noted as nickel may be discharged from electroplating processes. Silver is rarely discharged in wastewater, but is a controlled parameter in the West, too, because it is said to be as toxic as cadmium.

Table 1-3-1b lists Class II pollutants. Two sets of wastewater discharge limits are prescribed, one set for new facilities constructed on or after January 1, 1998, and another set for existing facilities installed prior to that date. The controlled parameters for new facilities are more numerous, and slightly stricter, than those for existing facilities.

Tables 1-3-1a and 1-3-1b give the discharge limits for new factories, which many Japanese companies would be subject to, and compares them with the wastewater standards in Japan. For some parameters, the discharge limit applies to a specific industrial sector; for other parameters, the discharge limit applies to all sectors. The discharge levels are prescribed separately for three classes, categorized according to the receiving water body. The Class I standard is for discharge to drinking water sources, Class II is for discharge to general water bodies, and Class III is for discharge into sewerage systems for final disposal. That is, the standard becomes stricter from Class III to Class I. Contrasted with Japan's wastewater standards, China's Class I is stricter, Class II is comparable, and Class III is more lenient.

The Class II standard for chemical oxygen demand (COD_{Cr}) is set in the range 120 to 300 mg/liter, depending on the sector. The figure appears to be the same level as Japan's limit of 160 mg/liter, but note that the method of measurement differs between the two countries. There are two ways of measuring COD. Japan uses the permanganate test (COD_{Mn}), which uses potassium permanganate as the oxidizing agent for measuring the amount of oxygen required for the oxidizing reaction. China, on the other hand, uses the chromate method (COD_{Cr}), based on potassium dichromate as the oxidizing agent. As potassium permanganate is a less powerful oxidizing agent, it yields a lower result when the same sample is analyzed by both methods. Although it depends on the sample, the COD_{Mn} method gives a value roughly one third of that given by the COD_{Cr} method. Therefore, China's limit of 120 mg/liter (by COD_{Cr}) is equivalent to 40 mg/liter using the COD_{Mn} method. This figure is a far more stringent standard than Japan's limit of 160 mg/liter. As a consequence, wastewater treatment equipment meeting Japan's effluent standards will not adequately serve the purpose if taken to China without any modification. Note also that although the COD_{Cr} method is used in China for controlling factory effluent, control of general water quality is based on the COD_{Mn} method.

The Class II standard for ammonia nitrogen in "other polluting sectors" (industries other than pharmaceutical preparation, dye manufacturing, and the petrochemical industry) is set at 25 mg/liter, a very strict limit. In Japan, the figure calculated as $NO_3 + NO_2 + 0.4 \times NH_3$ must not exceed 100 mg/liter. Thus, supposing that nitrogen is present entirely as ammonia nitrogen (NH_3), without any nitrate nitrogen (NO_3) or nitrite nitrogen (NO_2) being present, a value of up to 250 mg/liter is acceptable. In comparison, the limit of 25 mg/liter in China is quite stringent. This should be noted as ammonia nitrogen may be emitted by a wide range of industries, including fertilizer plants and meat processing plants. Ammonia nitrogen is not controlled under the Class III standard, but the plant that we visited in Tianjin, which is located in a Class II area according to the national standard, is nevertheless subject to a Class II standard of 25 mg/liter, set as an extended regulation by the Tianjin local government. Local governments can add parameters to the wastewater parameters in the national standards at their discretion.

The standard of 1 mg/liter for copper is stricter than the 3 mg/liter limit in Japan. Copper in wastewater tends to form compounds called complexes that do not react easily with alkaline agents. This can make it difficult to treat the discharged wastewater to an acceptable copper level by adding caustic soda or some other additive in the normal neutralizing coagulation and sedimentation method. Some kind of treatment must be added to decompose these complexes.

In addition to the discharge concentration limits, plants built in or after January 1998 in a total of 22 industries, including mining, nonferrous metals, coke, and petroleum refining, are subject to a maximum allowable wastewater discharge volume, as shown in Table 1-3-2. Most of the restrictions are in terms of discharge volume per ton of the end product. However, the allowable discharge for the gold mining industry is defined per ton of gold ore, and the allowable discharge for the petroleum refining industry is defined per ton of crude oil. In addition, a number of industries engaged in mining or processing of nonferrous metals are subject to a water utilization recycling rate. For these industries, the total discharge of pollutants is controlled through the restrictions on the wastewater discharge volume and the discharge concentration described above.

Table 1-3-1a: Wastewater discharge standards for Class I pollutants

(mg/liter)

No.	Pollutant	Maximum allowable concentration	Japanese uniform standard
1	Total mercury	0.05	0.005
2	Alkyl mercury	Not detectable	Not detectable
3	Total cadmium	0.1	0.1
4	Total chromium	1.5	2.0
5	Hexavalent chromium	0.5	0.5
6	Total arsenic	0.5	0.1
7	Total lead	1.0	0.1
8	Total nickel	1.0	--
9	3,4-Benzo(a)pyrene	0.00003	--
10	Total beryllium	0.005	--
11	Total silver	0.5	--
12	Total alpha radiation	1 Bq/l	--
13	Total beta radiation	10 Bq/l	--

Table 1-3-1b: Waste discharge standards for Class II pollutants (facilities constructed on or after January 1, 1998)

(mg/liter)

No	Pollutant	Sector	Class I standard	Class II standard	Class III standard	Japanese uniform standard
1	pH	All polluting sectors	6 - 9	6 - 9	6 - 9	5.8 - 8.6
2	Colorimetry (dilution factor)	All polluting sectors	50	80	--	
3	Suspended solids (SS)	Mining, ore dressing, and coal processing	70	300	--	200
		Gold deposit processing	70	400	--	
		Placer gold processing in frontier regions	70	800	--	
		Urban Class II wastewater treatment plants	20	30	--	
		Other polluting sectors	70	150	400	
4	Biochemical oxygen demand (BOD_5)	Sugarcane refining, jute degumming, wet-process fiberboard manufacturing	20	60	600	160
		Beet sugar refining, alcohol, chemical seasonings, tanning, and chemical fiber pulper industry	20	100	600	
		Urban Class II wastewater treatment plants	20	30	--	
		Other polluting sectors	20	30	300	

5	Chemical oxygen demand (COD_{Cr})	Beet sugar refining, coke, synthetic fatty acids, wet-process fiberboard, dyes, fur washing, and organophosphate factories	100	200	1000	160
		Chemical seasonings, alcohol, pharmaceutical preparation, biochemicals, jute degumming, tanning, and chemical fiber pulper industry	100	300	1000	
		Petrochemical industry (including petroleum refining)	60	120	500	
		Urban Class II wastewater treatment plants	60	120	--	
		Other polluting sectors	100	150	500	
6	Petroleum	All polluting sectors	5	10	20	5
7	Animal/plant oils	All polluting sectors	10	15	100	10
8	Volatile phenol	All polluting sectors	0.5	0.5	2.0	5
9	Total c	All polluting sectors	0.5	0.5	1.0	1.0
10	Sulfides	All polluting sectors	1.0	1.0	1.0	--
11	Ammonia nitrogen	Medicine raw materials, dyes, and petrochemical production	15	50	--	100[1)]
		Other polluting sectors	15	25	--	
12	Fluorides	Yellow phosphorous industry	10	15	20	8
		Low-fluoride areas (Fluoride content of water body < 0.5 mg/l)	10	20	30	
		Other polluting sectors	10	10	20	
13	Phosphates (as P)	All polluting sectors	0.5	1.0	--	16
14	Methyl alcohol	All polluting sectors	1.0	2.0	5.0	--
15	Aminobenzene	All polluting sectors	1.0	2.0	5.0	--
16	Nitrobenzene	All polluting sectors	2.0	3.0	5.0	--
17	Anionic surfactants (LAS)	All polluting sectors	5.0	10	20	--
18	Total copper	All polluting sectors	0.5	1.0	2.0	3
19	Total zinc	All polluting sectors	2.0	5.0	5.0	5
20	Total manganese	Synthetic fatty acid manufacturing	2.0	5.0	5.0	10
		Other polluting sectors	2.0	5.0	5.0	
21	Color developers	Movie film developing	1.0	2.0	3.0	--
22	Total volume of developers and oxides	Movie film developing	3.0	3.0	6.0	--
23	Phosphorous	All polluting sectors	0.1	0.1	0.3	--
24	Organophosphate fertilizers (as P)	All polluting sectors	Not detectable	0.5	0.5	--
25	Dimethoate	All polluting sectors	Not detectable	1.0	2.0	--

26	Parathion	All polluting sectors	Not detectable	1.0	2.0	--
27	Methyl parathion	All polluting sectors	Not detectable	1.0	2.0	--
28	Malathion	All polluting sectors	Not detectable	5.0	10	--
29	Pentachlorophenol (PCP) and sodium pentachlorophenate (Na-PCP) (as PCP)	All polluting sectors	5.0	8.0	10	--
30	Absorbable organic halogens (AOX) (as Cl)	All polluting sectors	1.0	5.0	8.0	--
31	Chloroform	All polluting sectors	0.3	0.6	1.0	--
32	Carbon tetrachloride	All polluting sectors	0.03	0.06	0.5	--
33	Ethylene trichloride	All polluting sectors	0.3	0.6	1.0	--
34	Tetrachloroethylene	All polluting sectors	0.1	0.2	0.5	--
35	Benzene	All polluting sectors	0.1	0.2	0.5	0.1
36	Toluene	All polluting sectors	0.1	0.2	0.5	
37	Ethylbenzene	All polluting sectors	0.4	0.6	1.0	
38	o-Xylene	All polluting sectors	0.4	0.6	1.0	
39	p-Xylene	All polluting sectors	0.4	0.6	1.0	
40	m-Xylene	All polluting sectors	0.4	0.6	1.0	
41	Chlorobenzene	All polluting sectors	0.2	0.4	1.0	
42	o-Dichlorobenzene	All polluting sectors	0.4	0.6	1.0	
43	p-Dichlorobenzene	All polluting sectors	0.4	0.6	1.0	
44	p-Nitrobenzene	All polluting sectors	0.5	1.0	5.0	
45	2.4-Dinitroaniline	All polluting sectors	0.5	1.0	5.0	
46	Phenols	All polluting sectors	0.3	0.4	1.0	5
47	m-Methylphenol	All polluting sectors	0.1	0.2	0.5	--
48	2,4-Dichlorophenol	All polluting sectors	0.6	0.8	1.0	--
49	2,4,6-Trichlorophenol	All polluting sectors	0.6	0.8	1.0	--
50	Dinonyl phthalate	All polluting sectors	0.2	0.4	2.0	--
51	Dioctyl phthalate	All polluting sectors	0.3	0.6	2.0	--
52	Acrylonitrile	All polluting sectors	2.0	5.0	5.0	--

53	Total selenium	All polluting sectors	0.1	0.2	0.5	0.1
54	Fecal coliform bacteria count	Pathogen-containing wastewater from hospitals*, veterinarian clinics, and health care organizations	500/l	1000/l	5000/l	3,000
		Wastewater from infectious disease and TB hospitals	100/l	500/l	1000/l	
55	Total residual chlorine (Wastewater of hospitals using chlorinated disinfectants)	Pathogen-containing wastewater from hospitals*, veterinarian clinics, and health care organizations	<0.5**	>3 (contact time ≥ 1.5h)	>2 (contact time ≥ 1.5h)	--
		Wastewater from infectious disease and TB hospitals	<0.5**	>6.5 (contact time ≥ 1.5h)	>5 (contact time ≥ 1.5h)	--
56	Total organic carbon (TOC)	Synthetic fatty acid manufacturing	20	40	--	--
		Jute degumming industry	20	60	--	--
		Other polluting sectors	20	30	--	--

Note: "Other polluting sectors" refers to all polluting sectors other than the industries specifically listed for the particular control parameter.
* Hospitals with 50 or more beds.
** The effluent must meet this standard after it has been dechlorinated following disinfection by chlorine addition.
1) $NO_3 + NO_2 + 0.4 \times NH3 \leq 100$ mg/liter

Table 1-3-2: Maximum allowable wastewater discharge volumes for specific industries (facilities constructed on or after January 1, 1998)

No	Industry type			Maximum allowable wastewater discharge volume; Minimum allowable water recycling rate
1	Mining industry	Nonferrous metal processing		Water recycling rate: 75%
		Mining, dressing, and processing in other mining industries		Water recycling rate: 90% (coal dressing)
		Gold deposit processing	Repetitive processing	16.0m^3/t (ore)
			Flotation	9.0m^3/t (ore)
			Cyanidation	8.0m^3/t (ore)
			Carbon serum	8.0m^3/t (ore)
2	Coke industry (coal gas factories)			1.2m^3/t (coke)
3	Nonferrous metal smelting, refining, and metalworking			Water recycling rate: 80%
4	Petroleum refining industry (excluding direct-effluent petroleum refineries) Categorized by stage of processing: A. Fuel-only refineries B. Fuel + lubricating oil-producing refineries C. Fuel + lubricating oil + petrochemical-producing refineries (Includes oil refineries at production sites producing high-sulfur shale oil and oil additives.)			> 5 mill. tons, 1.0m^3/t (crude oil) A: 2.5 - 5 mill. tons, 1.2m^3/t (crude oil) < 2.5 mill tons, 1.5m^3/t (crude oil)
				> 5 mill. tons, 1.5m^3/t (crude oil) B: 2.5 - 5 mill. tons, 2.0m^3/t (crude oil) < 2.5 mill tons, 2.0m^3/t (crude oil)
				> 5 mill. tons, 2.0m^3/t (crude oil) C: 2.5 - 5 mill. tons, 2.5m^3/t (crude oil) < 2.5 mill tons, 2.5m^3/t (crude oil)
5	Synthetic detergent industry	Alkyl benzene production using chlorination		200.0m^3/t (alkyl benzene)
		Alkyl benzene production using decomposition		70.0m^3/t (alkyl benzene)
		Detergent production from alkyl benzene		10.0m^3/t (end product)
6	Synthetic fatty acid manufacturing			200.0m^3/t (end product)
7	Wet-process fiberboard manufacturing			30.0m^3/t (boards)

8	Sugar refining		Sugarcane refining	10.0m^3/t (sugarcane)
			Beet sugar refining	4.0m^3/t (sugar beet)
9	Tanning industry		Wet salt pigskin	60.0m^3/t (raw leather)
			Dry cowhide	100.0m^3/t (raw leather)
			Dry sheepskin	150.0m^3/t (raw leather)
10	Brewing and distilling industry	Alcohol production	From corn	100.0m^3/t (alcohol)
			From potatoes	80.0m^3/t (alcohol)
			From molasses	70.0m^3/t (alcohol)
		Chemical seasonings industry		600.0m^3/t (chemical seasonings)
		Breweries (Discharge volume excludes germination liquid.)		16.0m^3/t (beer)
11	Chromates industry			5.0m^3/t (end product)
12	Sulfuric acid industry			15.0m^3/t (sulfuric acid)
13	Jute degumming industry (washing method)			500m^3/t (raw jute)
				750m^3/ (processed jute)
14	Viscose fiber and simple fiber industry	Short fiber (medium length cotton and wool)		300m^3//t (fiber)
		Long fiber		800m^3/t (fiber)
15	Chemical fiber pulp industry			Unbleached: 150m^3/t (pulp) Bleached: 240m^3/t (pulp)
16	Pharmaceutical preparation and medicine raw materials	Penicillin		4700m^3/t (penicillin)
		Streptomycin		1450m^3/t (Streptomycin)
		Terramycin		1300m^3/t (Terramycin)
		Macromycin		1900m^3/t (Macromycin)
		Lincomycin		9200m^3/t (Lincomycin)
		Aureomycin		3000m^3/t (Aureomycin)
		Gentamycin		20400m^3/t (??Gentamycin??)
		Vitamin C		1200m^3/t (vitamin C)
		Chloromycetin		2700m^3/t (Chloromycetin)
		Sinomin		2000m^3/t (Sinomin)
		Vitamin B2		3400m^3/t (vitamin B2)
		Novargin		180m^3/t (Novargin)
		Phenacetin		750m^3/t (Phenacetin)
		Furazolidone		2400m^3/t (Furazolidone)
		Caffeine		1200m^3/t (caffeine)
17	Organophosphate fertilizer factories*	Dimethoate (Rogor)		700m^3/t (end product)
		Methyl parathion (liquid method)**		300m^3/t (end product)
		Phosphorus parasulfide (P2S method)**		500m^3/t (end product)
		Phosphorus parasulfide (PSCl3 method)**		550m^3/t (end product)
		DDVP (trichlorfon potassium decomposition method)		200m^3/t (end product)
		Trichlorfon		40m^3/t (end product) (Excludes effluent from production of trichloroacetaldehyde)
		Malathion		700m^3/t (end product)

18	Herbicide industry*	Nitrofen (NIP, TOK)	5m^3/t (end product)
		Sodium pentachlorophenoxide	2m^3/t (end product)
		Sodium pentachlorophenol	4m^3/t (end product)
		Dichloromethane	14m^3/t (end product)
		2.4-D	4m^3/t (end product)
		Butylamin	4.5m^3/t (end product)
		Chlorotoluron (reduced using Fe powder)	2m^3/t (end product)
		Chlorotoluron (reduced using Na_2S)	3m^3/t (end product)
19	Thermal power generation industry		3.5m^3/ (MW.h)
20	Freight train washing facilities		5.0m^3/unit
21	Movie film developing		5m^3/1,000m (35mm film)
22	Petroleum asphalt industry		Rate of recycling water from cooling ponds: 95%

Notes
* Calculation based on 100% product concentration.
** Excludes effluent from P2S5, PSCl2, and PCl3 raw material production.
Source: For Tables 1-3-1a, 1-3-1b, and 1-3-2, the information being made public on the website of the Sino-Japan Friendship Center for Environmental Protection (http://www.zhb.gov.cn/japan/) was edited and other information added based on data published by SEPA.

(2) Wastewater monitoring

Three methods of industrial wastewater monitoring are employed by environmental administrations: regular monitoring, irregular monitoring, and online monitoring. Regular monitoring and irregular monitoring without prior notice are generally conducted annually. Online monitoring targets COD as regards water quality, but is performed by only small number of factories as yet. SEPA's stated policy is to encourage as many factories as possible to adopt online monitoring in the future, but because the factory itself must bear the costs of installing and operating the necessary instruments and equipment, for local industries the outlay appears quite onerous.

Although factories are not legally obliged to monitor effluent, a factory may be requested to install an online monitoring system by the Environmental Protection Bureau (EPB) of the area in which it is located. Such requests are advisory in nature, but the factory cannot refuse to comply. In the future, through the requirement for online monitoring for factories above a certain size, wastewater monitoring in China looks likely to become mandatory in practice. In fact, one company in our survey, although not required to install an online monitoring system, has a contractor sampling and analyzing its effluent in order to voluntarily control the effluent water quality.

Section 4
Industrial Waste Management

1. Entering a New Phase in Industrial Waste Management

Counted as one of the "three wastes," alongside waste gas (air pollution) and wastewater (water pollution), solid waste in China is now one of the country's main environmental problems. Rapid economic growth, particularly over the last decade or so, has been accompanied by a dramatic increase in both household and industrial waste (generally called "industrial solid waste" in China) as well as in household waste. In urban areas and elsewhere in country, solid waste has become an issue demanding urgent solution.

In response, the Chinese government has embarked on a program to tackle solid waste. The Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste was enacted in 1996. In the Ninth Five-Year Plan for National Environmental Protection (1996 - 2000), and in the following Tenth Five-Year Plan for National Environmental Protection (2001 - 2005), measures to combat solid waste, particularly industrial waste, are prioritized as key areas along with air and water pollution measures. The Five-Year Plans map out policies promoting the establishment of waste treatment facilities and the "comprehensive use" (recycling) of industrial waste. As a specific target, the Tenth Five-Year Plan calls for a 10% reduction in industrial waste from 2000 levels by 2005. In tandem with these waste management initiatives, the building of a "recycling-based society " has become a key concept in recent years in discussions of future environmental issues in China. The Law on the Promotion of Cleaner Production, aimed at encouraging companies to practice conservation and effective utilization of resources, was enacted in January 2003. A number of other recycling-related laws, such as the Household Appliance Recycling Law (provisional title), are planned as China enters a new phase in waste management.

Implementation of waste controls in China is based fundamentally on the aforementioned Law on the Prevention and Control of Environmental Pollution by Solid Waste, which lays down a management framework and contains provisions relating to the collection, storage, transportation, and treatment of solid waste. In addition, the law incorporates provisions on reducing, reusing, and rendering waste harmless, responsibilities and obligations for recycling and management of solid waste, and penalty provisions. The law also makes any company that generates industrial waste responsible for its treatment. Practical implementation of the law is governed by decrees drafted and issued by local people's governments, taking into account the distinctive features of the specific area.

Solid wastes are classified under this law into three types: (1) Solid and semi-solid wastes generated by industrial activity (industrial waste); (2) waste generated in daily life and consumer activities (domestic waste); and (3) dangerous waste included in industrial and domestic wastes (hazardous waste). China also has pollutant discharge fees which are levied if a company, whether or not it has storage facilities, stores industrial waste in a site that lacks any measures for protecting the environment (against seepage or scattering of the waste, for example), or buries toxic waste in a manner that does not meet the standards relating to hazardous waste.

Of these three types of waste, hazardous industrial waste is relevant to Japanese companies' environmental practices. Substances to be controlled as hazardous waste are specified in the National Catalogue of Hazardous Wastes, published in 1998 and based on the Law on the Prevention and Control of Environmental Pollution by Solid Waste. The classes of hazardous waste defined in the catalogue comply with the Basel Convention. Hundreds of different types of waste are listed by substance name in roughly 60 groups. Toxic substances, substances that carry a high environmental risk, and wastes that are difficult to treat or dispose of by ordinary means, such as PCBs, medical waste, and fly ash emitted from waste incinerators, are categorized as scheduled hazardous wastes.

According to the State Environmental Protection Administration (SEPA), 945.09 million tons of industrial waste were generated in 2002, of which 10 million tons were hazardous waste. However, only 26.35 million tons of the total industrial waste (including 17,000 tons of hazardous waste) were sent off-site. This means that rest was recycled or treated, or is being stored on-site or at external locations. The total volume of industrial waste dumped or being held in storage for a long length of time is estimated to exceed 7 billion tons. Treatment of this waste is regarded as an important future issue.

2. The need for more treatment facilities to cope with hazardous industrial waste

Of the industrial waste generated by Japanese companies, substances classed as hazardous waste are subject to the storage, treatment, and transportation procedures laid down in the Law on the Prevention and Control of Environmental Pollution by Solid Waste. Treatment and transportation of hazardous waste must be contracted to a licensed operator. The following types of hazardous waste are likely to be generated at the factories of Japanese companies:

- Waste mineral oils
- Wastes resulting from the production, formulation, and use of inks, dyes, pigments, lacquer, and varnish
- Wastes resulting from the production, formulation, and use of resins, latex, plasticizers, and adhesives
- Wastes resulting from the surface treatment of metals and plastics
- Hexavalent chromium, copper, zinc, arsenic, selenium, cadmium, antimony, mercury, tellurium, thallium, lead, fluorides, inorganic cyanide compounds, acids in liquid or solid form, bases in liquid or solid form, organic phosphorus compounds, organic cyanide compounds, phenol and its compounds, halogenated organic solvent, PCBs, dioxins, etc., and other wastes containing any of these substances

Final disposal of these hazardous wastes can be categorized in general terms as either of two methods: incineration or stabilization plus landfill. If the incineration ash contains heavy metal residues, it must be further stabilized by cement solidification.

Under the Tenth Five-Year Plan for National Environmental Protection, comprehensive treatment facilities for hazardous waste are to be built in eight locations in China by the target year, 2005. However, as of February 2004 when our field study was conducted, there was apparently only one treatment plant in China capable of handling the incineration, stabilization, and landfill of hazardous waste in a comprehensive fashion. This is the Tianjin Integrated Hazardous Waste Treatment Center, established in 2003. Said to be technically world-class, the treatment center was constructed at a total cost of 130 million yuan (approximately 2 billion yen), financed by the central government, a French engineering company, and four local industries. Its annual waste treatment capacity is 13,500 tons of waste incineration and 6,200 tons of landfill waste. Capacity for decontamination and recovery processing of heavy-metal-containing effluent and waste solvents is 10,000 tons annually. The treatment charges are determined by the government and published on the Internet.

As an example of treatment charges at the center, the charge for incineration of waste oil, waste copier toner and other burnable wastes is RMB 3/kg (approximately JPY 45/kg), including transportation costs. This is comparable with treatment costs in Japan, but is actually extremely expensive, given that general price levels in China are about one fifth those in Japan. This presents a considerable burden for most local companies.

Prior to completion of the Tianjin Integrated Hazardous Waste Treatment Center, Japanese companies that generate hazardous waste have had to store it on-site over the many years since they began operations in China. There were contractors who would accept hazardous waste for a price, but the company generating the waste would be putting its reputation at enormous risk if it was discovered that the waste had been illegally dumped and its source came to light.

In Beijing, there are three companies that provide waste incineration only. Waste oil and other such substances generated in Beijing are treated at these plants. Incineration facilities are apparently available in other cities, too.

Hazardous waste unfit for incineration is trucked to the country's one and only Tianjin treatment facility from cities as far away as Shanghai in the south, and Shandong and Hebei in the north. Construction of seven more hazardous waste treatment facilities is planned, one in each of seven cities, including

Shanghai and Guangzhou. The Chinese government apparently believes that encouraging competition by allowing more than one plant per city would result in operators discounting prices and cutting corners. In the future too, the government will likely allow only one waste treatment plant per area.

For hazardous waste, a manifest system is in place, for tracking waste movement from the waste source factory to the waste treatment facility. The source company, haulage contractor, and waste treatment operator, in that order, fill in a manifest form. After the waste is treated, the form is submitted to the Environmental Protection Bureau (EPB) that has jurisdiction over the source company. The latter also receives a copy of the form. The details noted by each of the parties are the name of the source company, the type of waste and volume to be treated, the name, license number and contact details of the haulage contractor, and the name, license number, treatment method and contact details of the waste treatment operator. Any waste material to be treated for recycling that is classed as hazardous waste must also be consigned to a licensed waste treatment operator. In this case, the operator buys the waste, but the same manifest system applies.

In summary, hazardous waste management in China is ostensibly advanced as a control framework incorporating a manifest system, but the slow progress on establishing comprehensive waste treatment plants is a major issue. At present, with only one such facility in the whole country, the only options for Japanese companies wanting to deal with their hazardous waste in line with the law are to contract waste treatment to that one plant or to store the waste on-site. If they do choose the treatment plant, the waste may have to be transported nearly 1,000 km across the vast land of China to Tianjin where the plant is located, which is hardly realistic. It is anticipated that even more Japanese companies will locate in China in the future, making the management of hazardous waste a major issue that needs to be addressed.

According to a recent newspaper report, in January 2004 the State Council approved a plan for establishing new treatment facilities for hazardous and medical waste. Over the three years until 2006, approximately RMB 15 billion (JPY 225 billion) will be spent on constructing 31 hazardous waste treatment centers nationwide, providing a treatment capacity of 2.82 million tons annually. If this plan comes to fruition, albeit with some delay on the completion date, China's hazardous waste problem will reach a turning point.

Section 5

Soil Pollution Management

1. China's Soil Pollution Regulations

The need to address soil contamination at factory sites

As well as measures on waste gas, wastewater, and solid wastes, the need to address soil pollution should not be forgotten by Japanese companies operating in China.

In Japan, under the Soil Contamination Countermeasures Law, which came into effect in February 2003, soil pollution at factory sites is strictly controlled and the land owner is required to take remedial action if soil contamination is evident. In China, the Environmental Quality Risk Assessment Criteria for Soil at Manufacturing Facilities came into effect in 1999, as a State Environmental Protection Administration (SEPA) standard (HJ/T25-1999). Like the treatment of hazardous waste, this SEPA notice makes treatment of contaminated soil the responsibility of the company that caused it. Thus, any Japanese company that causes soil pollution would be liable for extremely costly clean-up operations.

In the notice, soil quality is controlled under two separate criteria. The first applies to soils where the groundwater flows are not used or contemplated for use as a drinking water source; the other applies to soils where the groundwater flows are used for drinking water. For both soil categories, the standards describe acceptable levels in terms of the concentration of soil pollutants. That is, if the concentration of soil pollutants exceeds the criteria, the same treatment is required as for hazardous waste. Where the groundwater is not used as drinking water, the maximum level of pollutant concentration in the soil is such that direct exposure to the skin causes no risk to human health. Where the groundwater is used as drinking water, the maximum pollutant concentration in the soil is such that the groundwater poses no health risk even when rainwater penetrates and dissolves the substances in the soil. The notice also gives water quality standards for groundwater at factory sites.

The soil quality standards include a huge number of parameters, 89 in all, and a maximum concentration is set for each parameter for each of the two soil categories described above. In Japan's Soil Contamination Countermeasures Law, pollutants are regulated using 25 parameters known as "specific hazardous substances." For each of these 25 parameters, a standard value is set, based on the concentration of the pollutant in the test solution when a leach test using weakly acidic water is performed on the soil. Japan also has specified concentration limits in soil for nine of the most frequently encountered soil contaminants, including cadmium, hexavalent chromium, and arsenic. As China's regulatory methods are different from Japan's, it is not possible to compare values for all parameters. However, if we take just the nine parameters controlled under Japan's Soil Contamination Countermeasures Law, and compare them against the standards in China for the same parameters, we obtain the comparative values shown in Table 1-5-1.

Table 1-5-1: Comparison between China's soil quality standards and Japan's corresponding standard

(mg/kg)

No	Parameter	Standard in case of groundwater not used as drinking water	Standard in case of groundwater used as drinking water	Japanese standard*
1	Total cadmium	3,790	147	150
2	Hexavalent chromium	189,000	1,470	250
3	Total cyanide compounds	75,800	5,860	50 (free cyanide)
4	Total mercury	1,140	88	15
5	Total selenium	18,900	1,470	150
6	Total arsenic	44	3.4	150
7	Lead and its compounds	--	--	150
8	Fluorine and its compounds	--	--	4,000
9	Boron and its compounds	--	--	4,000
Remarks		Standards are prescribed for further 80 parameters, 89 in total.		Standards are prescribed by the leach test method for further 25 parameters.

Source: Regulations for the enforcement of the Soil Contamination Countermeasures Law, December 26, 2002, Attached Table 3.

Looking at total cadmium, a very high concentration of 3,790 mg/kg is set as the soil standard where groundwater is not used as drinking water. The corresponding standard of 147 mg/kg where groundwater is used as drinking water is quite similar to the 150 mg/kg Japanese standard. For the other soil concentration standards where groundwater is not used as drinking water, very high figures are given for all parameters except total arsenic. Where groundwater is a drinking water source, the Chinese standards are again higher than in Japan except for total arsenic (3.4 mg/kg), which is extremely low compared with the Japanese standard of 150 mg/kg. Lead, fluorine, and boron are controlled parameters in Japan, but unregulated in China. The reason for lead's absence in the soil quality standards, although it is a controlled parameter in the wastewater and waste gas standards, is unknown. It will apparently be added when the soil quality criteria are revised.

No criteria are indicated as to the future use of groundwater as a drinking water source. Even if the groundwater is not currently being used for that purpose, it would be reasonable as a risk measure to adopt practices that meet the soil standards for drinking water sources.

An effective means of monitoring soil contamination at factory sites is to sample the groundwater. As yet, none of the Japanese companies in China visited in the course of this research was performing groundwater monitoring. Some Japanese companies in Singapore were monitoring groundwater at the time of our 2002 study in that country. There, sampling wells had been dug at points on the upstream and downstream boundaries of the groundwater flowing through the factory site, and the water quality was being regularly monitored. Monitoring serves two purposes: Firstly, to ascertain the extent of soil contamination before factory construction, and, secondly, to monitor the present soil status. Although not legally required to do so at the present time, Japanese companies operating in China will need to carry out groundwater monitoring in the future as a risk management precaution.

Essential to groundwater monitoring is a water quality standard for judging whether the groundwater is contaminated. In the Environmental quality risk assessment criteria for soil at manufacturing facilities, the same 89 parameters used as soil quality criteria are set as groundwater standards, three times as many as the 25 parameters specified in Japan's Soil Contamination Countermeasures Law. China and Japan have 16 parameters in common, but otherwise use different parameters. Table 1-5-2 lists the 16 common parameters which are likely to be of most relevance to Japanese companies. Except for total arsenic and 1,1-dichloroethylene, all of the Chinese government standards are many times more lenient than Japan's standards.

Table 1-5-2: Groundwater standards

(mg/liter)

No.	Parameter	Chinese government standard	Japanese standard
1	Dichloromethane	0.201	0.02
2	1,2-Dichloroethane	0.0166	0.004
3	1,1,1-Trichloroethane	3.02	1.0
4	1,1,2-Trichloroethane	0.0265	0.006
5	Carbon tetrachloride	0.0116	0.002
6	1,1-Dichloroethylene	0.00251	0.02
7	Sis-1,2-dichloroethylene	0.862	0.04
8	Ethylene trichloride	0.137	0.03
9	Tetrachloroethylene	0.029	0.01
10	Benzene	0.052	0.01
11	Total arsenic	0.00101	0.01
12	Total cadmium	0.0431	0.01
13	Hexavalent chromium	0.431	0.05
14	Total mercury	0.0259	0.0005 (Alkyl mercury not detectable)
15	Total selenium	0.431	0.01
16	Total cyanide	1.72	Not detectable
		Total 89 parameters	Total 25 parameters

Section 6

Efforts by Local Environmental Administration

- Tianjin Case Study -

Environmental Protection Bureaus at local administrative levels

As mentioned in Section 1 of this chapter, China's environmental administration is headed by a national authority, the State Environmental Protection Administration (SEPA), under which are a hierarchy of local administrations at the provincial level (provinces, autonomous regions, and municipalities directly under the central government), city level, and county level (counties and districts). Each of these local administrations has an Environmental Protection Bureau (EPB). At the town and village level, one level below the county level, the local governments have an Environmental Protection Section. The local government departments related to land use, mining, forestry, agriculture, and water utilization at the county level and above are charged with managing and overseeing nature conservation and resource protection in their respective areas of jurisdiction, in accordance with the relevant laws and regulations.

For Japanese companies operating in China, factory construction and the various other procedures related to the environment, such as day-to-day environmental monitoring and payment of pollutant discharge fees (pollution levies), are basically conducted through the EPB of the area in which the factory is located. The local EPB thus serves as an immediate point of contact in administrative matters.

During our field study, we had an opportunity to visit the Tianjin Environmental Protection Bureau (TianjinEPB). Its environmental programs are discussed briefly below as representative of local environmental administrations in China. It should be noted, however, that as one of the four major municipalities directly under the central government, and an economically advanced area of China, Tianjin has a very high level of administrative capability. TianjinEPB initiatives and programs are therefore at the top level among local environmental administrations in China.

600 employees engaged in Tianjin environmental governance

The TianjinEPB is a provincial-level local environmental administrative authority with jurisdiction over the whole Tianjin area. Established in 1980, it has 17 departments related to air quality, water protection, environmental monitoring, environmental administration, international cooperation, and so on. As of the end of 2003, the TianjinEPB had 105 employees. The 21 counties and districts that make up the Tianjin administration each have a county-level (district-level) EPB to which the TianjinEPB provides advisory services. These 21 county-level EPBs have 467 employees in total. Counting the EPBs at each level within Tianjin, nearly 600 employees are engaged in day-to-day environmental controls and related administration. In addition, Tianjin has 13 external entities, such as waste treatment facilities, that offer environmental services and operate on an independent financial basis.

The TianjinEPB has a wide range of responsibilities. They include: (1) Drafting and implementing plans for environmental protection; (2) Approving environmental impact reports; (3) Inspecting facilities that discharge pollutants; (4) Making inspections in regard to the "three synchronizations" system and approving pollution treatment facilities; (5) Collecting and registering pollution discharge data; (6) Levying pollutant discharge fees; (7) Enforcing penalties on polluters and applying to the People's Court for compulsory enforcement; (8) Preparing environmental news bulletins. Among these diverse responsibilities, the TianjinEPB's key tasks are monitoring (inspection) of facilities that discharge pollutants and enforcement of environmental legislation. Each of the 21 county-level EPBs in Tianjin has an environmental monitoring station. In 2002, these environmental stations carried out inspections of 8,454 factories licensed to discharge pollutants. Of these, pollution control deadlines, requiring compliance within a set period of time, were applied to 958 factories that exceeded the emission standards, and 88 factories that caused serious pollution were ordered to shut down. The EPB monitoring and supervision teams that carry out on-site inspections also levy pollutant discharge fees, we were told.

In this survey, we visited four Japanese companies in Tianjin. All of these companies handled environmental procedures through the EPB in their district and had received on-site inspections by their district EPB. Most of the latest information on environmental regulations also came from the district EPB.

To gauge the effectiveness and rate of implementation of environmental monitoring, the TianjinEPB requires large-scale factories that generate wastewater or waste gas to install online monitoring devices by the end of 2005. In regard to wastewater, the requirement applies to factories that have minimum daily discharge rates of 100m^3 wastewater, 30kg COD, and 27kg ammonia nitrogen. In regard to waste gas, the requirements target key industries, such as thermal power plants, that need to control air pollution. The online monitoring equipment installed in the factory is connected to the EPB of the district or county in which the factory is located, and to the TianjinEPB. The equipment costs are borne by the particular company, but penalties are imposed if any company refuses to install such equipment.

Stringent local emission standards for boiler flue gas

Tianjin's environmental policy, like that of the central government, focuses on air pollution, water pollution, and hazardous waste management.

In regard to air pollution, Tianjin is a designated "SO_2 control zone," a key area for reducing air pollution. Tianjin is also targeted to become one of China's model cities for air pollution control by the end of 2004. To achieve this objective, stronger controls on emission sources and incentives for fuel conversion are being aggressively pursued. In 2002, the Blue Sky Program was launched, aimed at reaching National Ambient Air Quality Standard Grade II (air quality standard deemed suitable for urban areas) on a minimum of 80% of the 365 days of the year. The legal backing for these air pollution controls is the national Law on the Prevention and Control of Atmospheric Pollution and the Tianjin Air Pollution Prevention Ordinance, enacted by the People's Congress of Tianjin in July 2002. Based on these statutes, Tianjin is implementing controls on factories and other stationary emission sources, and on mobile emission sources such as automobiles. To prevent fugitive dust emissions from factories, roads, demolition and construction sites as well as from coal stockyards and other powder stockyards, Tianjin is introducing strict controls for preventing scattering of particulate matter.

Of particular note are Tianjin's local regulations for boilers, which are considerably more stringent than the national standards. These regulations are based on the Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boiler, issued by the Tianjin government in October 2003. For example, in regard to the sulfur dioxide content of boiler flue gas, the limit for coal-fired boilers is specified in the national emission standards as 1,200 mg/m^3 for existing facilities (built prior to December 31, 2000) and 900 mg/m^3 for new facilities (built on or after January 1, 2001). In Tianjin, the maximum SO_2 emission levels are restricted to 400 mg/m^3 and 200 mg/m^3, respectively, which is more than three times stricter. Equally stringent standards are set for boiler emissions of soot and nitrogen oxides. To meet these standards, the use of coal fuel is banned in small boilers, and medium-size boilers are required to convert from coal to a clean fuel such as natural gas. The reason Tianjin has adopted such strict emission standards is that, under the national Law on the Prevention and Control of Atmospheric Pollution, areas that fail to meet the air quality standards are required to comply by the end of 2005.

Tianjin also has enacted and implemented offensive odor controls that are stricter than the national standards. These are the Tianjin Emission Standards for Odor Pollutants (effective January 1996).

In regard to water pollution, the 1994 Management measures for the prevention and control of water pollution in Tianjin was revised in January 2004 and incorporates a number of new provisions. These include: (1) Implementation provisions relating to total discharge controls; (2) Clarification of the penalties imposed for violation of the management measures; (3) Provision for contracting factory wastewater treatment to a specialist treatment operator certified by the TianjinEPB; (4) Special discharge controls for factories that manufacture products which could cause serious water contamination or readily cause water pollution. In the future, while tightening its existing water pollution controls through stricter supervision of emission sources, the TianjinEPB plans to develop new methods of dealing with water pollution and will shortly adopt a new regime of emissions trading for specified water contaminants, targeting COD and ammonia nitrogen.

In regard to hazardous industrial waste, regulations tailored to local conditions have been put in place in Tianjin, regarding the licensing of hazardous waste treatment facilities and the implementation of a manifest system for the movement of hazardous waste. The regulation about waste treatment licensing sets out in detail the approval criteria for hazardous waste operators. To date, eight companies have been licensed as waste recyclers under the terms of this regulation, and one company has been licensed as an integrated waste treatment operator permitted to incinerate, stabilize, and landfill hazardous waste. This integrated hazardous waste treatment company is partly owned by Tianjin city (for details, see Section 4 in this chapter).

The regulation about manifests sets out details about implementing a manifest system for tracking the movement of hazardous waste from the generation source to the final disposal site. In China, hazardous waste must be treated and disposed of basically within the provincial-level administration area in which it is generated. As a special case, however, if there are no treatment facilities in the area or if it is considered better for the company to contract a treatment facility in another location, hazardous waste may be moved to another province for treatment. In such cases, with the approval of the provincial-level EPBs in both the source and destination areas, hazardous waste may be transported across provincial borders in accordance with the manifest system for hazardous waste movement. Regardless of where the waste is going, transportation of hazardous waste also requires a license to be obtained from the Tianjin Public Safety Department and Traffic Management Department.

Chapter 2

Environmental Conservation

by Japanese Companies in China

: Case Studies of Corporate Practices and Policies

In this chapter we present 14 case studies of practical environmental measures implemented by Japanese companies, primarily in the manufacturing sector, and based on a survey conducted during visits to 12 Japanese companies active in the cities of Beijing and Tianjin in the People's Republic of China.
Section 1 presents an outline of the implementation of environmental measures by Japanese companies in China, and is followed by presentation of the 14 case studies in Section 2, 3, and 4.
Section 2 presents six case studies of implementation of advanced measures to reduce discharge of pollutants.
Section 3 presents three case studies of implementation of improvements in environmental management systems.
Section 4 presents five case studies of implementation of other improvements for environmental protection.

Section 1
Japanese Companies in China and Environmental Measures

The survey was conducted between December 2003 and January 2004 during visits to 12 Japanese companies active in the cities of Beijing and Tianjin in the People's Republic of Chin in which the companies were asked the practical details of the environmental measures implemented. The majority of the companies surveyed were in the manufacturing sector, with the remainder being engaged in distribution (supermarkets) and transport. Factories of companies in the manufacturing sector were visited, and the implementation of environmental measures surveyed at the site of the relevant business activity. Eight of the companies visited were located in the city of Beijing, and four in the city of Tianjin.

All of the Japanese companies surveyed in the manufacturing sector have made considerable investments in equipment for environmental measures directed at waste gas and waste water, and have taken a positive approach to the implementation of measures which satisfy emissions standards to a significant extent. Furthermore, companies in non-manufacturing sectors where a direct environmental load is not generated are engaged in social contributions indirectly promoting awareness and resolution of environmental problems.

Some Japanese companies have noted cases of unnecessary investment in environmental equipment required due to disagreements within the Chinese bureaucracy, and bewilderment as a result of sudden changes in regulations by the Environmental Protection Bureau.

1. Japanese Companies in China and Environmental Measures

Full ownership by Japanese companies in China increasing

A variety of statistics are available on the number of Japanese companies active in China, however if sales bases of manufacturing operations, branches of non-manufacturing operations, and representative offices are included, the figure is between 15,000 and 20,000 companies. The great land area of China, among other factors, has resulted in the number of Japanese companies active in China being an order of magnitude greater than is the case in South East Asia (e.g. Thailand, Indonesia). Entry of Japanese companies into China began in earnest in the 1990s, and reached a peak between 1994 and 1995. Subsequently, factors such as the long recession in Japan resulted in a decrease, however since 2000 the number of Japanese companies active in China is again increasing. Reasons given for the entry of Japanese companies into China include the availability of plentiful and cheap labor of excellent quality, and the massive Chinese consumer market for population of approximately 1.3 billion, however in addition to these fundamental reasons, the primary reasons for the renewed increase since 2000 are the development of manufacturing bases in China by the major Japanese automobile and electronic equipment manufacturers as a means of reducing costs, and the entry of associated small and medium parts manufacturers and materials manufacturers. Furthermore, the entry of China into the World Trade Organization (WTO) in December 2001 and the liberalization of the environment for investment and various restrictions have provided additional incentives.

Approximately half of the Japanese companies active in China are located in the city of Shanghai, Guangdong Province, and the Yangtze Delta in Jiangsu Province. According to the 2001 Overseas Business Activities Yearbook published annually by Toyo Keizai Shinpo Inc., of 2525 Japanese companies recorded, 663 companies (26.3%) were established in the city of Shanghai, followed by 352 in Jiangsu Province, 327 in Guangdong Province, 252 in the city of Beijing, 246 in Lianoning Province, 155 in Shandong Province, and 149 in Tianjin Province, the majority being established in the Yangtze Delta, and in the Hebei and Dongbei regions (excluding the city of Beijing). The Japanese Chamber of Commerce in China which provided support in conducting the current survey has approximately 550 registered members, being primarily Japanese companies in the Beijing area.

A breakdown of the Japanese companies in the manufacturing sector shows that at the beginning of 1990 the majority were engaged in textile manufacture, the proportion engaged in electrical, electronic, chemical, and transport equipment manufacture had increased from the mid 1990s, and that there has been a vigorous entry of materials manufacturers since 2000. Furthermore, the investment format of Japanese companies in China includes full ownership, joint ventures, collaboration, and consignment manufacture, with the full ownership format becoming increasingly common in contrast to the joint venture format of previous years. This is a result of changes in the legislation relating to foreign investment associated with China joining the WTO, and the consequent major liberalization of the investment ratio for foreign enterprises. A survey conducted by JETRO (Japanese External Trade Organization, an independent administrative entity) shows that of Japanese companies established in China prior to 1999, 48% were full ownership, and that this proportion had increased to 76% for companies established in 2000 or later. Furthermore, this proportion had increased to 80% in 2001, and to 86% in 2002. The increase in the full ownership format has allowed introduction of advanced environmental measures without the need for decisions based on consultations with a joint venture partner, and has had a positive effect on environmental measures implemented by Japanese companies in China.

Of the 12 companies visited in the current survey, eight were established in the city of Beijing, and four in the city of Tianjin. One company was established in each of the years 1993, 1994, 1995, 1997, and 2000, three in 1996, and four in 1998. Ten of the companies were engaged in the manufacturing sector, and two in non-manufacturing. Those involved in manufacturing were variously engaged in the areas of electronic and electrical equipment, transport equipment, pharmaceuticals, foodstuffs and liquor, cosmetics, and printing. Those involved in non-manufacturing were engaged in distribution (supermarkets) and transport. The majority of the ten companies engaged in manufacturing were located in areas designated as specialized industrial areas such as development zones, production bases, and

industrial districts (hereafter referred to as ‘development zones’).

Japanese companies implementing advanced environmental measures not only satisfying regulations

As introduced in Chapter 1, China’s environmental problems are severe after a period of rapid industrial growth extending over a quarter of a century. In addition to resolving concerns over the supply of electricity, and water shortages, the need to resolve the problem of pollution is essential for the continued stable economic growth of China. Furthermore, the environmental awareness of the people of China is increasing with the prospect of the Beijing Olympics in 2008, and the Shanghai Expo in 2010, and both central and regional government are unable to avoid the need for serious measures to deal with pollution. On the other hand, in parallel with the strengthening of conventional anti-pollution measures, China has recently commenced a transformation to a recycling society, and it is expected that a range of recycling-related legislation, notably the ‘Domestic Electrical Appliance Recycling Law’, will be implemented in future. As it is expected that preparation of an environmentally-related system of laws incorporating aspects of those of Japan, Europe, and the US will accelerate, Japanese companies entering China will be expected not only to respond to pollution regulations, but to positively embrace a wide range of environmental measures.

In particular, the region incorporating the cities of Beijing and Tianjin, the areas of the current survey, exhibits similar levels of high economic growth to the Yangtze Delta region centered on Shanghai, and the power of the regional administrative authorities, notably the environmental authorities, is considerable. For this reason, Japanese companies in the region are required to satisfy a variety of environmental regulations, including additional emissions regulations imposed by the authorities in these two cities, and are subject to highly effective environmental monitoring to ensure that these regulations are followed. Some factories have been required to install online monitoring equipment in order to increase the efficiency of monitoring, and are subject to on-site inspections once or twice annually, and checks to ensure that emissions standards are followed. If found to be in contravention of environmental regulations, improvements within a fixed period are ordered based on a time-limited pollution prevention system, and if improvements are not possible, administrative measures such as suspension of operations or factory closure may be implemented, rather than simple imposition of a fine.

Furthermore, the “Three synchronization” system for the prevention of environmental pollution requires prescribed environmental procedures during the factory design and construction stages, and formal operations are permitted only after environmental measures are inspected and found satisfactory.

Within this context, the Japanese companies visited in the survey were therefore all involved in implementation of a thorough program of environmental measures. The ten companies engaged in the manufacturing sector had implemented anti-pollution measures to conform strictly to the Chinese system of environmental legislation focused measures in the ‘Three Wastes’ (waste gas, waste water, waste products) program. Since these measures include some regulations more severe than the equivalent in Japan, and some not present in the Japanese system, large amounts of investment for installation and modification of environmentally-related have been required in some cases. A number of Japanese companies were notable for their positive approach to environmental measures, and not only satisfied the environmental regulations, but set voluntary standards in excess of the emissions criteria and implemented environmental measures at a higher level, incorporated stepped reduction in pollutants in action plans based on ISO14001, and were engaged in the implementation of a planned reduction of emitted pollutants. Of the two companies engaged in non-manufacturing, the company involved in distribution was engaged indirectly in environmental measures through contributions to China’s social problems, for example, reducing the difference between rich and poor, and providing employment. The company involved in transport was engaged in incorporating environmental measures associated with truck transport into preparations for planned full development of its operations.

All Japanese companies surveyed were Chinese subsidiaries of major Japanese companies, and considered implementation of environmental measures as a normal part of daily operations. Environmental measures were not considered to be special, and their implementation was seen as

providing cost reductions through savings in energy and resources. These companies have been highly praised by the Environmental Protection Bureau – 'Japanese companies have implemented environmental measures exceptionally well, have strictly followed the legislation, and have given no cause for complaint'.

Japanese companies also implementing voluntary stepped reductions in sulfur dioxide emissions

All ten Japanese companies visited engaged in the manufacturing sector were involved in production processes having a relatively low environmental load such as assembly work, and manufacture of foodstuffs and pharmaceuticals, and located in specialized industrial areas being development zones. The environmental measures concerning these Japanese manufacturing companies were focused on measures to deal with waste gas and wastewater.

The measures implemented by company B and described in detail in Case 2 in Section 2 of this chapter are representative of waste gas measures. Sulfur dioxide pollution of the atmosphere resulting from combustion of coal is a serious problem in China. The use of three large coal-fired boilers by company B therefore required implementation of measures to deal with sulfur dioxide in the waste gas from the boilers. Since the city of Tianjin where the factory is located has implemented additional emissions regulations which are approximately twice as strict as the national emissions standards, measures have been taken to reduce the sulfur content of the coal used as fuel, and equipment to wash the waste gas with water has been added to the waste gas treatment equipment, so that emissions standards have been satisfied since commencement of operations in 1998. Upon receiving ISO14001 certification, the company proposed a planned reduction in sulfur dioxide in excess of the emissions regulations in which, based on the sulfur dioxide emissions of each production unit for 2001 as 100%, emissions are to be reduced each year so that in 2005 emissions will be reduced to 40%. To achieve this target, the company made improvements to waste gas washing equipment added to the waste gas treatment equipment, and reductions targets for 2002 and 2003 have been achieved.

The positive approach to implementation of these advanced improvements is a function of the plentiful experience of Japanese companies in measures designed to deal with atmospheric pollution previously implemented in Japan, and provides Chinese regional enterprises, and others, with an excellent point of reference for measures to deal with atmospheric pollution.

Furthermore, most Japanese companies operating small boilers in Tianjin have been required to convert from coal to clean fuels such as kerosene and natural gas. Some of the companies visited were suddenly ordered to cease use of coal by the Environmental Protection Bureau without prior notification, and without a grace period, the normal method of implementing changes in regulations in China, resulting in considerable confusion on the part of personnel responsible for environmental matters in the companies. As an order of the agency cannot be challenged, rapid, and considerable, investment was required for the reconstruction of the boiler equipment in some cases.

Superior measures to deal with wastewater through major investment and wise design

Most of ten Japanese companies visited engaged in the manufacturing sector had implemented measures to deal with a further important environmental problem, that of wastewater. As described in Section 3 of Chapter 1, standards for COD and ammonia nitrogen in the Chinese wastewater standards are more strict than is the case in Japan, and some restrictions not present in the Japanese legislation, for example, nickel, are also employed. Furthermore, as with waste gas restrictions, regional governments may apply more stringent restrictions beyond the national emissions standards, or add parameters in the restrictions.

As a result, a number of cases were noted in which Japanese companies had expended considerable sums in construction and operation of wastewater treatment equipment. Of these, a company generating wastewater from the plating process (see Case 1 in Section 2) has added improvements to the wastewater treatment process, and employs an absorption process using chelate resin, used in Japan in the production of pure water, to remove the trace amounts of copper and nickel from the final stage of the wastewater

treatment process, and thus satisfy the wastewater standards, albeit at considerable expense in terms of running costs. In order to satisfy the strict standards for SS, another Japanese company has employed a sand filter, rarely used in Japan, in the final stage of the wastewater treatment process (see Case 3 in Section 2). Setting of voluntary standards in excess of the existing wastewater standards, and advanced measures in wastewater treatment, are common.

While the companies in the survey have a proud record of promoting wastewater treatment, contradictions within Chinese administrative policy have resulted in unnecessary construction of wastewater treatment equipment in one case. This was a result of completion of central wastewater treatment site, and a relaxation of the relevant standards, soon after the company constructed a sophisticated wastewater treatment facility to satisfy strict wastewater restrictions, so that the facility became unnecessary (see Case 12 in Section 4). In this case, the company continued operating the facility, making effective use of the highly treated water by spraying it within the site, however one cannot escape the conclusion that the company was the victim of a mismatch between development and environmental policies. While the variety of environmentally-related procedures can be seen as an imposition on the companies active in China, collection of a wide range of information is necessary in environmental terms.

As described above, installation of equipment for the online monitoring of wastewater is required in some cases. While installation costs are borne by the factory, refusal to install such equipment results in a fine, so that there is no choice but to comply with an instruction from the Environmental Protection Bureau.

Storage of toxic waste in processing facility in factory for a period of six years

As part of measures to deal with industrial waste, all of the companies in the survey rely on contractors licensed by the Environmental Protection Bureau for processing of reusable material such as metal scrap, waste materials, and cardboard boxes, however handling of toxic industrial waste is problematic.

Factories of some of the companies in the survey discharge waste products specified as industrial waste products such as sludge containing heavy metals, waste oil, and asbestos. The companies generally rely on licensed waste disposal contractors for treatment of these toxic industrial waste products, however the treatment abilities of such contractors extends only to incineration. The city of Tianjin therefore legally required that toxic industrial waste products unable to be treated by incineration be stored by each company until the completion in 2003 of China's first comprehensive treatment facility capable of incineration, stabilization, and landfill disposal, and toxic waste products generated by one Japanese company were therefore stored at its factory for a period of six years between the commencement of operations in 1997 and completion of the comprehensive treatment facility in 2003. While a contractor was available to the receive the toxic waste products, it was assumed that the waste would simply be disposed of illegally by the contractor, and the image of the company would suffer once this was discovered. Other Japanese companies are also sensitive to illegal disposal, and a number track disposal by visiting the incineration site to ensure that the toxic waste has indeed been disposed off.

Opening of China's first comprehensive treatment facility in Tianjin in 2003 (see Chapter 1 Section 4) result in progress in measures for the disposal of toxic waste, and the problem faced by Japanese companies of storage of the waste on-site was alleviated. However, as many of the companies in the survey are located at a considerable distance from Tianjin, when transport of the waste over a long distance is impractical, on-site storage will become necessary in some cases. Under the Tenth Five-year National Environmental Plan, the development of similar treatment facilities will be promoted, and a new plan to accelerate the development of such facilities was announced in January 2004. Under any circumstances, development of a well balanced and distributed system of treatment facilities throughout the great expanse of China is considered a matter of great urgency.

As a further measure in dealing with waste products, a Japanese brewing company has implemented measures to ensure that empty bottles are reusable. Empty bottles are now collected from restaurants, major consumers of bottled beverages, and washed and refilled. While not classified as a manufacturing industry, the company engaged in distribution has installed boxes for recovery of used batteries, paper,

and plastic etc in front of its supermarkets. As described above, a variety of laws related to recycling, notably the 'Domestic Electrical Appliance Recycling Law' are scheduled, and related infrastructure and mechanisms will be required, and the cases noted here are the focus of attention from the point of view of developments in China similar to that in Japan.

Development of an ISO14001-based environmental management system

ISO14001 certification is considered the representative example of development of a voluntary environmental management system to provide a higher level of environmental responsibility than merely satisfying environmental requirements. As noted in Section 1 of Chapter 1, the Chinese government is engaged in the positive promotion of ISO14001 certification, and by the end of 2003, 5,000 companies had received certification. One of the first companies in China to receive ISO14001 certification in 1997 was a Japanese electrical equipment manufacturer.

Five of the 12 companies in the survey have already received ISO14001 certification, and have developed a well-organized environmental management system within the company. All companies have developed internal environmental management systems represented by top management, and employ a variety of numerical targets in the reduction of discharge of environmental pollutants, and conservation of energy and resources in terms of power consumption, water consumption, and fuel consumption etc. While reduction plans are normally implemented annually, some companies take a mid-term view by employing a three-year continuous plan in the development of continuous reduction activities. Furthermore, in one case, an environmental management manual produced as part of ISO14001 activities contains, in addition to the normal environmental measures for the prevention of atmospheric and water pollution, a manual dealing with the prevention of potential environmental pollution and emergency measures, as well as measures for the prevention of environmental risk. This identifies items liable to cause pollution in each workplace, and provides a plan to deal with pollution should it occur, and all employees are trained to ensure familiarity with the content of the manual. This company has clearly stated its policy of giving priority to ISO14001-certified companies in selection of its wide range of suppliers and contractors.

One point of concern with ISO14001 certification was the fact that a number of the companies in the survey not yet ISO14001-certified have policies to postpone certification. Reasons given for postponement include "the business has just started and we do not have time", and "gaining the international ISO9000 Series certification for quality management has priority", however it is hoped that certification be received as soon as possible to ensure a voluntary and progressive attitude to environmental matters. At the same time, as noted in Section 1 of Chapter 1, the costs of gaining certification in China are approximately one-seventh that in Japan, so that, provided the management of the company is willing, certification may be obtained relatively easily.

Personnel responsible for environmental matters in most of the companies visited were Chinese employees, operation of the equipment associated with environmental measures, and contact with the Environmental Protection Bureau, being left to these employees. Furthermore, companies gaining ISO14001 certification have Chinese personnel at each workplace responsible for promoting environmental matters, and have developed systems to promote the implementation of environmental measures throughout the entire company.

Development of a system to provide common environmental information to Japanese companies

In a similar survey conducted in the nations of South East Asia, problems appeared in relation to the effort expended by Japanese companies in the collection of information on environmental regulations, however in China a considerable amount of this information is available on the Internet. In practice, the companies in the survey commonly collect information other than that received from the Environmental Protection Bureau on the Internet. For example, the website of the Environmental Protection General Office (http://www.zhb.gov.cn), one of the primary sources of information, is comprehensive and well organized, and the various environmental legislation and standards for regulations etc are available in an easily understood manner. This website is in both Chinese and English, and a considerable amount of

information is available. Furthermore, the Japan-China Friendship Environmental Protection Center, established in Beijing in 1996 with Japanese funding, is staffed by Japanese environmental experts.

This Center is subordinate to the Environmental Protection General Office, however it has a Japanese website (http://www.zhb.gov.cn/japan) providing Japanese translations of Chinese environmental legislation and standards etc, and related news, and is very helpful in clarifying points which may be unclear in this field.

As is apparent from the above, China provides many sources of environmentally-related information, and for this reason, Japanese companies in China are relatively well provided for in comparison to those active in South East Asia.

On the other hand, information available from these sources is solely official policy. For example, even with the establishment of recycling-related legislation etc, and further development of the Chinese system of environmental legislation, while the system will outwardly resemble that of Japan, actual operation of the system of environmental legislation will be problematic due to, for example, a lack of specialists, and regional differences in the administrative abilities of the Environmental Protection Bureau. It is therefore unlikely that a national system equivalent to that of Japan, Europe, or the US will develop in the short term. For example, development of facilities for the treatment of toxic industrial waste is not as proceeding as planned.

It is therefore necessary to develop a system in which Japanese companies provide information they hold on both legislation etc readily available on the Internet, and the more detailed practical knowledge and information useful in dealing with environmental policies, for example, information such as that related to actual operation of the legal system, and treatment of toxic industrial waste, to a common pool. Availability of such a system will forestall cases such as that noted above in which a sudden change in regulations led to confusion, and avoid unnecessary investment in environmental equipment, as well as facilitate submission of proposals for improvements in the rational implementation of legislation as a group rather than as individual companies.

In South East Asia, where Japanese companies have a long history of activity, this type of system has been in place for some time providing an exchange of environmental information on a daily basis. Furthermore, in Malaysia, an organization within the Japanese Chamber of Commerce fulfilled this function, and submitted a petition to government in an attempt to reduce the cost of treatment and disposal of toxic waste.

It is anticipated that the development of this system will commence with the exchange of information between companies within individual development zones having a high proportion of Japanese companies, and progress to the provincial level within the area of jurisdiction of each regional government. Development of eco-business on a considerable scale is forecast for China. A large number of Japanese environmental engineering companies etc dealing with anti-pollution measures and recycling are present in China, and participation of these companies in the common holding of environmental information will improve the level of detail available.

While the system will initially inevitably be for the purpose of improving the ability of Japanese companies to deal with environmental matters, and to protect the interests of Japanese companies in terms of environmental regulations, its future lies in implementing the experience of Japanese companies in environmental measures in the Chinese context, and in promoting development of Chinese environmental measures.

Section 2
Case Studies of Advanced Measures to Reduce Discharge of Pollutants

When a regional government in China determines a need to reach environmental standards, it is able to set numerical levels exceeding those in discharge standards established by the national government, and to add new regulatory items. The current survey was conducted only in the cities of Beijing and Tianjin, however standards were found to be in excess of Japanese standards, or to include extremely strict numerical levels for items not covered in Japan. For example, standard levels for COD and nickel in wastewater, and lead and VOC in waste gas.

Japanese companies have installed advanced equipment not used in Japan, and invested large amounts of money, in order to satisfy the standard levels. For example, the use of chelate resin absorption treatment technology is normally employed in the production of pure water, to absorb copper and nickel.

Case 1 Satisfying Strict Wastewater Discharge Standards with Advanced Treatment Rarely Used in Japan

1) Outline of the company

Company A
Details of business: Electronics-related manufacturing.
Number of employees: 1100
Commencement of operations: 1998
Location of factory: Production base to the north of city of Beijing (Haidian District, Beijing)
Japanese equity ratio: 78.3%

2) Background

Company A is engaged in the manufacture of PCs, mobile phones, and electronic products employed in automobile control etc. The Japanese head office is a well-known company operating on an international scale. The mission of this factory is the manufacture of products cheaply and to the same level of quality as in Japan.

The manufacturing process generates wastewater containing heavy metals, and the standard values for wastewater set by the city of Beijing are considerably more strict than those employed in Japan. As there is no central wastewater treatment facility in the production base, the wastewater from the factory is discharged directly into the public water system, and thus strict standard values have been set. Expensive and advanced treatment technology was therefore adopted in order to reliably satisfy these standard values. The company has taken a positive approach to the environmental measures while being fully aware of the fact that the costs of wastewater treatment are reflected in product cost.

3) Details of measures implemented

a. Wastewater Treatment

The factory discharges wastewater from the plating process. Standard values set by the city of Beijing Environmental Protection Bureau are shown in Table 2-2-1.

Table 2-2-1: Wastewater standard values

(values other than pH are in measuring mg/liter)

Items	pH	COD_{Cr}	BOD	SS	Pb	Cu	Ni	Animal/ vegetable oil
Standard values	6.0 - 8.5	100	60	80	0.1	0.5	0.5	20
Reference								
Chinese government's standard value[1)]	6 – 9	150	30	150	1.0	1.0	1.0	15
Japanese standard value[2)]	5.8 - 8.6	160 [3)]	160	200	0.1	3.0	—	30

1) Values for Pb and Ni are standard values for Type 1 pollutants, others are Class II standard values for Type 2 pollutants.
2) Ministerial ordinances determining wastewater standard values are taken from the separate Tables 1 and 2.
3) Value according to COD_{Mn} method.

Levels other than BOD and animal fats are more strict than the standard values set by the Chinese government. These strict standard values have been added after being evaluated as necessary to reach the water quality environmental standards of the city of Beijing (a regional government).

Standards for all items are more strict than the relevant Japanese standard values, and the standard value of 0.5mg/liter for copper (Cu) and nickel (Ni) are particularly strict. Nickel is not subject to regulation in Japan. Heavy metals are generally dissolved at low pH acidity, and when neutralized by addition of an alkaline agent to raise the pH, form a hydroxide which settles and is then separated. However, copper and nickel are amphoteric metals, and while they are naturally dissolved by acids, they also form complex salts and are dissolved, by alkalines. The optimum pH for separating the hydroxide from the solution lies

within a fixed range. Since it is normally difficult to reliably satisfy the standard value solely with the neutralization sedimentation method, wastewater treatment equipment using the chelate resin absorption process has been installed in addition to the neutralization sedimentation method as a finishing treatment (see Figure 2-2-a).

The pH of the wastewater from the plating process is first adjusted to an acidity of between pH2 and pH5, and subsequently to an alkalinity of between pH8 and pH10 to produce an insoluble hydroxide from the heavy metals. A coagulant is then added to coagulate and settle the hydroxide, forming an excellent large floc. The hydroxide floc is settled and separated in a sedimentation tank, and the supernatant fluid passed through a sand filter to remove the microscopic suspended material. Trace amounts of copper and nickel are then finally removed by chelate resin absorption. Since the sand filter and the chelate resin absorption tower must be rejuvenated periodically, two towers are installed, with one being rejuvenated and on standby. The treated water is then checked for pH and discharged. Approximately 500m^3 of wastewater is treated daily.

Chelate resin is extremely expensive at approximately JPY4,000/liter, requiring an expenditure of a few millions of Yen to refill an absorption tower. The saturated resin is rejuvenated repeatedly using expensive materials such as sodium hydroxide and reused, and must be replaced every two or three years with new product. It is used in Japan only for such special applications as the production of extremely pure water, and its use in the treatment of factory wastewater is extremely rare.

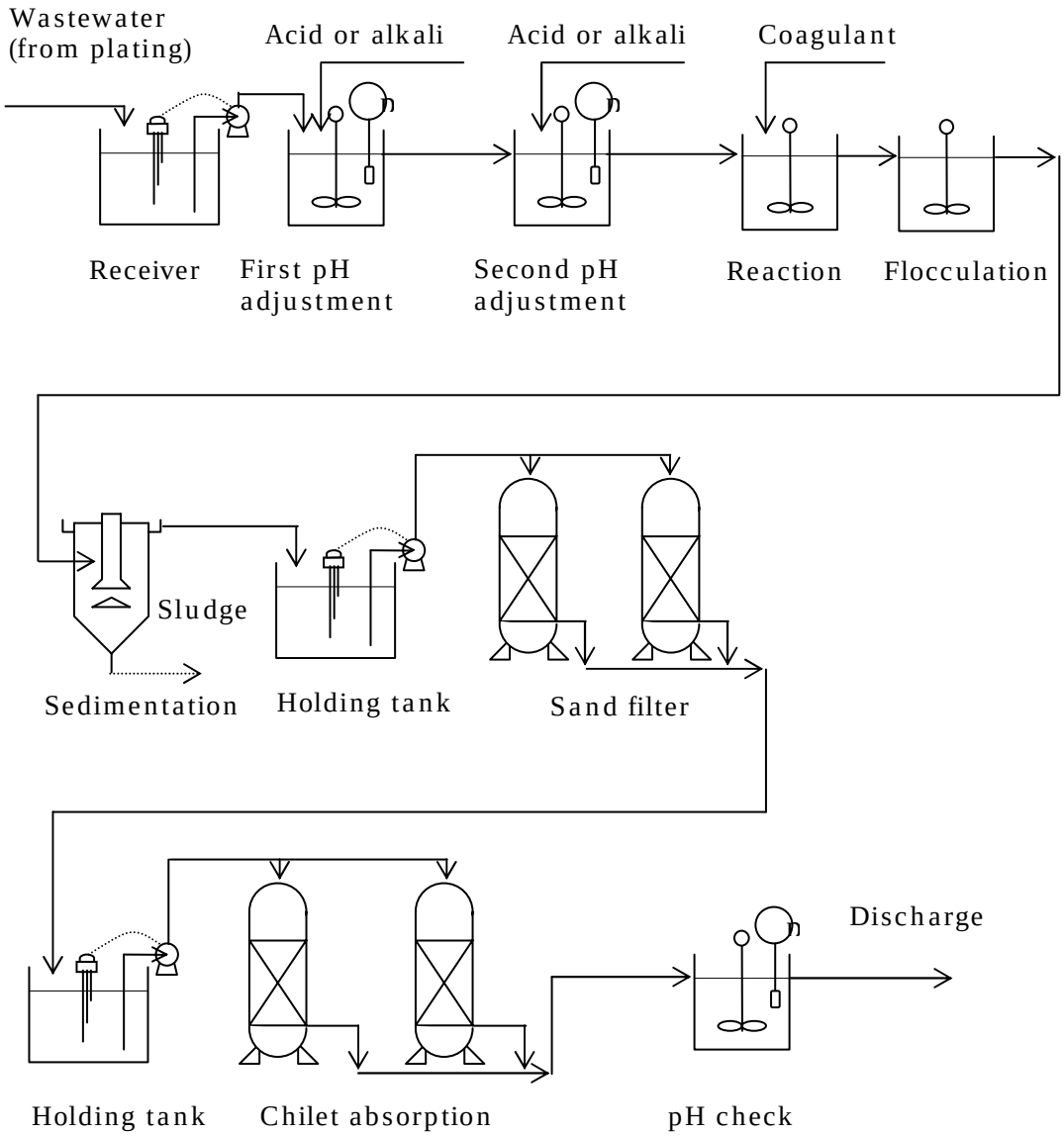
The treated water is checked weekly by simple analysis, and an inspection conducted twice yearly by the city of Beijing Environmental Protection Bureau during which the water is sampled. The analysis results are reported back to the factory. All standard values are satisfied.

The sludge produced in the sedimentation tanks is dried with a dehydrator, and the sludge cake handled by a licensed toxic waste treatment contractor.

b. Miscellaneous

Information on environmental regulations is available on the Internet and published environmentally-related material. The energy section of Company A is responsible for environmental measures sometimes receives information directly from the city of Beijing Environmental Protection Bureau.

Figure 2-2-a: Wastewater treatment flow



Case 2 Voluntary Reduction in Sulfur Dioxide Discharge

1) Outline of the company

Company B (same as Company G in Case 7)
Details of business: Manufacture and sale of automobile engines.
Number of employees: 800
Commencement of operations: 1998
Location of factory: Xiqing District, city of Tianjin
Japanese equity ratio: 50%

2) Background

The Japanese head office of Company B is engaged in the manufacture and sale of automobile engines on an international scale. The company is aiming at the top level of environmental measures in international terms, and was the first in the Chinese automobile industry to gain ISO14001 certification. The company not only follows strictly the standard values for discharge set by the bureaucracy in association with certification, but also is engaged in activities directed towards the maximum possible reduction in environmental load.

3) Details of measures implemented

a. ISO14001 reduction plan

Company B is concerned with reducing the sulfur dioxide in the waste gas discharged from the three coal-fired boilers it owns. The reduction plan adopted under ISO14001 is shown in Table 2-2-2. The amount of gas discharged is managed in terms of each engine manufactured, so that with the amount discharged in 2001 as 100%, discharge has been reduced to 87%, 49.0%, and 43.0% in subsequent years, and is planned to be reduced to 40.0% in 2005.

Table 2-2-2: Planned reduction in discharge of sulfur dioxide

(amount discharged per engine manufactured)

Year	2001	2002	2003	2004	2005
Amount discharged	100%	87.0%	49.0%	43.0%	40.0%

b. Waste gas regulations

The standard values set by the city of Tianjin for waste gas from the boilers operated by company B are shown in Table 2-2-3.

Standard values set by the government of China for particulate matter from coal-fired boilers are according to location. The standard value is set at 100mg/m^3 for Type 1 areas, 250mg/m^3 for Type 2 areas, and 350mg/m^3 for Type 3 areas. While it is unclear as to which type of area the location of the factory belongs, based on the fact that it is in an industrial area in the city of Tianjin, it is thought to be either Type 1 or Type 2.

It is therefore considered that the additional standard value of 220mg/m^3 set by the city of Tianjin is a little excessive.

Similarly, standard values for sulfur dioxide as set by the Chinese government are 1200mg/m^3 in all areas. The additional 650mg/m^3 set by the city of Tianjin is extremely strict.

Table 2-2-3: Standard values for boiler waste gas

(mg/m^3)

Items	Particulate matter	SO_2
Standard value	220	650

In accordance with regulations applicable prior to period of construction (December 31st, 2000).

As well as regulating waste gas concentration, the city of Tianjin also regulates the sulfur content of the coal burnt to 0.5% in order to reduce sulfur dioxide. The sulfur dioxide content of waste gas resulting from the combustion of coal having a sulfur content of 0.5% is approximately 1,000mg/m^3 according to combustion calculations, and combustion of coal as per the regulations therefore does not satisfy the standard values for waste gas. Combustion of coal having a sulfur content less than required by the regulations, or treatment of the waste gas to remove sulfur dioxide, is necessary to ensure that the standard values are satisfied.

c) Treatment of Waste Gas

Company B obtained detailed information on the strict boiler waste gas standard values during the construction planning stage, and therefore uses low-sulfur coal, and has installed waste gas washing equipment. These measures have allowed the company to satisfy the standard values set by the city of Tianjin since the start of operations in 1998, however, as described above the company has set a target of reducing emissions to 40% of the 2001 value by 2005 as part of the ISO14001 certification activities. The company has therefore commenced work on improving the waste gas washing equipment, and adding sodium hydroxide to the wash water to create an alkaline solution and remove sulfur oxides by absorption, in order to achieve this target.

In 2002, one of the three boilers was modified as shown in Figure 2-2-b. Water was previously recirculated while washing the gas, however two modifications have been implemented, one in which equipment has been installed to add sodium hydroxide to the recirculated water to create an alkaline solution, and thus increase the ability to absorb the acidic sulfur dioxide gas, and the other in which an interrupter plate in the form of an impeller is installed to raise the efficiency of contact between the gas and the water. These two modifications have had a dramatic effect in raising the efficiency of removing sulfur dioxide from between 40 and 50% to more than 79%, and reduced the concentration of the sulfur dioxide in the waste gas to 100mg/m^3 or less, well below the standard value of 650mg/m^3.

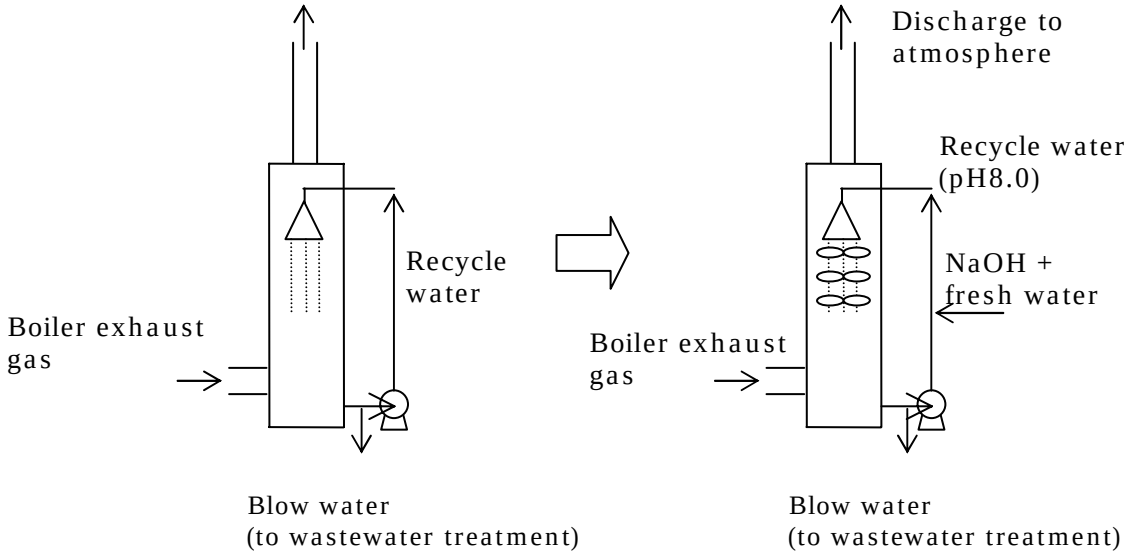
Since the recirculated water absorbs the sulfur dioxide, the concentration of sulfur dioxide in the water is increased, and thus part of the water is discharged as blow water.

Conversion to oil and natural gas as boiler fuels is promoted in the city of Tianjin, particularly in the case of small boilers which are characterized by a very low combustion efficiency. Company B has been permitted to continue with coal fuel due to its relatively large coal consumption (1ton/hr), and its effective program of managing waste gas treatment.

On-site waste gas inspections are conducted by the bureaucracy once ever two or three months, and random samples taken. Coal is sampled immediately before being supplied to the boiler.

The remaining two boilers were modified in 2003, and the company is confident that the reduction targets for 2004 and 2005 will be achieved.

Figure 2-2-b: Modification of boiler exhaust discharger



Before remodeling **After remodeling**

Case 3 Online System Transferring Measured COD Values to the Authority

1) Outline of the company

Company C
Details of business: Manufacture and sale of Japanese liquor.
Number of employees: 52
Commencement of operations: 1998
Location of factory: South East area of city of Beijing (Fengtai District, Beijing)
Japanese equity ratio: 92.0%

2) Background

Company C is engaged in the manufacture of Japanese sake liquor using Chinese rice as the raw material, and sale of the liquor within China. The company is the focus of much attention for its attempt to introduce and establish hitherto unknown liquor to Chinese food culture, and has featured on Chinese TV and in newspapers.

The process of manufacturing sake liquor generates highly polluted wastewater which is eventually discharged into rivers. For this reason, the city of Beijing has set very strict standard values for waste water. While the name of the product is becoming increasingly well-known, and the business is expanding, due to exposure in the mass media, any problem involving the standard values for wastewater must be avoided at all costs.

Furthermore, at the instruction of the Environmental Protection Bureau, an online monitoring system has been installed in which the COD value of treated water is sent automatically via a telephone cable to the agency in the Fengtai district of Beijing. Since a fine is imposed if the standard value is exceeded, it is expected that the wastewater treatment equipment be able to provide treatment to a high degree and cover all eventualities.

3) Details of measures implemented

a. Wastewater Treatment

Almost 400m^3 of rinse water is generated daily by the rice steamer, the liquor fermenter, and malt press etc. Standard values set by the city of Beijing for discharge of this wastewater with its high concentration of organic materials are as follows.

Table 2-2-4: Standard values for wastewater

(mg/liter)

Items	COD	BOD	SS
Standard values	100 (COD_{Cr})	60	80
(Reference) Japanese standard values [1)]	160 (COD_{Mn})	160	200

1) Ministerial ordinances determining wastewater standard values are taken from the separate Table 2.

All items are more strict than the Japanese standard values. As described in Section 3 of Chapter 1, since the oxidizability of COD_{Cr} is approximately three times that of COD_{Mn}, a COD_{Cr} of 100mg/liter is the equivalent of 30mg/liter under the Japanese standards. Comparison with 160mg/liter reveals the severity of this value. This standard value is the equivalent of the Chinese government's Class I standard for manufacture of alcohol-related products. Furthermore, the standards of 80mg/liter for suspended solids (SS) is severe in comparison with the Japanese standard value of 200mg/liter. The wastewater treatment equipment shown in Figure 2-2-c has been installed to satisfy this standard.

Aeration is conducted in three stages in order to satisfy the strict COD and BOD standard values. In the first stage the air is introduced from the bottom of the aeration tank immediately after the equalization tank, and in second and third stages the air is introduced from the bottom of a column packed with filler.

The biological slime method involves the growth on the surface of the filler of a biofilm which

decomposes the organic matter in the waste water. In order to satisfy the strict standard values for suspended solids, the wastewater is passed through an inclined plate-type sedimentation tank is provided in the first stage of the biological slime treatment, and through a further inclined plate-type sedimentation tank and sand filter in the finishing treatment. In 2002, a system was installed entirely at Company C's expense to measure the COD of the treated water once every three days with an automatic COD analyzer, and send the data automatically via a telephone cable to the Environmental Protection Bureau in the Fengtai District. Prior to the installation of this system, on-site water quality inspections were conducted by personnel from the Environmental Protection Bureau in the Fengtai District. The system is such that a warning is generated if a measurement in excess of the standard value is does not return to normal within a fixed period.

COD_{Cr} at the time the wastewater enters the treatment equipment is between 400mg and 600mg/liter, and the value for the treated water is 30mg/liter, a reduction more than sufficient to satisfy the standard value. Installation of a sand filter for treatment of wastewater not containing toxic substances is rare in Japan.

Sludge produced when part of the organisms in the reproducing biofilm peel off, and the sludge formed by sedimentation in the first stage of the sand filter is concentrated and dried with a filter press dehydrator. Since the annual total of this sludge is a mere one ton, it is all used as fertilizer for garden plants within the factory site.

Since the outward appearance and odor of the wastewater treatment equipment are inappropriate for a factory manufacturing foodstuffs, the entire equipment is enclosed within a building. To ensure that the entire equipment is compact, the equalization tank, the first stage aeration tank, and the air compressor pump are installed underground.

The inclined plate-type sedimentation tank and the biological slime treatment equipment both have a high treatment capacity per unit area, and were adopted to ensure a compact and efficient installation. The design of this equipment was undertaken at the Chinese Academy of Environmental Science, constructed by a Chinese company, and funded by Japanese overseas development aid.

b. Waste products

Since the dregs left after the manufacture of Japanese sake liquor is sold as animal feed, and the sludge remaining after treatment of the wastewater is used as fertilizer for garden plants within the factory site as described above, almost no waste products need be disposed of outside the site.

Sake is sold in issho bottles (0.477 U.S. gallons), and empty bottles are recovered and reused. A system has been established whereby approximately 100 restaurants being large consumers of the product contact the company when the empty bottles have been collected in sufficiently large numbers, and the bottles are then picked up for reuse. This service extends to areas such as Dairen, approximately 100km away. Approximately one third of the bottles shipped are recovered. As the issho bottle is not a standard size in China, they must be imported from Japan, and the reuse of this resource, and the associated cost reduction, has proved useful.

c. Waste Gas

Coal-fired boilers were employed until recently, however at the instruction of the authorities, the boilers were converted to a fuel oil similar to kerosene in November 2003. The city of Beijing is promoting the use of clean fuels as a means of preventing atmospheric pollution. The policy of converting to clean fuels is still implemented, even though this factory is located away from urban areas in an underdeveloped area. Costs of improvements to the equipment amounted to approximately JPY2,600,000 (RMB17,000), and fuel costs increased four-fold. The city of Beijing provided an incentive of JPY600,000 (RMB40,000) for improvement of the equipment. The improvements allowed removal of the smokestack required by the coal-fired boiler.

The restrictions on the type of coal used were severe, and sulfur content and brand were prescribed, with

on-site inspections and associated sampling conducted. Furthermore, waste gas was also analyzed twice yearly.

d. Environmental measures during the factory planning stage

Environmental measures (e.g., characteristics of waste products, amount generated, and method of treatment) were submitted for each process, evaluated, and construction permission granted based on the outcome.

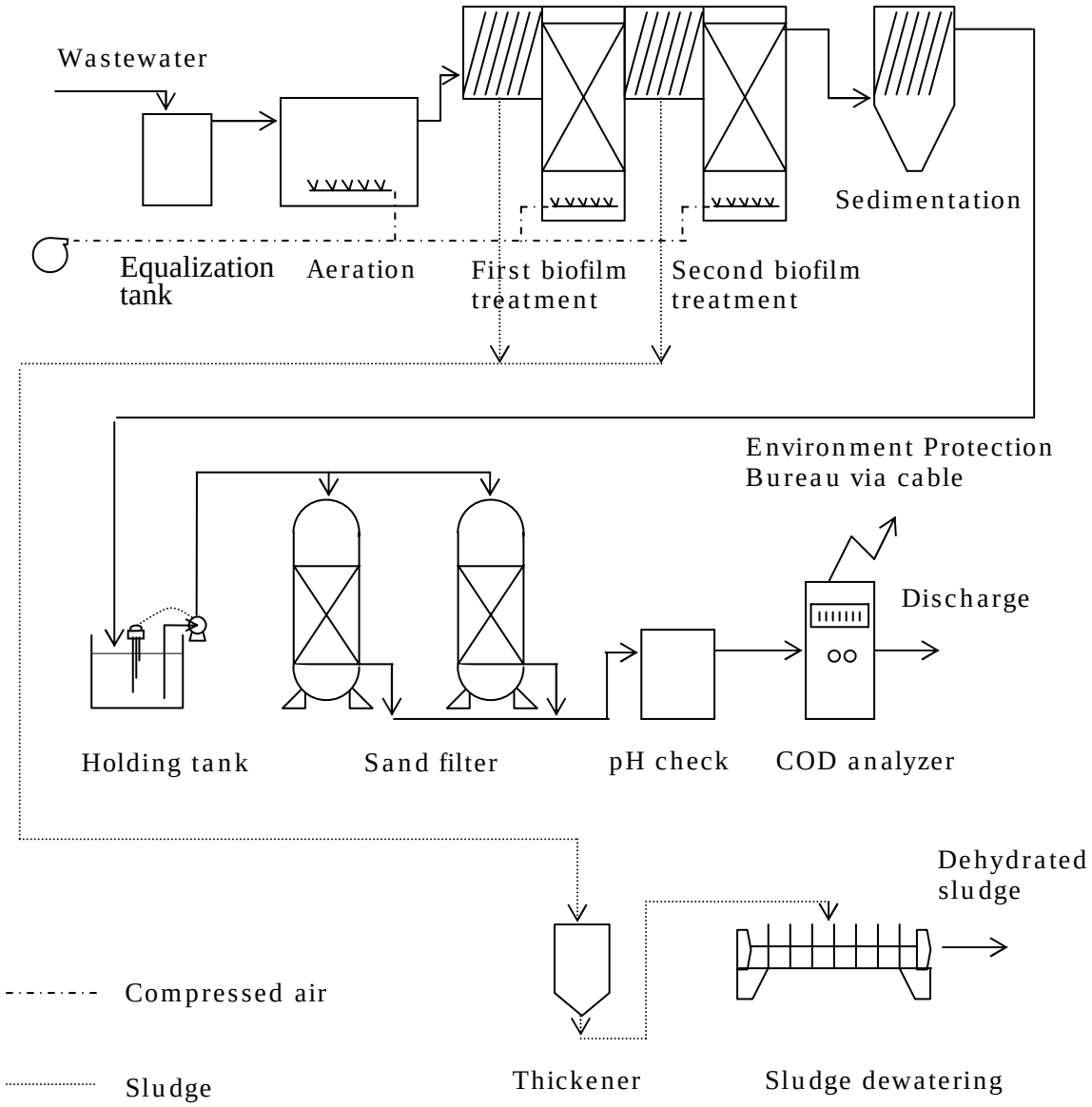
Permission to commence operations was issued once the completion inspection was conducted. This permission notes the standard values for emissions. The company was required to comply with the environmental regulations at the planning, construction, and operational stages ("Three synchronization").

e. Miscellaneous

Since good quality water is necessary for the brewing of sake, hard water is drawn from artesian sources and treated with ion exchange resin to obtain soft water. The amount of artesian water which may be drawn is restricted to 250,000 tons annually. Within this limit, approximately RMB0.5/ton is payable to the city of Beijing. This price jumps ten-fold if the limit is exceed. The limited water resources available in China require restrictions on the use of artesian water as well.

While Beijing's standard values for wastewater are very strict, local businesses are also subject to sanctions if found to be contravening the regulations. A local company brewing vinegar adjacent to Company C's site was fined RMB100,000 (approximately JPY1,500,000) for exceeding standard values, and were subject to an order requiring improvements within a set time. Some businesses under government management have moved to areas where restrictions are less severe.

Figure 2-2-c: Wastewater Treatment Flow



Case 4 Storage of Toxic Waste in Factory for a Period of Six Years

1) Outline of the company

Company D
Details of business: Manufacture and sale of copiers.
Number of employees: 170
Commencement of operations: 1997
Location of factory: South of the city of Tianjin (Hexi District, Tianjin)
Japanese equity ratio: 92.0%

2) Background

The Japanese parent company of Company D employs a positive approach to environmental measures as an effective contribution to management, for example, through increased operating earnings, and is top in newspaper N's environmental management rankings. Overseas subsidiaries are also expected to implement thorough environmental measures.

As assembly work is the main operation at the factory, highly polluted wastewater and waste gas is not generated, however a few materials designated as toxic waste products by the Chinese government are generated. Materials recognized as toxic waste products are required to be treated in a treatment facility, however a certified facility has yet to commence operations even after six years of operation of the factory.

Toxic waste products may be handed over to contractors, however if these materials are disposed of illegally and their source determined, the image of the company is severely damaged. The toxic waste products generated are therefore properly sorted and stored on the factory site until completion of the treatment facility.

3) Details of measures implemented

a. Control of waste products

Waste products generated at the factory are sorted into toxic waste products and general waste products as shown in Table 2-2-5. Toxic waste products are defined by the Chinese government and equate to waste products regulated under the Basel Treaty. In this factory they are sorted into waste solder and flux, and waste oil and toner. Waste solder and flux are reusable and are therefore purchased by licensed contractors. Waste oil and toner are consigned to other licensed contractors for treatment, treatment costs being paid by Company D. These contractors first appeared in 2003, and toxic waste products generated in the six years between commencement of operations at the factory in 1997 and 2003 were therefore stored on the factory site.

A manifest system is employed for consignment of toxic waste products to contractors for treatment. The business generating the toxic waste products, the transport operator, and the treatment operator are noted on the form in that order, and the form submitted to the city of Tianjin Environmental Protection Bureau when treatment is complete. A copy is then returned to the business generating the waste products. Items entered on the form are the name of the business generating the waste products, the type of waste products, amount of waste products treated, name, license number, and contact address of transport operator, and name, license number, treatment method, and contact address of treatment company. Treatment costs are RMB3(approximately JPY45)/kg.

General waste products are sorted into reusable and domestic waste products, each being consigned to a different licensed contractor for treatment. Considerable amounts of reusable metal scrap, waste plastic, and cardboard boxes are generated, and are each sold to different contractors. Domestic waste consists of leftovers from the canteen and office trash, and is collected by the Hexi District trash collection at three or four day intervals. Annual collection costs are approximately RMB7,000 (approximately JPY100,000).

Table 2-2-5: Generated waste products

Type		Waste products	Treatment company	Final disposal	Remuneration
Toxic waste products		Waste solder and flux	Tianjin Rising Corporation	Reused	Sold
		Waste oil and toner.	Tianjin Integrated Hazardous Waste Treatment Center	Incinerated	Treatment costs paid
General waste products	Reusable waste products	Metal scrap Waste plastic Cardboard boxes	Handled by different contractors	Reused	Sold
	Domestic trash	Canteen leftovers Office trash	Hexi District Health Office	Disposed of in landfill	Treatment costs paid

b. Waste Gas

Small coal-fired boilers are used in the factory, and as part of the city of Tianjin's Blue Sky Program designed to reduce atmospheric pollution, the use of coal in boilers generating ten tons of steam or less per day is prohibited. Notification of this regulation by the Hexi District Environmental Protection Bureau was without warning, and caused considerable confusion. Boiler equipment was rapidly updated for the combustion of natural gas, the gas being taken from a natural gas pipeline passing close to the site.

Waste gas regulations for lead have been set for two locations in the soldering process. Standard values are 0.7mg/m^3 under the Chinese government's general standard values for atmospheric pollution. These levels are adequately satisfied. The process will be converted to lead-free solder in July 2004.

c. Wastewater

Wastewater standard values as shown in Table 2-2-6 have been set for domestic wastewater, e.g., wastewater from the canteen and toilets. Standard values for everything from pH to mineral oil are covered by the Chinese government's general wastewater discharge standard values and Class III standard values. Ammonia nitrogen is not set in the Class III standard values, however the Class II standard value are set here. Class III standard values are discharge standard values for sewerage systems in the final treatment plant, and the Class II standard values are direct discharge standard values for public water areas, however some regulations incorporate both standard values.

Personnel from the Hexi District Environmental Protection Bureau take samples on site to monitor water quality twice yearly.

Table 2-2-6: Wastewater standards

(values other than pH are in mg/liter)

Regulated items	pH	Suspended Solid	COD	Mineral oil	Ammonia nitrogen
Standard values	6-9	400	500	30	25

c. ISO14001

Certification was received in 2003. A person solely responsible for environmental matters is assigned to the equipment section, and all matters related to certification were handled primarily by this person. Persons responsible for environmental matters are also assigned to other sections.

Environmental targets for 2003 are as follows.

- Reduction of sulfur dioxide in boiler waste gas to zero through conversion to natural gas.
- A 1% reduction in power consumption in comparison with 2002 by eliminating unnecessary lighting.
- A 70% reduction in the costs of treating waste products through reuse of old paper, and resorting of waste products etc.

- A 400m^2 increase in vegetation within the site by tidying up.

An environmental management manual covering the following has been produced as part of ISO14001 activities.

- Preventing water pollution.
- Preventing atmospheric pollution.
- Preventing potential environmental pollution and emergency responses.
- Preventing pollution by waste oil and waste fluids.
- Transmitting environmental information.
- Requesting environmental measures of suppliers and contractors.
- Acquiring up-to-date information on environmental regulations and legislation.

Prevention of potential environmental pollution and emergency responses is particularly advanced and is unique. Items liable to cause environmental pollution in each workplace are identified, and a plan to deal with pollution has been developed. This plan clarifies the persons in charge, and includes a list of all personnel in related workplaces, the path of communications in an emergency, practical methods for emergency measures etc, and includes training to ensure that all personnel at the workplace thoroughly conversant with the details.

The section on requesting environmental measures of suppliers and contractors gives priority to ISO14001 certified suppliers in selection, requires that contractors sufficiently understand and follow strictly the factory environmental policy, and provides environmental training prior to commencement of operations.

d. Miscellaneous

An environmental report is required to be submitted to the Hexi District Environmental Protection Bureau annually. This report is approximately 50 pages in length, and covers amounts of wastewater, waste gas, toxic waste products, general waste products, noise generated, and also reports on the flow of current manufacturing processes. This report covers environmentally-related items in a lateral manner, since hierarchical bureaucratic structures are normally rare in China.

Case 5 Treating Highly Concentrated Wastewater while Accepting a Large Number of Visitors

1) Outline of the company

Company E
Details of business: Manufacture and sale of confectionery.
Number of employees: 520
Commencement of operations: 1996
Location of factory: Economic and technical development zone south east of the city of Beijing.
Japanese equity ratio: 100%

2) Background

Company E manufacturers chewing gum, cookies and snacks etc, and generates large amounts of highly concentrated wastewater in the washing of containers employed in mixing raw materials. Wastewater is subject to primary treatment at each tenant's factory within the economic and technical development zone, and is then piped to a central wastewater treatment facility for final treatment. The company established the factory in this area as a result of its well-developed infrastructure (e.g., wastewater treatment facility).

As the factory is engaged in the manufacture of items for human consumption, it is important to maintain an image of cleanliness in the primary wastewater treatment process as well. The wastewater treatment process is therefore installed entirely indoors, the odors characteristic of wastewater treatment are suppressed, and equipment having an appearance inconsistent with foodstuffs is covered from view. Furthermore, the economic and technical development zone is considered to be a model development zone in China, and as such receives many overseas visitors, so that there is a need to be able to respond to sudden visits of interested parties.

3) Details of measures implemented

a. Wastewater treatment

Controlled items and standard values set for company E's wastewater treatment are as shown in Table 2-2-7. After treatment to ensure that these standard values are satisfied, the wastewater is piped to the central wastewater treatment facility. Since it is assumed that this wastewater will be finally treated in the central wastewater treatment facility, standard values for the company are comparatively low.

Table 2-2-7: Wastewater standards set by the city of Beijing

(Values other than pH are in mg/liter)

Items	COD_{Cr}	BOD	SS	pH
Standard values	500	300	160	6 - 9

The wastewater treatment process is shown in Figure 2-2-d. The wastewater from each type of product process is mixed together in the equalization tank. Approximately 250 tons of wastewater is equalized daily, and has an average BOD of 3,000mg/liter. Oil is separated from the wastewater with oil cracking equipment. BOD following separation of the oil is reduced to approximately 1,000mg/liter. The wastewater is then piped to the aeration tanks where it is aerated in batches for approximately ten hours. BOD following aeration is sufficient to satisfy the BOD standard value of 300mg/liter, and it therefore piped to the central wastewater treatment facility. Three aeration tanks are employed alternately. Wastewater piped to the central wastewater treatment is charged at a rate of RMB1.2/ton. The oil separated by cracking is taken by a waste products contractor for disposal as waste oil.

The wastewater treatment equipment is designed by the Japanese parent company, and is installed by local contractors. Operation is the responsibility of the energy section of the company at the factory. When the equipment was first constructed its processing capacity was found to be insufficient, and was therefore expanded in a Stage II program. Including Stage II costs, a total of JPY50,000,000 has been expended on the equipment.

Personnel from the Beijing Environmental Protection Bureau visit the factory to take random samples for water quality inspections. Fines are payable if inspection reveals that standard values are exceeded, and if these levels are repeatedly exceeded, the company may be ordered to cease operations at the factory. The initial contract upon becoming a tenant of the development zone requires that the wastewater standard values be strictly adhered to.

b. Treatment of waste products

Waste products are of two types, one being cardboard boxes, plastic, and wooden pallets etc which are saleable, and the other being garbage and office trash etc which is not saleable. Cardboard boxes can be sold for RMB0.8/kg. Unsaleable garbage is collected by truck by the development zone twice daily, this collection being charged at a rate of RMB40/truck/time. Combustible items in the collected garbage are incinerated, and incombustible items are disposed of in landfill.

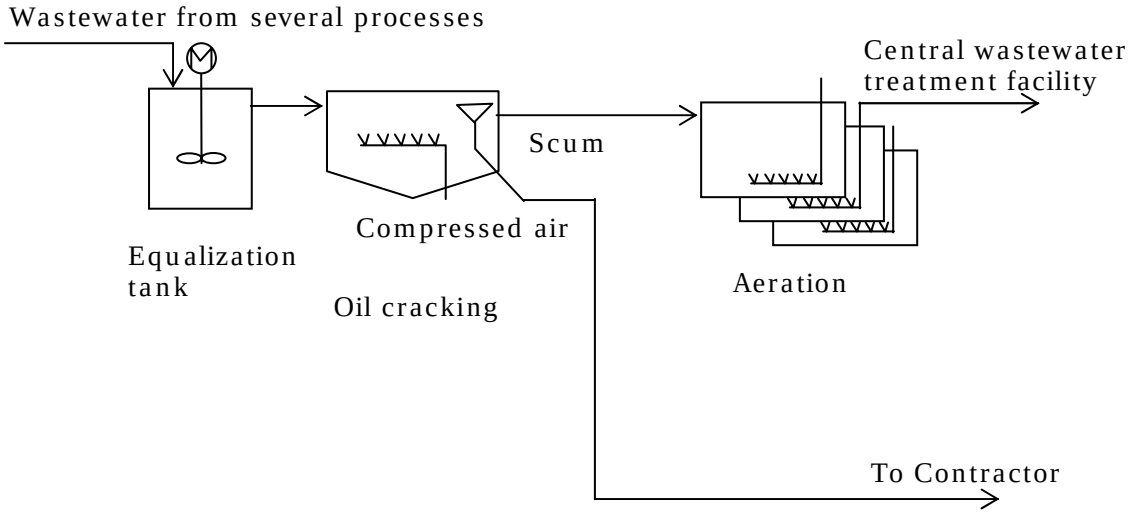
c. Miscellaneous

Information on revisions of environmental regulations etc is received from the person responsible for environmental matters in the development zone. When a revision occurs, a meeting is held at which it is explained and explanatory materials distributed.

Employees have been invited to submit slogans, the best of which are displayed.

Ovens used in baking the confectionary are fired with natural gas, and waste gas regulations are therefore not applied.

Figure 2-2-d: Treatment flow for highly concentrated wastewater



Case 6 Handling Volatile Organic Compounds (not subject to regulation in Japan)

1) Outline of the company

Company F
Details of business: Printing.
Number of employees: 200
Commencement of operations: 1995
Location of factory: Economic and technical development zone south east of the city of Beijing.
Japanese equity ratio: 100%

2) Background

Company F is engaged in the printing of catalogs and brochures, and other general printing work, and is the largest in its field in Beijing. Volatile organic compounds (organic solvents) released from ink used in the printing industry are subject to regulations in China.

When establishing operations in China, the company employed the same technology in its environmental measures as used in Japan, and has installed the most recent equipment for treatment of organic solvents.

3) Details of measures implemented

a. Waste gas treatment

Discharge standard values set by the city of Beijing for organic solvents in gas discharged during printing are as shown in Table 2-2-8.

Table 2-2-8: Discharge standard values for organic solvents

Items	Benzene	Toluene	Xylene	Remarks
Concentration (mg/m^3)	12	40	70	Discharged volume: $8064m^3$/hr Smokestack height: 11m
Exhaust quantity (kg/hr)	0.13	0.83	0.27	

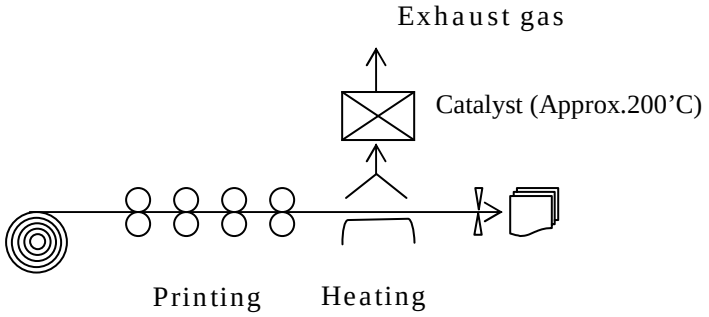
Concentration and discharged volume are regulated for the three components benzene, toluene, and xylene in printing ink. Standard values are determined in accordance with discharged volume and smokestack height. In Japan, voluntary reductions in discharge for each industry are sought, rather than standard values at a national level.

Catalytic decomposition equipment as shown in Figure 2-2-e was installed in order to satisfy these standard values. The solvent in the ink is evaporated when the printed pages are heated with the dryer. This evaporate is collected, heated to approximately 200'C, and passed through a catalyst layer where it is oxidized and decomposed by the oxygen in the air in the equipment. The waste gas after treatment is then discharged from the smokestack. A licensed organization specializing in analysis is contracted to measure the regulated items in the treated gas once each year, and the results of the analysis are submitted to the Environmental Protection Bureau.

Measured concentrations for benzene and toluene in the treated waste gas are less than $1mg/m^3$, and $3mg/m^3$ for xylene. All three standard values are readily satisfied. The exhaust quantity for discharge for all three solvents is 0.03kg/hr or less. This level is satisfied with considerable leeway. On-site inspections are sometimes conducted by personnel from the Beijing Environmental Protection Bureau.

The catalytic decomposition equipment was designed and manufactured by a specialist Japanese manufacturer after investigating the relevant regulations established by the city of Beijing.

Figure 2-2-e: Treatment process for solvents in printing ink



b. Waste products

Small amounts of toxic waste products (e.g., photographic developer fluid, waste film) are generated and are consigned to specialist contractors for treatment. On-site inspections are conducted by personnel from the Beijing Environmental Protection Bureau to determine the amounts generated, and the status of treatment.

Section 3
Case Studies of the Relationship of Environmental Management Systems to Improvements in Management

ISO14001 certification is useful as evidence of the positive approach of a business to environmental matters, however there is sometimes a tendency for it to become a matter of mere formality. In order to ensure its effectiveness, one company has developed a continuous three-year activity plan based on ISO14001 requirements, and another has obtained considerable benefits in terms of reduced use of resources and energy through its implementation.
The common thread running through these approaches is the leading role of top management in the use of ISO14001 certification to contribute to the management of the company. In these cases, this attitude is reflected in consolidation of internal company organization, and in the creativity of activities.

Case 7 Implementing a Continuous Three-year Activity Plan Based on ISO14001 Requirements

1) Outline of the company

Company G (same as Company B in Case 2) Details of business: Manufacture and sale of automobile engines. Number of employees: 800 Commencement of operations: 1998 Location of factory: Xiqing District, city of Tianjin Japanese equity ratio: 50%

2) Background

The Japanese parent company of Company G is engaged in the manufacture and sale of automobile engines on an international scale, and has commenced its operations in China in earnest. The company is engaged in acquiring international certification appropriate to a world-class enterprise, and as such, ISO9001 certification was obtained in 2001, and ISO14001 certification is considered a natural part of this progression. A plan directed towards obtaining ISO14001 certification came to fruition in September 2002, immediately prior to the release of a new model in the Chinese market in October of that year. The company did not wait for instructions from the Japanese parent company, and made and implemented its own proposals.

The implementation of ISO14001 was characterized by autonomy and creativity, and included the continuous three-year activity plan, and the setting of standard values for waste discharges in excess of those set by the relevant authorities. ISO14001 activity plans are commonly established for single years, and struggle to incorporate new ideas for reduction in environmental load each year. The company is the focus of much attention for its long-term vision as evidenced by its continuous three-year activity plan harmonized to company management.

3) Details of measures implemented

a. Acquisition of ISO14001 certification

In 2001, the environmental philosophy comprising the four items shown below as preparations for acquisition of ISO14001 certification was developed, the environmental management organization shown in Figure 2-3-a was inaugurated, and the environmental management policy clarified.

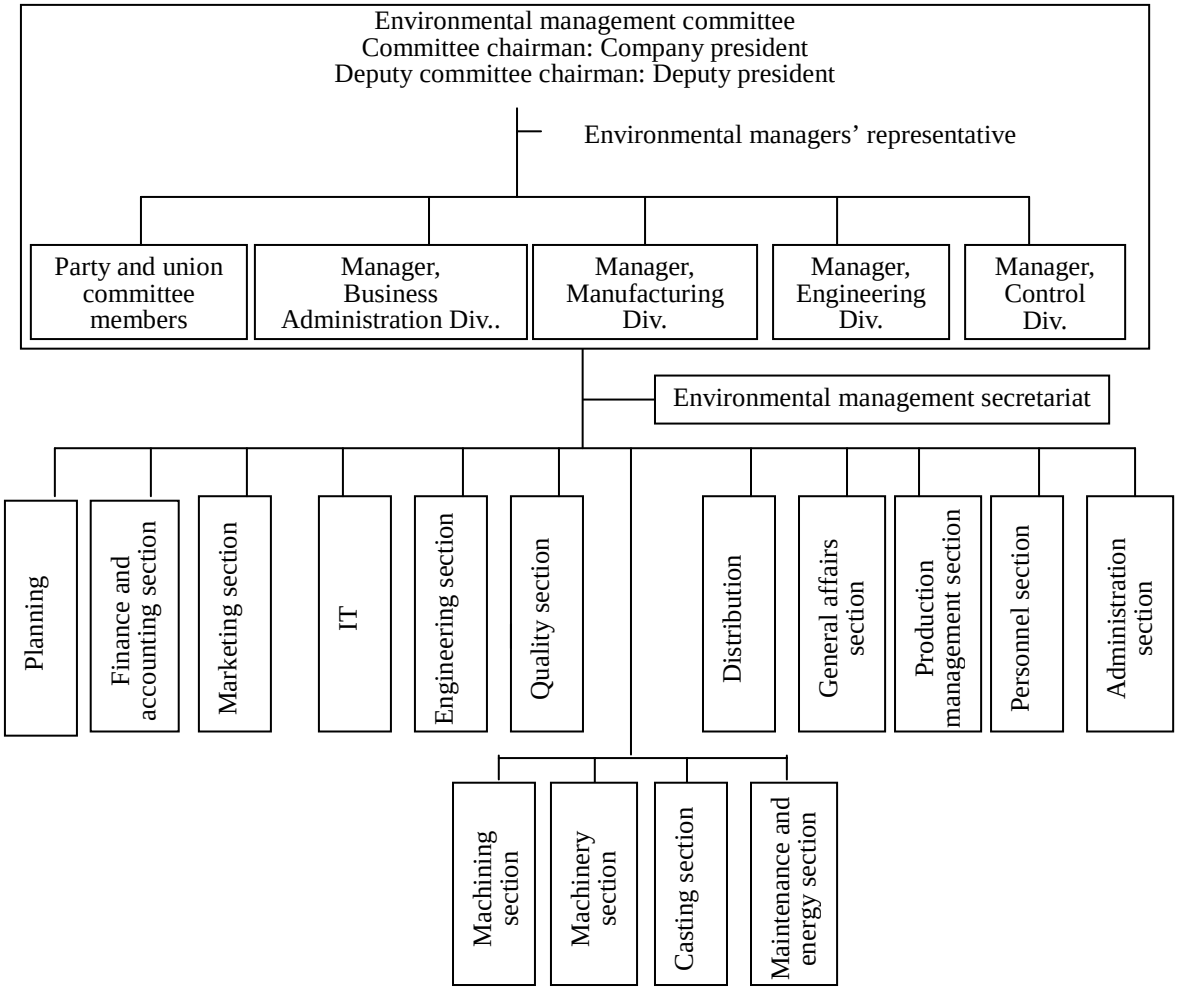
Environmental Philosophy

(1) Integration of environmental protection and sound management
(2) Effective use of resources
(3) Global environmental protection
(4) Continuous development

An environmental committee comprising top management and responsible persons from each section was established as the organization responsible for decisions on environmental matters. This committee was placed directly under the secretariat in charge of day-to-day operations, and was charged with the promotion of activities at each workplace. A person responsible for environmental matters was assigned to each workplace, and was assigned the central function of assigning activities.

The first requirement of environmental policy was the strict observance of the environmental regulations set by the Chinese government, the second being the clarification of the responsibilities of each section, and overall, the implementation of the environmental philosophy through reduction in environmental loads associated with production, and effective use of resources.

Figure 2-3-a: Environmental management organization and environmental policy



Environmental Management Policy

The company is to engage in production activities in consideration of environmental protection, and to contribute to society.

1. To strictly observe both Chinese national and Tianjin municipal environmental regulations, and respond rapidly to changes in such regulations.
2. To identify the persons responsible for environmental management, and to endeavor to improve environmental management abilities of each responsible person.
3. To endeavor to reduce environmental load of waste water, waste gas, waste products, and chemicals etc, and prevent environmental pollution before it occurs.
4. To endeavor to reduce consumption of resources and utilities, and to reduce environmental load.
5. To incorporate the company's environmental philosophy firmly in its operations, and to make maximum efforts in environmental protection.

Education and training activities at all levels within the company commenced in 2001 as preparation for certification. Environmental matters were investigated thoroughly at each workplace centered on the environmental management secretariat, and targets for reduction in environmental loads, and practical measures for such reductions, determined. Certification was granted in September 2002 following preparatory and final inspections by the certificating organization.

In order to ensure that ISO14001 certification activities were continuous, the plan for reduction in environmental load was in the form of a three-year schedule. In other words, results at the end of the first year were evaluated, the following three-year plan reviewed, and a new plan prepared. The outline of the plan for 2003-2005 based on the evaluation of the 2002 year is as shown in Table 2-3-1. Assuming the load on the environment per engine manufactured in 2001 as 100%, target values for subsequent years are shown as percentages. For example, power consumption was reduced to 87.0% in 2002, and is going to be reduced to 72.0% in 2003, to 67.0% in 2004, and to 65.0 % in 2005, in their plan.

Assuming the COD of wastewater as 100% in 2001, discharge is planned to be reduced to 65.0% in 2005, and sulfur dioxide (SO_2) in waste gas from boilers is planned to be reduced to 40.0%. In addition to strictly observing the discharge standard values, the target is to reduce load on the environment as much as possible.

Between two and six practical measures to reduce discharge are proposed for each item. While not shown in the following table, the possibility of listing expenses for each measure, and equalizing these expenses by implementation of the reduction measures through the years, is considered. This method is considered to have promoted the reduction plan without imposing excessive costs of environmental measures on administration.

Furthermore, the responsible divisions are shown in the following table in only one location, however where measures are implemented in common at two or three locations, the name of the division is clearly noted.

In addition to the six items in the following table, a total of ten items (including domestic wastewater etc) were subject to reductions.

Table 2-3-1: Targets of primary ISO14001 activities

Items		Year	2001	2002	2003	2004	2005	Division responsible
Reduction in power consumption	Reduction target (per engine manufactured) (%)		100	87.0	72.0	67.0	65.0	
	Measures	Immediate repair of compressed air leaks at joints			○	○	○	Each production section
		Thorough maintenance and inspection of electrical equipment			○	-	-	Engineering section
		Thorough reduction in defective items			○	○	○	Engineering section
		Study to reduce power consumption of casting smelting furnace			○	○	○	Each production section
		Active promotion for power-saving activities of each division Technical section			○	○	○	Engineering section
Reduction in LNG consumption	Reduction target (per engine manufactured) (%)		100	99.0	94.0	88.0	85.0	
	Measures	Review of smelting furnace work standards			○	-	-	Casting section
		Statistical analysis of consumption			○	-	-	Engineering section
		Various modifications to improve combustion efficiency			○	○	○	Casting section
		Reduction in heat loss by modifications to thermal insulating walls			○	-	-	Casting section

Items		Year	2001	2002	2003	2004	2005	Division responsible
SO_2 reduction	Reduction target (per engine manufactured) (%)		100	87.0	49.0	43.0	40.0	
	Measures	Thorough maintenance of boiler waste gas treatment			○	○	○	Energy section
		Maintain pH8 for circulating wash water			○	○	○	Energy section
COD discharge reduction	Reduction target (per engine manufactured) (%)		100	80.0	73.0	68.0	65.0	
	Measures	Thorough optimization of operation of wastewater treatment equipment			○	○	○	Energy section
		Prohibit disposal of waste oil in wastewater			○	○	○	Each production section
		Thorough monitoring of discharged water			○	○	○	Energy section
		Creative improvements to raise treatment efficiency			○	○	○	Energy section
Reduction in waste cutting oil	Reduction target (per engine manufactured) (%)		100	130	95.0	92.0	90.0	
	Measures	Immediate repair of leaks from cutting machinery			○	○	○	Machinery section
		Collect all possible ideas to extend life			○	-	-	Machinery section
		Improve method of changing waste fluids			○	-	-	Machinery section
Reduction in consumption of wastewater	Reduction target (per engine manufactured) (%)		100	75.0	67.0	63.0	60.0	
	Measures	Raise awareness of saving water			○	○	○	Engineering section
		Thorough leakage checks and rapid repair			○	○	○	Energy section
		Endeavor to raise recirculation of cooling water to 100%			○	○	○	Each production section
		Remove unnecessary water supply systems			○	-	-	Technical section
		Spray wastewater on vegetation			○	-	-	Administration section
		Promote measurement and management of water consumption			○	○	-	Technical section

b. Wastewater treatment

Between 200m^3 and 240m^3 of wastewater containing cutting oil from parts cutting and product washing processes is generated daily. Cutting oil is an emulsion of oil and waste water, and the two are therefore not readily separated, and wastewater treatment is difficult. The wastewater standard values set by the city of Tianjin are as shown in Table 2-3-2. These standard values are the same as the Class II standard values for discharge of water into rivers set by the Chinese government. As COD_{Cr} of 150mg/liter is equivalent to a COD_{Mn} of 50mg/liter with the Japanese measurement method, it is very severe in comparison with the Japanese standard values of 160mg/liter. A more strict voluntary standard value of 140mg/liter was set by the company in order to ensure that the standard value was to be reliably observed, and operations are managed to ensure that this level is not exceeded.

Table 2-3-2: Wastewater standard values

(values other than pH are in mg/liter)

Items	pH	COD_{Cr}	SS	Mineral oil	NH_3-N
Standard values	6 - 9	150	150	10	25
Company standard values	6 - 8	140	150	8	25
Reference: Japanese standard values [1)]	5.8 - 8.6	160 (COD_{Mn})	200	5	100 [2)]

1) Ministerial ordinances determining wastewater standard values are taken from the separate Table 2.

2) (NHO_3 - N + NHO_2 – N + 0.4 × NH_3-N) $\leqq$100 mg/liter

The wastewater treatment equipment shown in Figure 2-3-b is operated not only to satisfy the standard values above, but to reach the ISO14001 COD reduction target. The quality of the factory wastewater received is equalized in the equalization tank, and a de-emulsifier added to break down the emulsion. The oil is then readily separated from the wastewater by cracking. The tank is pressurized by injecting air through small holes into the waste water, the resulting small bubbles adhering to the oil particles and rising, and thus separating from the water. After most of the oil is removed, the remainder is aerated to assist decomposition by microorganisms. A secondary cracking process is then employed to float and remove suspended matter. The remaining suspended matter is then removed with a sand filter, and organic matter is absorbed with activated charcoal and removed. The use of activated charcoal is a sophisticated method of treatment which increases operating costs, and is rarely used in Japan for treatment of wastewater, however it is necessary in company G's factory to satisfy the COD standard value.

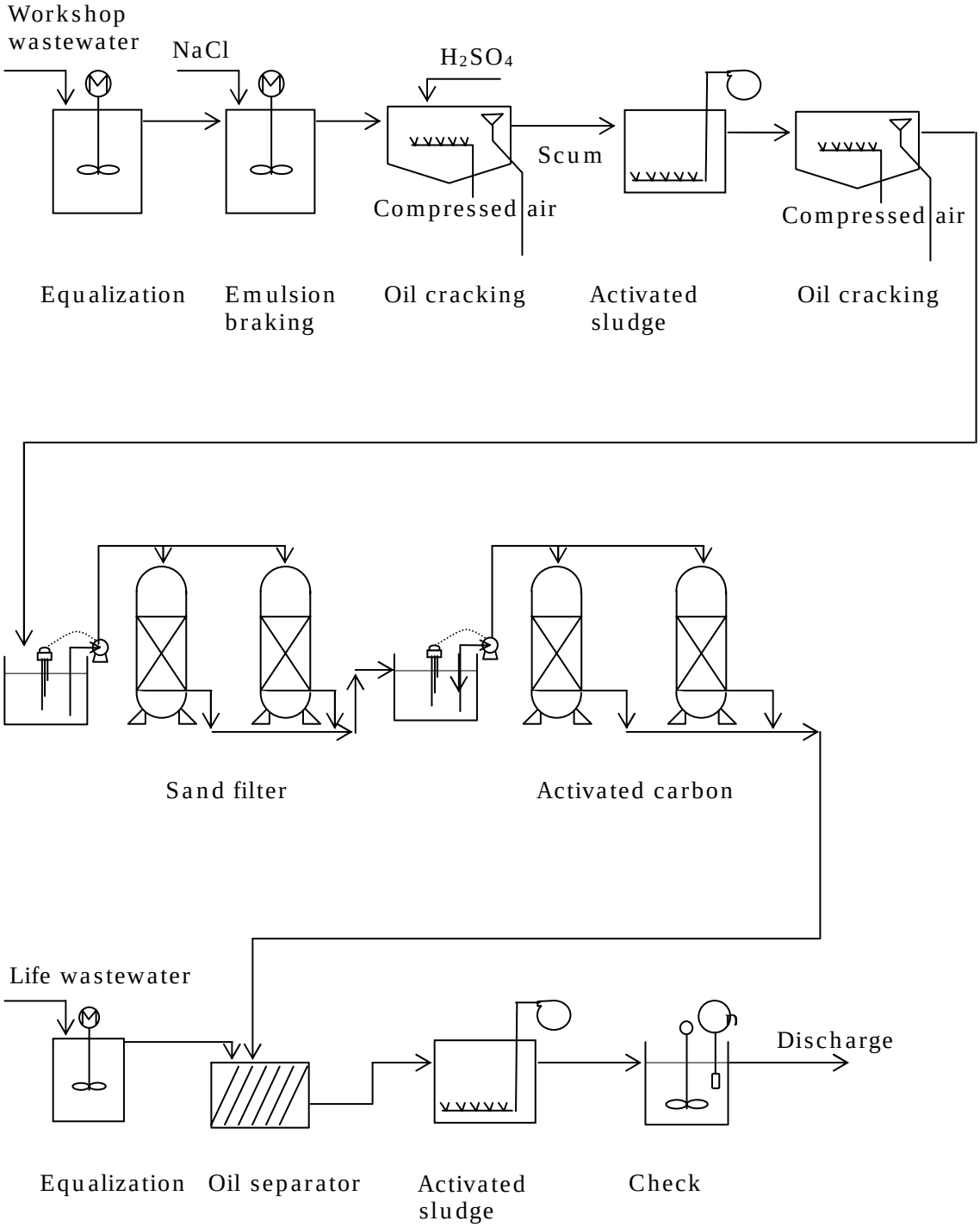
The treated water is then mixed with between 300m^3 and 360m^3 of domestic wastewater per day from a separate system and oil removed again, subjected to activated sludge treatment, checked, and discharged. The treatment equipment was designed and installed by a Chinese manufacturer. The equipment produces between 500 tons and 600 tons of treated water per day, of which part is sprayed on vegetation within the factory site.

The standard value for NH_3-N (ammonia nitrogen) of 25mg/liter is very severe, however as this compound is not generated at the factory, the standard value is satisfied without the need for special measures.

c. Toxic Waste Products

Approximately 15 tons of toxic waste products such as sludge from the wastewater treatment process, discarded dry batteries, and asbestos is generated annually. Those are left to a contractor by paying RMB2,000/ton, and incinerated at the Integrated Hazardous Waste Treatment Center completed in 2003. The waste was tracked to ensure that it had been disposed of in the correct manner. Prior to completion of the Treatment Center this waste was stored on-site, and when the Center was completed, 60 tons of the waste was disposed of in one operation.

Figure 2-3-b: Wastewater treatment equipment



Case 8 Employing ISO14001 Certification in Conservation of Resources and Energy

1) Outline of the company

Company H (same as Company A in Case 1)
Details of business: Electronics-related manufacturing.
Number of employees: 1,100
Commencement of operations: 1998
Location of factory: Production base to the north of city of Beijing (Haidian District, Beijing)
Japanese equity ratio: 78.3%

2) Background

Company H is a subsidiary of a well-known company operating on an international scale. The parent company is naturally ISO14001-certified, and employs environmental accounting. Most of its Japanese factories have already gained ISO14001 certification. The products of this factory are shipped to Japan and the rest of the world, and the environmental evaluation of the company occupies an important role in management.

Within this context, ISO14001 certification of company H's factory was a natural development. While comprehensive environmental management is a natural aim of the company, reduction in consumption of power, water, and paper for office use is also a goal.

3) Details of measures implemented

a. ISO14001 certification

ISO14001 certification was gained in August 2002, however progress towards certification was as follows.

October 2001	Preparatory organization for certification initiated
February 2002	Preparatory organization for environmental management initiated
March 2002	Primary identification of environmental aspects
May 2002	Preparatory inspection by external organizations
August 2002	Certification by passing final inspection
January 2003	Secondary identification of environmental aspects
February 2003	Primary internal inspection
September 2003	Revision of environmental aspects
December 2003	Targets set for 2004

Environmental policy comprising the following six items was clarified at initiation of the preparatory organization for certification.

(1) Strictly observe current environmental regulations, and respond rapidly to changes in such regulations.
(2) Endeavor to reduce consumption of resources, and make effective use of resources.
(3) Prevent environmental pollution by chemicals through preventative measures.
(4) Educate employees thoroughly in environmental matters, and raise environmental awareness.
(5) Disclose environmental policy and endeavor to implement it.
(6) Invigorate the environmental management organization, and effectively promote environmental policy.

The organization of the internal company system promoting the above activities is as shown in Figure 2-3-c. The ISO secretariat is positioned directly under the president of the company, and is comprised of three specialist staff and six staff dispatched from the various workplaces. The secretariat proposes, promotes, and checks results of activity plans, and reviews plans for the next year etc. Technical aspects are the responsibility of environmental staff in the energy management section of the management division. Each workplace has staff responsible for environmental matters.

Practical topics and targets for reduction of environmental loads for 2003 are as follows.

(1) Reduction of power consumption per 1,000 products manufactured by 5% (to 137.7kwh) in comparison with 2002.
(2) Reduction of water consumption per 1,000 products manufactured by 5% (to 1.43 tons) in comparison with 2002.
(3) Reduction of office paper consumption per 1,000,000 products manufactured by 5% (to 18.76 packs) in comparison with 2002.
(4) Reduction of sealing plastic consumption by 60% (to 2.4 tons annually) in comparison with 2002.
(5) Strict observance of wastewater standards.
(6) Reliable management and treatment of toxic waste products.
(7) Appropriate response to emergency situations such as chemical leaks.

Time limits, and divisions responsible, for implementing these targets have been clarified. The related divisions are responsible for implementing targets. The secretariat collects monthly data and checks the state of progress. As of November 2003, almost all items are progressing smoothly, and full implementation by the end of December is expected as planned. For example, power savings are concentrated in equipment having low operating ratios, and unnecessary lighting is extinguished. Air-conditioning is operated partially, and unused spaces are divided off with partitions.

A thorough program of water reuse has been implemented, and shower faucets etc in which water issues only while the button is pressed have been adopted. These measures are proving effective.

As of December 2003, the ISO14001 training plan for 2004 is as shown in Table 2-3-3.

The training plan encompasses all employees, including new employees and division managers, with content being relevant to each. Internal audits and environmental management encompass specialist fields, and external tutors are employed in training lectures. As the company has more than 1,000 employees, persons responsible for promoting training are assigned to each workplace, and all workplaces are incorporated organically in activities under the instructions of the secretariat.

Figure 2-3-c: ISO14001 promotion organization

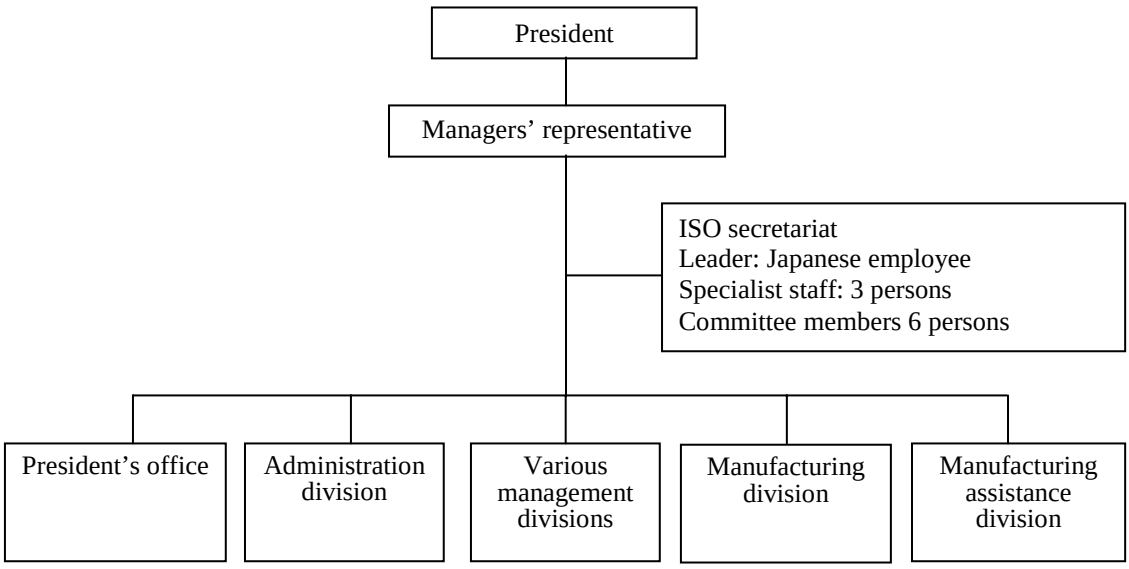


Table 2-3-3: Environmental training plan

Personnel	Details	Method	Persons responsible for promotion	Timing
Division heads and above	Environmental legislation	Visits	--	January, April, July, October
	Environmental manuals	Visits	--	February
Intermediate managers All employees	Environmental legislation, manuals	Mass lectures and reading texts	Persons responsible for each workplace	January, April, July, October
	Environmental topics for each workplace			February, September
	Environmental topics for each head office			November
Environmental controller	Comprehensive environmental management			February, September
Internal audit controller	Auditing methods	Mass lectures	External lecturer	August
Assistant manager and above	Environmental management methods	Mass lectures	External lecturer	June
New employees	Environmental policy	Mass lectures	Person responsible for training plans	As necessary

b. Waste products

Reliable management and treatment of toxic waste products is covered in ISO14001 activities, however general waste products and reusable waste products are also generated. These three categories of waste products generated by the factory are shown in Table 2-3-4.

Table 2-3-4: Classification and treatment of waste products

Major classification	Intermediate classification	Examples
General waste	Scrap glass	--
	Office trash	Paper scraps and discarded office supplies
	Canteen leftovers	--
	Rags	--
Toxic waste	Waste oil	Machine oil
	Plating sludge	Wastewater treatment sludge
	Printer toner	Including ribbons
	Waste plastic	Resin exceeding shelf life etc
	Chemical waste	Waste chemicals from analysis lab
	Discarded batteries	--
	Florescent lamps	--
	Rags contaminated with oil	--
	Waste chelate resin	--
	Filters	Waste gas filters and activated charcoal
	Waste solder	Waste solder
	Plastic office paper	OHP paper
	Medical waste	Syringe needles, cotton used for sterilization

Reusable waste	Defective products	--
	Steel scrap	--
	Glass bottles	--
	Metals	Copper wire
	Paper packaging	Cardboard boxes
	Wood packaging	Wooden frames

Classification of toxic waste products is determined by regulations set by the city of Beijing. All three categories are consigned to licensed treatment contractors.

c. Miscellaneous

Lead-free solder and high-melting point solder are technically possible, and are used at the request of the customer.

Case 9 A Company at the Top of its Field Gains ISO14001 Certification

1) Outline of the company

Company I
Details of business: Manufacture and sale of cosmetics.
Number of employees: 1900
Commencement of operations: 1993
Location of factory: Economic and technical development zone south east of the city of Beijing.
Japanese equity ratio: 65%

2) Background

Company I's cosmetics have a sophisticated image and are sold in 72 countries. The company is aiming at a sophisticated brand image for the products manufactured and sold in China. The Chinese cosmetics market is growing at an annual rate in excess of 10%, and the company is developing a network of sales outlets throughout the country to take advantage of this growth.

The company is thought of favorably in China - in 2001 the company was certified as an enterprise supporting the Chinese Olympic Committee, and in 2002 the honorary president of the Japanese parent company was made an honorary citizen of the city of Beijing. Furthermore, Company I was the first tenant in this development zone.

Within this context, it is desirable that the company engage in advance environmental measures, and indeed, from its position at the top of the Chinese cosmetics industry, the company has made its own decision to obtain ISO14001 certification without waiting for instructions from the Japanese parent company.

3) Details of measures implemented

a. Gaining ISO14001 certification

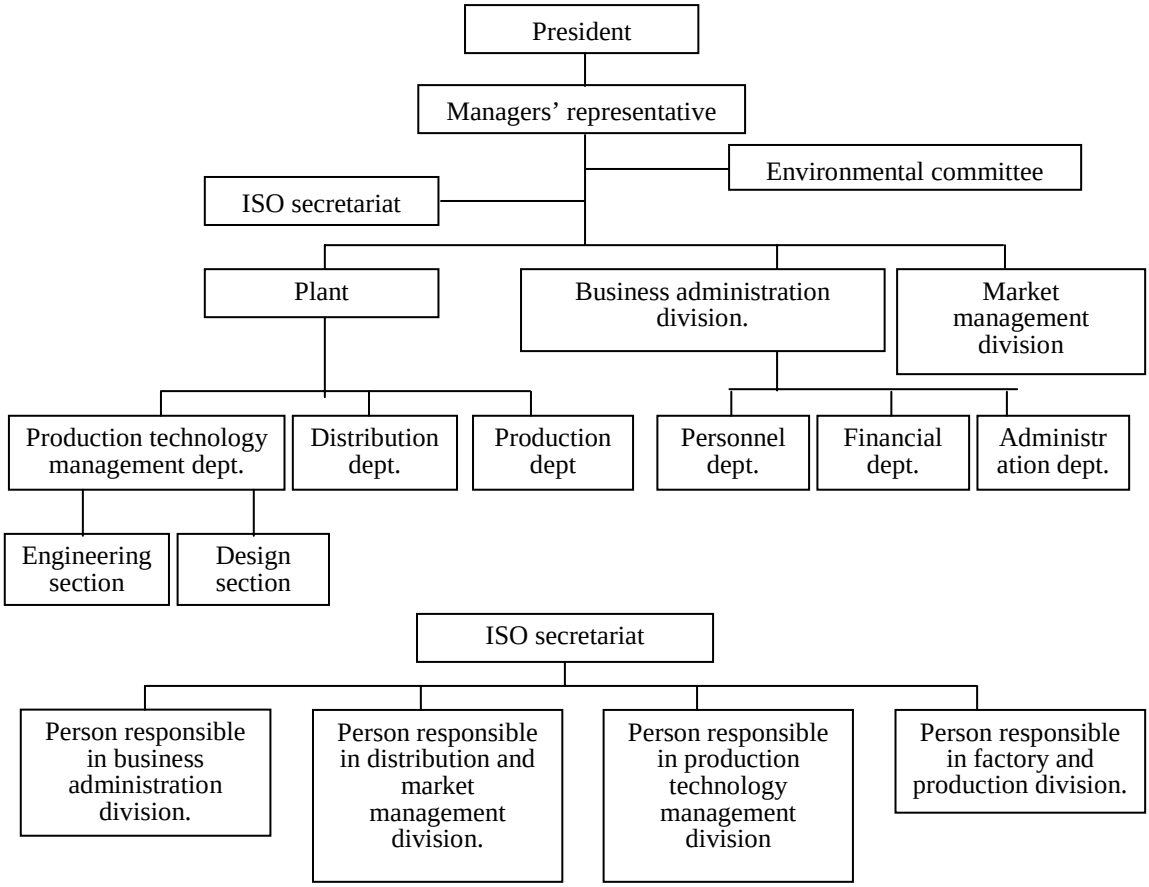
The schedule for gaining certification was as follows.

July 1999	Organization for ISO14001 certification initiated
January 2000	Organization for environmental management initiated
February 2000	Activities of organization for environmental management commenced
July 2000	External inspection by certifying organization
August 2000	ISO14001 certification obtained
August 2003	First survey and certification update

Activities of the organization for gaining certification were commenced in July 1999 to provide education and training at all levels within the company. Environmental aspects were thoroughly investigated for each division in February 2000, and targets and numerical targets, set. During this period the importance and purpose of ISO14001 was emphasized to general employees at each morning company meeting as part of education and training. ISO14001 certification was obtained in August 2000.

The internal company organization for ISO14001 is as shown in Figure 2-3-d. The environmental committee (same members as the management committee) is the highest authority responsible for environmental problems within the company. The ISO secretariat is responsible for day-to-day activities, and is directly under the president. The secretariat is comprised of a specialist leader and personnel dispatched from each workplace, and is engaged in development of practical activity plans, promoting their implementation, follow-up, and modifications to plans etc. The leader is a section head who is a local employee.

Figure 2-3-d: Environmental management organization



The following items have been identified for reduction of environmental load.

- Reduction in the amount of water used per 100,000 products.
- Reliably satisfying standard values for treated wastewater.
- Reduction in the amount of power used.
- Reduction in the amount of paper for office use.
- Fire prevention
- Elimination of chemical leaks.

A dramatic reduction was achieved in water usage as shown in Table 2-3-5.

Table 2-3-5: Reduction in water usage

Year	2000	2001	2002	2003 (tentative)
Water (tons)	47,000	47,220	48,585	49,000
Amount of water used per 100,000 products (tons)	737	439	385	290

Water usage is increasing in association with the overall increase in production, however while water usage per 100,000 products was 737 tons in 2000, it had decreased by 61% to 290 tons in 2003 as a result of thorough use of recirculated water, and measures such as turning off all faucets immediately. Replacement of washroom faucets with a design which shuts off after a set time has been particularly useful in saving water.

b. Treatment of wastewater

Satisfying the standard values for wastewater treatment reliably is an ISO14001 certification target, and is an environmental policy of primary importance. A total of 140 tons of wastewater per day is generated at the factory in the process of washing containers used in mixing raw materials. This wastewater is subjected to preliminary treatment and is then sent to a central wastewater treatment facility located within the development zone. The wastewater standard values set by the city of Beijing for preliminary treatment are as shown in Table 2-3-6.

Table 2-3-6: Wastewater standard values

(values other than pH are in mg/liter)

Items	pH	COD_{Cr}	BOD	SS	LAS
Wastewater Standard set by city of Beijing	6 - 9	500	100	160	10

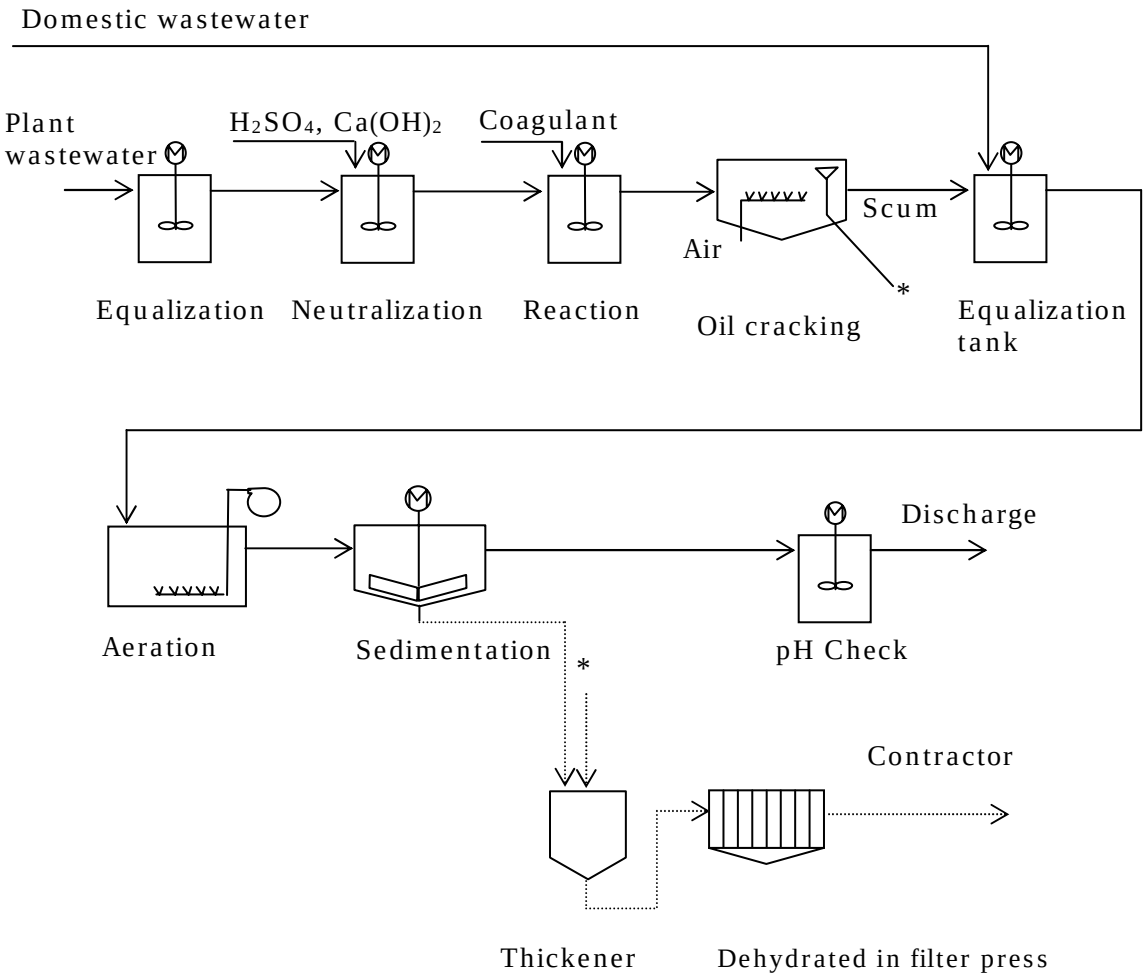
Since it is assumed that wastewater will be finally processed in the central wastewater treatment facility located within the development zone before discharge into the public water area, the standard value for COD is comparatively high at 500mg/liter. LAS is an anion surfactant linear alkylbenzene sulfonic acid, and is the largest component of synthetic detergents.

The wastewater treatment plant shown in Figure 2-3-e was installed in order to satisfy these standard values. As the quality of the wastewater generated in the various processes within the factory differs, it is equalized in the equalization tank, adjusted for pH, and a coagulant added to coagulate suspended matter. Compressed air is then injected in microscopic bubbles, the suspended matter and oil floating on the surface as a scum. Wastewater from which the scum has been removed is then mixed with domestic wastewater (from toilets and canteen etc) in the second equalization tank to ensure a uniform water quality and sent to the aeration tank. Aeration breaks down organic matter through the action of microorganisms. The floc of microorganisms settles and is separated in the sedimentation tank, and the supernatant fluid is then discharged as treated water. The equipment is managed by two specialist personnel from the equipment management section, and was designed and constructed by a Japanese specialist manufacturer of water treatment equipment. The annual cost of chemicals for the equipment is JPY2,000,000 (RMB133,000).

The pH of the treated water is checked, and it is then pumped to the central wastewater treatment facility in the development zone via the sewerage system. A COD value of more than 1,000mg/liter at the entrance to the wastewater treatment equipment is reduced to an average of no more than 100mg/liter after treatment, thus satisfying the standard value of 500mg/liter by a considerable margin. The scum produced by cracking, and the sludge generated in the aeration tank, are separated and thickened and dried in a filter press to produce a cake which is taken by a waste disposal contractor.

Random water samples are taken without warning from the development zone for water quality inspection. COD and pH checked in the factory lab weekly for this purpose.

Figure 2-3-e: Wastewater treatment equipment



c. Miscellaneous

An environmental policy plan was submitted to the office of the development zone prior to construction of the factory. The plan was investigated in detail and permission granted to proceed with construction. A geological survey was also required to determine the strength of the ground in the area. Soil samples were taken to depths of 30m and analyzed. No requirements are currently in place for soil contamination, however a system will be introduced in 2005.

Waste products are sorted into those able to be disposed of by sale, and those for which treatment costs are paid. The former include cardboard boxes, metals, and plastics. Plastics are recycled for use in products such as children's chairs. The latter includes sludge from wastewater treatment, domestic trash, waste oil, and plastics unable to be recycled. Furthermore, organic solvents are stored as toxic waste products, and eventually taken by a licensed disposal contractor for incineration. Three incinerators are in operation in the city of Beijing as of 2003. Disposal by the contractor is followed up to ensure that the toxic waste has indeed been disposed off in the correct manner.

Section 4
Case Studies of Improvements Designed for Other than Environmental Protection

A number of Japanese companies are notable for the unique characteristics of their approach to the environment. Case studies of these companies include the resolution of social problems such as poverty and employment considered essential to the resolution of environmental problems, installation of equipment for stable wastewater treatment taking advantage of low power costs, dealing with the problem of truck exhaust from a point prior to gaining formal permission to conduct business, and improvements in noise levels in the working environment.

Case 10 Placement of Recovery Boxes outside Stores to Increase Awareness of Recycling

1) Outline of the company

Company J
Details of business: Large-scale retailing
Number of employees: 2500 (including employees and tenants)
Commencement of operations: 1996
Location of factory: North east area of city of Beijing (Chaoyang District, Beijing)
Japanese equity ratio: 51%

2) Background

The parent company of Company J has a chain of large retail stores throughout Japan. While other companies in the same business entering the Chinese market have foundered and withdrawn, Company J continues its development, and will soon open its third store in Beijing. The company plans for between seven and eight stores by the time the Olympics are held in Beijing in 2008.

The period of non-competitive state-owned retail stores was of considerable duration, and as a consequence, staff attitudes to customers, and product management, left much to be desired. Company J has resolved these problems in line with its management ideals, and developed a modern retailing business in China.

The resolution of social problems such as poverty are internationally recognized as being essential to environmental protection, and the various social contributions of Company J will prove useful in the resolution of such social problems, and by extension, to environmental protection.

3) Details of measures implemented

a. Waste products

As is the case in Japanese stores, the company has placed boxes for the recovery of recyclable waste products outside its stores to raise the awareness of customers of recycling. In practice, separate boxes for recovery of dry batteries, paper, plastic, and glass are employed. The contents of these boxes is sold to a waste recovery contractor each month.

Waste products from food counters are very few compared to Japan, fish are sold without removing the head, and vegetables not sold are taken by contractors.

Cardboard boxes are purchased by a contractor for a fixed price of RMB8,000/month. This price will be increased to RMB10,000 from next year. Cardboard boxes are used in recycled paper.

b. Tree planting

A group of approximately 20 employees planted 200 trees of three varieties including peach trees, in Daxing prefecture located in the area south east of the city of Beijing. Trees have also been planted in desert areas of Inner Mongolia.

c. Promoting employment

Of the 1.2 billion population of China, and between 800 and 900 millions are extremely poor farmers with an annual income of less than RMB400 (approximately JPY6,000). A stable society cannot be achieved without development including this part of the population. Furthermore, as restructuring of state-owned businesses proceeds, the number of citizens losing their jobs will increase. Many students graduating from university are currently unable to find work. Company J places great expectations in its employment promotion work, and receives requests from other cities asking the company to open stores. Company J's monthly salary for high school graduates is RMB800 (approximately JPY10,000).

Furthermore, a route for sales and distribution of regional agricultural products is necessary, and this is

being undertaken as a part of a large-scale distribution operation. The company is currently searching for direct links with farmers in order to eliminate intermediate costs.

d. Personnel training

Company J is placing considerable emphasis on the training of Chinese middle managers. It is engaged in the transfer of knowledge and skills in such areas as collection and analysis of data related to product management, personnel management, and accounting. The manager of the third store scheduled to open soon is Chinese. While some personnel are attracted to work for European companies in the same sector, they often state that they wish to return. Employees acquire a variety of knowledge and skills in parts, and as they work within a system such knowledge and skills is not immediately useful to their new employer.

e) Miscellaneous

Differences in wealth are considerable in China. Parents of children in poor households engaged in criminal activities may be arrested, and the children often left destitute. One former police officer has employed his own savings in creating a Children's Village for these children. The company received a request from the officer to sell jujube fruit picked by the children within the Village in its stores, and has continued to make contributions ever since. These contributions entail the supply three times each year of food and clothing etc to the equivalent of approximately JPY100,000 (RMB6,700). Some of the products supplied are damaged and could normally be returned to the manufacturer, however they are purchased by the company for the Children's Village. Upon hearing of a plan to construct a log house for the children to play in, the president contributed the costs from his own pocket.

Between 30 and 40 employees give blood each year. The company provides each of these employees with RMB1,000 out of welfare expenses. This contribution has been recognized and the company has received an award as a cooperating enterprise.

Case 11 Electrolytic Treatment of Wastewater Containing Oil – a Process Rarely Used in Japan

1) Outline of the company

Company K
Details of business: Manufacture and sale of automobile power transmission units.
Number of employees: 300
Commencement of operations: 1998
Location of factory: Dongli Economic Development Zone, Tianjin
Japanese equity ratio: 90%

2) Background

The components manufactured by company K are vital to the manufacture of automobiles by other companies in the group in China. The manufacturing process generates a considerable amount of wastewater highly polluted with cutting oil which must be treated to satisfy the relevant standard values. Halting of operations due to wastewater not satisfying these levels would have a disastrous effect on the group as a whole.

Since the costs of power necessary to satisfy the standard values is low in comparison with Japan, the electrolytic method was adopted for its ease of maintenance and stability in treatment.

3) Details of measures implemented

a. Treatment of waste products

Cutting oil is used within the factory in the cutting and drilling of metal materials, and wastewater polluted with the cutting oil is generated when the products are washed. This wastewater is subjected to primary treatment and then piped to the central wastewater treatment plant within the development zone. The items included in the wastewater regulations, and standard values, have been set by the Tianjin Environmental Protection Bureau as shown in Table 2-4-1.

Table 2-4-1: Wastewater standard values

(values other than pH are in mg/liter)

Items	pH	COD_{Cr}	BOD	SS	Oil	Sulfides (sulfur)
Standard values	6 - 9	500	300	400	30	2

These standard values are equivalent to Class III wastewater standards as determined by the Chinese government.

The standard values are satisfied by means of the wastewater treatment equipment shown in Figure 2-4-a. Since the wastewater received is in the form of an oil-water emulsion, a de-emulsifier is first added to break down the emulsion. The oil is then in a readily separated condition, and is piped to the electrolyzing tank. A DC current is passed between the stainless steel anodes and cathodes in the electrolyzing tank, and oxygen gas generated at the anodes, and hydrogen gas at the cathodes. These bubbles of gas adhere to the microscopic suspended particles of oil and float to the surface. The oxygen gas generated also contributes to oxidation and decomposition of the oil. Current is limited to 150 - 200A. Chinese power costs are lower than in Japan, being JPY6 - 7/kwh in the daytime, and half that at night. The wastewater from which oil has been separated is passed through a sand filter to remove suspended matter, and then passed through activated carbon to remove organic matter by absorption. The system currently treats approximately 1 ton of water daily, however it is designed for a capacity of 8 tons of water daily to cope with plans for expansion. The small amount of water treated and low power costs have permitted use of the electrolytic treatment, a method not commonly used in Japan. The equipment was designed in consultation with a Chinese manufacturer. This manufacturer was also responsible for construction.

COD before and after treatment is analyzed daily in the company lab. The standard value is satisfied by a

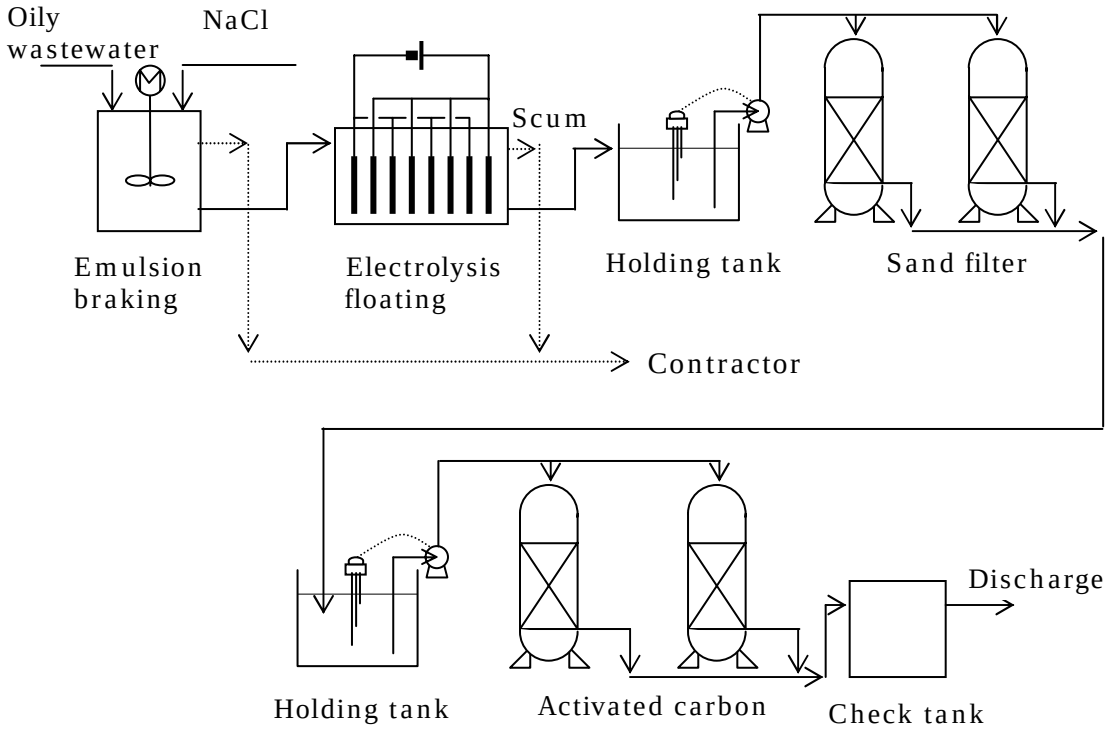
considerable margin.

The Tianjin Dongli Economic Development Zone Environmental Protection Bureau makes on-site visits without warning once every three months, and informs the company of the results of analysis.

The activated carbon employed in the system is not currently used. The central wastewater treatment facility was not yet complete during the planning and construction stages of the factory, and strict standards for discharge directly into rivers were set. The equipment was therefore installed to clear these standards.

The waste oil scum rising to the surface in the de-emulsifier tank and electrolysis floating tank is consigned to a licensed treatment contractor.

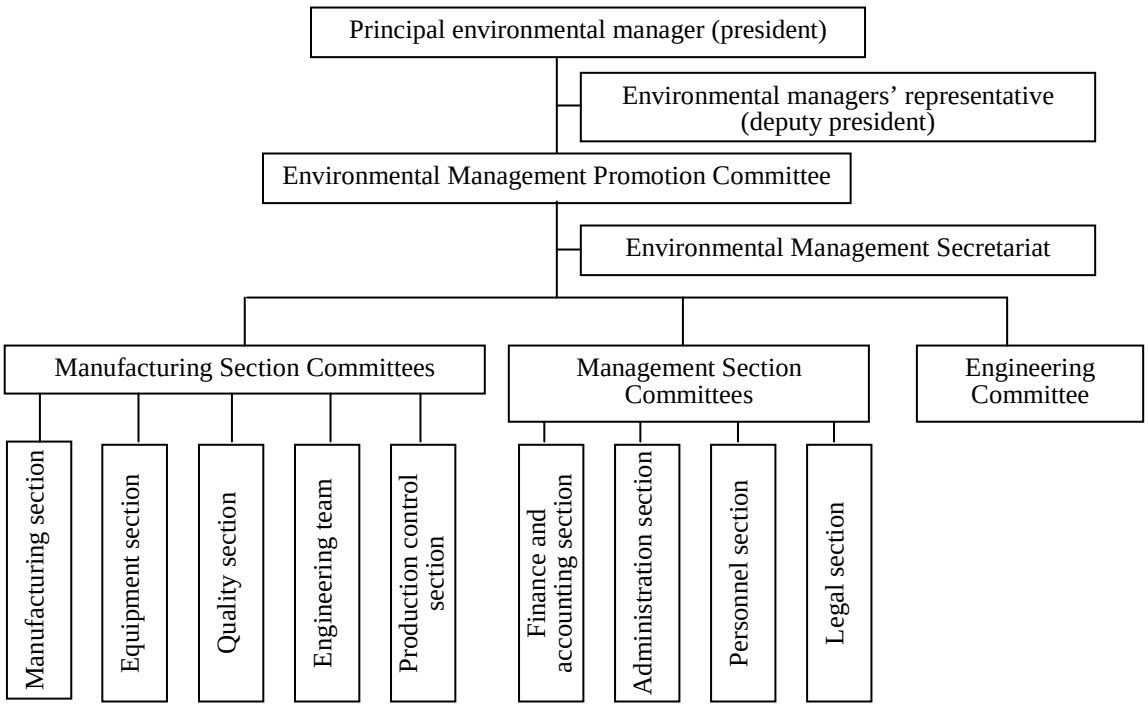
Figure 2-4-a: Wastewater Treatment Flow



b. Acquiring ISO14001 certification

Preparations commenced in May 2002 at the instruction of the Japanese parent company, and certification was acquired ten months later in March 2003. The organization for promoting ISO14001 is as shown in Figure 2-4-b. The organization is headed by the President, with the Environmental Management Promotion Committee positioned directly below. The committee has the same members as the Management Conference, and is the highest decision-making body in the company. The Environmental Management Secretariat is responsible for actual operations. The Manufacturing Section Committees and Management Section Committees are under the jurisdiction of the Environmental Management Promotion Committee. Each section committee holds monthly meetings to consider ISO14001 planning, implementation, evaluation, and reviews. Results are received by the Environmental Management Promotion Committee and decisions made accordingly.

Figure 2-4-b: Environmental management organization



Actual items and numerical targets for 2003 are shown in Table 2-4-2. Nine items are listed, each with an actual numerical target and description of the relevant methodology. Numerical targets are relative to unit production. Actual work is the responsibility of the related division, and names of persons responsible for promotion are clearly stated (omitted in this table). Reuse of hardening oil, a product unique to this factory, is proceeding in parallel with product quality management in a rational manner.

The current year is the first since ISO14001 certification, and much is expected from the initial activities.

c. Miscellaneous

As gas is used to fire the heating furnace used in the hardening process, problems with waste gas regulations are avoided. Organic solvents are discharged in the painting area, however the concentrations of the regulated chemicals benzene, toluene, and xylene discharged are extremely low. Measurements taken on-site by the Dongli District showed that concentrations were low, and they were therefore not included as measurement items. Information on environmental regulations is obtained periodically at meetings held by the Tianjin Dongli District Environmental Protection Bureau, and also from meetings of the group.

Table 2-4-2: ISO14001 targets for 2003

	Items	Target	Management method	Responsible division
1	Observance of regulations	No contravention of regulations	Observance of work standards, and thorough environmental management.	Environmental management secretariat
			Rapid response to changes in regulations and standards.	
2	Reduction in power consumption	Reduction of 7% in power consumption per production unit in comparison with 2002.	(1) Switch off unused equipment.	Manufacturing and technical sections, and technical department.
			(2) Reduction in defect rate by observance of work standards.	
			(3) Power savings by changes in machining processes.	
			(4) Use of low-pressure air.	
3	Reduction in water consumption	Reduction of 6% in water consumption per production unit in comparison with 2002.	(1) Observance of internal water conservation regulations.	Administration section
			(2) Thorough water conservation work.	
			(3) Periodic inspection of equipment.	
			(4) Investigation of monthly water consumption records.	
4	Reduction in waste lubrication oil	Reduction of 6% in waste lubrication oil per production unit in comparison with 2002.	(1) Measurement and control of amounts used by each item of equipment.	Equipment section
			(2) Inspection and repair of each item of equipment to prevent leaks.	
5	Reuse of hardening oil	Complete reuse	(1) Equipment necessary for recirculation.	Equipment section
			(2) Performance testing with reused oil.	
6	Reduction in solid waste	Reduction of 12% in solid waste per production unit in comparison with 2002.	(1) Thorough management of defective products.	Quality section
			(2) Promotion of measures for important items.	
7	Observance of wastewater standards	COD < 500mg/liter Sulfides < 2mg/liter	(1) Clean canteen waste oil tank.	Administration section
			(2) Clean purification tank.	
			(3) Measure water quality before and after treatment.	Equipment section
			(4) Increase number of measurements of water quality by external contractors.	Administration section
8	Observance of standards for canteen wastewater and waste oil	Wastewater concentration < 2mg/liter	(1) Periodic cleaning of waste oil tank.	Administration section
			(2) Installation of equipment to purify used oil.	Environmental management secretariat
			(3) Voluntary measurement annually.	Administration section
			(4) Manage usage of edible oil.	
9	Reduction in paint usage	Reduction of 5% in paint usage per production unit in comparison with 2002.	(1) Investigate possibility of reducing stock.	Engineering section
			(2) Optimize ratio of paint to solvent.	
			(3) Develop manual documenting methods of reducing paint usage.	

Case 12 Continuing Sophisticated Treatment to Reuse Wastewater

1) Outline of the company

Company L
Details of business: Manufacture and sale of pharmaceuticals.
Number of employees: 404
Commencement of operations: 2000
Location of factory: Economic and technical development zone south east of the city of Beijing.
Japanese equity ratio: 100%

2) Background

The manufacture of pharmaceutical products by Company L generates wastewater in the process of washing containers employed in pharmaceuticals. The central wastewater treatment facility in the development zone was not yet complete when permission was obtained to construct the factory, and standard values for wastewater were severe since discharge was directly into the public water area. A treatment facility was therefore constructed within the factory to satisfy these standard values. The central wastewater treatment facility was subsequently completed and the standard values were relaxed, and it is now permitted to discharge wastewater without treatment at the factory. Despite this relaxation, treatment is still undertaken at the factory, and the treated water is reused by spraying on vegetation on-site etc.

3) Measures taken by the company

a. Wastewater treatment

The wastewater standard values to be satisfied as a condition for granting permission for construction of the factory, and the wastewater standard values revised in 2002, are shown in Table 2-4-3.

Table 2-4-3: Wastewater standard values

(values other than pH are in mg/liter)

Items	pH	COD_{Cr}	BOD	SS	Fats and oils	Fluorine
Standard values to be satisfied for plant construction	6 - 9	150	30	160	15	5
Revised standard values	6 - 9	500	300	300	-	-

The wastewater standard values to be satisfied as a condition for granting permission for construction are Class II standard values for direct discharge into the public water area, and are very strict for both COD and BOD. The COD_{Cr} of 150mg/liter equates to approximately 50mg/liter when converted into COD_{Mn} in accordance with the Japanese system of measurement. The central wastewater treatment facility was subsequently completed, and was based on the premise of final treatment of the wastewater, so that standard values for COD, BOD, and SS were considerably relaxed. Records show discharge of fats and oils, and fluorine, to be minimal, and as such these items are no longer subject to control.

A wastewater treatment facility as shown in Figure 2-4-c was previously constructed to satisfy the initial standard values. Approximately 140 tons/day of wastewater (including wastewater from the production process and domestic wastewater) is generated. Process wastewater is first pre-aerated, a coagulant is added to flocculate the suspended matter which is then separated out. Domestic wastewater is supplied to a tank where the coagulant is added, and air then injected to assist microorganisms in decomposing the organic matter. The floc consisting of microorganisms is then separated out, the supernatant fluid removed as the treated water, checked for pH, and then discharged to the central wastewater treatment facility via the sewerage system. The feature of this treatment process is the use of pre-aeration to promote oxidation of pollutants.

The sediment from the suspended matter floc and microorganism floc is dried with a dehydrator, and disposed of to a contractor as dried sludge. Since the wastewater treatment facility has an image incompatible with the cleanliness and purity required of pharmaceuticals, the treatment equipment is installed out of site inside a building. Treated water is piped to a tank where it used in raising goldfish to

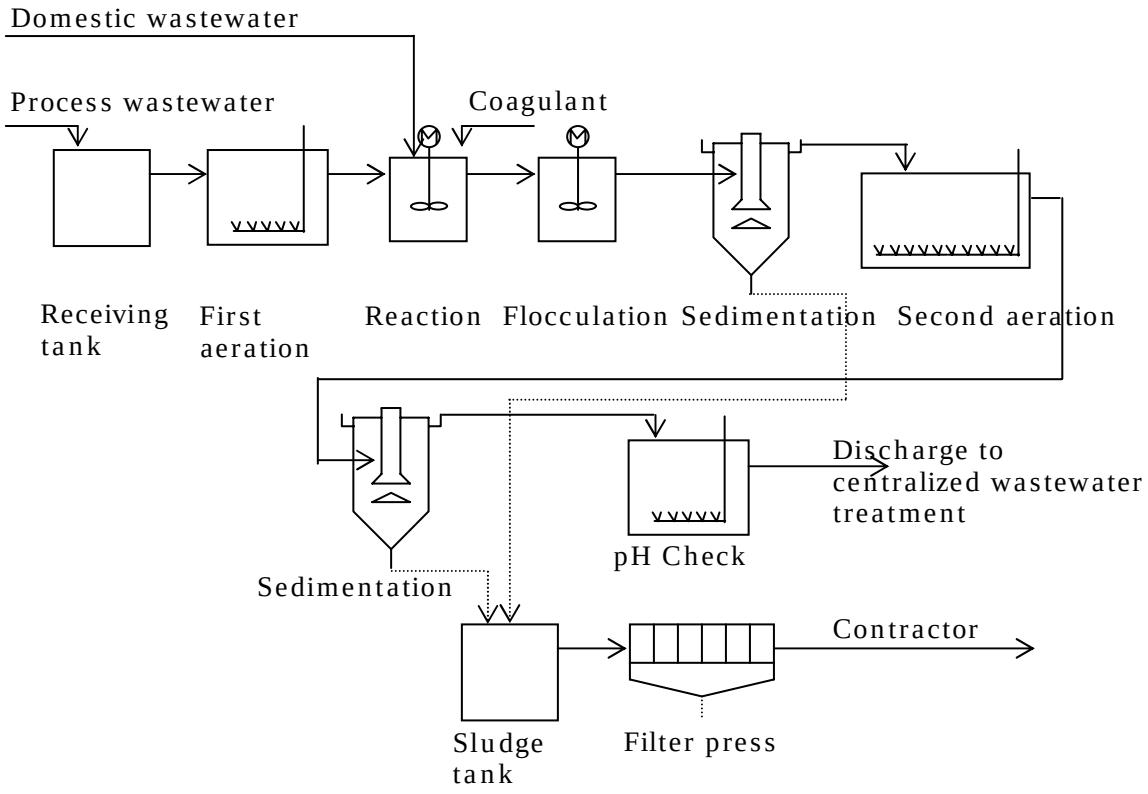
illustrate its compatibility with living organisms.

This equipment was designed and constructed, and is operated and managed, by a wastewater treatment manufacturer in Beijing. One person within the company is also responsible for wastewater treatment.

Personnel from the Beijing Environmental Protection Bureau visit twice each year to inspect water quality. One visit is at random without notification, and one visit is regular, samples being taken and analyzed on both visits, and the company informed of the results. Furthermore, water quality is analyzed twice weekly for internal company purposes, and is required for operating permission.

The quality of the water generated within the factory is such that the revised standard values are satisfied without further treatment.

Figure 2-4-c: Wastewater treatment flow



b. Environmental procedures when construction permission was granted

When requesting permission to construct the factory, a plan describing environmental policy was submitted to the Beijing Environmental Protection Bureau. This plan was thoroughly examined before permission was granted. Temporary permission to begin operations was obtained two months after completion, and measurements taken to determine the amounts of wastewater, waste products, waste gas, and noise, and concentrations of pollutants before and after treatment, while in operation. Full permission to operate the factory was granted after it was determined that these amounts were satisfactory. A document describing the method of discharge management, covering standard values, frequency of analysis, methods of measurement, and locations of measurement was then issued.

Standard values for wastewater are described above, while standard values for dust in waste gas are as shown in Table 2-4-4, and standard values for noise are as shown in Table 2-4-5. Dust is generated in the

processes of handling, weighing, granulation, and packaging of powered pharmaceuticals, and installation of filters for the waste gas was required. The pump in the cooling tower is subject to noise standards.

Table 2-4-4: Standard values for dust in waste gas

Measurement item	Smokestack height (m)	Dust concentration (mg/m^3)	Discharge (kg/hr)
Dust	13	120	2.63

Table 2-4-5: Standard values for noise at site boundary

(dBA)

Classification	Day	Night
Standard	65	55

Measurements showed that all controlled items were well within the standard values, for example dust concentration before filtering was a maximum of $42mg/m^3$, and $12mg/m^3$ after filtering.

c. Waste products

Waste products generated are of three types - toxic waste products, reusable waste products, non-reusable waste products. Toxic waste products include pharmaceuticals beyond their shelf life, and waste chemicals from the analysis lab, and amount to a few hundreds of kilograms annually. Such waste products are consigned to a licensed waste disposal contractor for incineration. Disposal is tracked to ensure that the waste products have been properly incinerated, and to ensure that they have not been resold. Reusable waste products include plastic, cardboard boxes, and metals, and are purchased by a contractor. A contractor is paid to dispose of non-reusable waste products which include wastewater treatment sludge and domestic trash. Processing of food scraps from the canteen is consigned to the canteen contractor.

One person is assigned to management of waste products.

d. Miscellaneous

A booklet providing guidelines for activities is given to each employee as a means of developing awareness of environmental matters. This booklet describes efforts in dealing with environmental matters such as contributions to global environmental protection, effective use of resources, reduction in amounts of waste products generated, and development of a plentiful and civilized society. At completion of the factory, seedlings were purchased with contributions from employees and planted on the site.

Case 13 Considering the Environment Prior to Full Commencement of Operations

1) Outline of the Company

Company K Details of business: Transport Number of employees: 745 Commencement of operations: 1996 Location of factory: Airport Industrial Zone close to Beijing International Airport Japanese equity ratio: 50%

2) Background

Company M is a representative example of a Japanese transport company, and has established operations in China in association with the move to China of its Japanese customers. Foreign investment in the transport industry in China has been delayed both for reasons of national security, and its position as a key industry. Investment has been limited to such areas as warehousing, and the core of Company M's business is still the transport of international airfreight. The company owns less than 20 trucks, and the majority of domestic transport is contracted to local operators.

China has promised deregulation of the service sector in association with its joining the WTO in December 2001. It is thought that this liberalization will occur by 2005, and this, in combination with the rapid pace of change in China, has prompted the company to make preparations for commencing domestic transport operations. These preparations include environmental measures associated with truck transport.

3) Details of measures implemented

a. Following guidelines from the Japanese parent company

Guidance for overseas operations by the Japanese parent company in environmental matters began in 1994 with the establishment of an environmental measures group in the Quality Management Division. The role of this group includes making international contributions in the environmental field.

A variety of examples of environmental measures both in Japan and overseas operations are sent as guidelines from the parent company. These examples are also recorded in the environmental report issued by the parent company, and include a commentary on, and training in, environmental regulations for drivers, modal shifts to obtain the optimum combination of transport methods, and examples of implementation of joint transport.

These guidelines are implemented in accordance with Chinese conditions, and are in observance of Chinese legislation such as waste gas regulations, vehicle inspections, and labor regulations. Internal company regulations are established if Chinese legislation is insufficient. Waste gas legislation exists in China, however it does not function in practice due to lack of a measurement system for monitoring.

All trucks currently owned by the company are of Chinese manufacture, and are fueled with gasoline. They were selected for the fact that gasoline vehicles are readily obtainable, and are of the specifications necessary for transport. These vehicles are currently employed in short-range operations such as transport between the airport and the company warehouse, and in collection of freight from customers within the city. The company has a target to reduce gasoline consumption per unit distance traveled by 10% over the previous year. An aim is to reduce idling, and this has the added benefit of reducing theft of gasoline. Drivers are instructed to take the shorter routes, and if the odometer distance is abnormally high, another driver is instructed to drive the same route to provide a comparison.

The number of vehicles will increase if it becomes possible to expand operations throughout China in future. Low-pollution vehicles powered by LPG etc are not yet available, and even if such vehicles are

imported from Japan, the lack of refilling stations prevents their use. Chinese trucks are cheaper than passenger vehicles.

Competing on cost with local transport operators while properly implementing measures in response to the various regulations is not an easy matter. Services such as collection of freight, ensuring that is delivered correctly, and driving on the specified paved roads are considered a matter of course in Japan, and the basis of trust on which the business is developed. If it becomes possible to expand operations throughout China, freight collection depots will be developed in each area, and freight will be loaded on return trips to reduce costs, and it will then be possible to contribute to a reduction in CO_2 emissions.

b. Miscellaneous

The most recent information on revisions to regulations is available on the Internet. Chinese government organizations, and administrative organizations at provincial level, publish regulations and legislation on their websites, the majority being in Chinese, and therefore checked by local staff. When information is necessary in more detail a visit is made to the city office and questions asked in person. Some information has recently become available in English.

Industry organizations are gradually developing, and an organization for the customs clearance industry was formed recently. Company M is a member of this organization, and serves as a director. These industry organizations are a source of information on changes in the regulations, and also a path for transmitting opinions to the appropriate authorities.

ISO14001 certification is a topic for the future. China is characterized by the tendency of employees to follow a system well once it is formed. The formation of a system of environmental management will prove useful in management.

Case 14 Use of Inverter Control in Measures to Deal with Noise

1) Outline of the Company

Company N Details of business: Manufacture and sale of pharmaceuticals. Number of employees: 237 Commencement of operations: 1994 Location of factory: Industrial areas in Xiqing District, city of Tianjin Japanese equity ratio: 100%

2) Background

Since company N's factory is engaged in the manufacture of pharmaceuticals, its entire working area of approximately 4,000m^2 operates as a clean room. In order to maintain the cleanliness of this working area, large volumes of air are fed by blowers at positive pressure and passed through fine filtering cloth. Conventionally, blower rooms were very noisy, to the extent that conversation is impossible. The company has therefore implemented measures to deal with noise as part of a program to improve the working environment.

3) Details of measures implemented

a. Inverter control

Blowers are generally selected with a performance margin (1.2 - 1.5) in the design stage. If the volume of air supplied is too great, problems such as localized turbulence develops so that particulate matter is lifted into the air. In practice, dampers are therefore employed for adjustment and thus obtain optimum flow, however even if operation is at a flow below the blower performance, little benefit is obtained in terms of reduced power consumption. Furthermore, a throttled damper presents resistance to the airflow, resulting in vibration which may cause noise. Resonance in ducting may produce noise far beyond expectations.

The fact that torque of the blower is proportional to square of the rpm (round per minute), and shaft power is proportional to the cube of the rpm, is therefore used to change the blower rpm in accordance with load and thus reduce power consumption of the drive motor. Rpm is controlled by changing the AC power frequency. Since no damper is used, noise is considerably reduced, and a stable difference between interior and exterior pressure is facilitated.

An initial investment is, however, required for installation of the equipment employed in detecting the load and changing the frequency of the power supply. As power costs in Japan are approximately JPY15/kWh, the initial investment is recovered over a period of between three and four years through cost savings due to reduced power consumption. In China, however, power costs are low at JPY6 - 7/kWh and a long period is necessary to recover the initial investment, so that this method does not always prove to be a beneficial energy-saving measure and is therefore not broadly common.

In this factory, it has been adopted to deal with noise, reducing the noise level in the blower room considerably so that normal conversation is possible.

b. Boiler waste gas

The use of coal in the small boilers installed in Company N's factory is prohibited under Tianjin's Blue Sky Program, and low-sulfur heavy oil was therefore used as fuel from the initial stage of operation. While waste gas standard values for sulfur dioxide are set at 400mg/m^3, emissions are a maximum of 20mg/m^3. Personnel from the Environmental Protection Bureau of Xiqing District in the city of Tianjin visit the site annually to take measurements, and the company voluntarily requests measurement by an external contractor annually.

<Appendices>

Appendix 1
Environmental Protection Law of the People's Republic of China

Environmental Protection Law of the People's Republic of China

(Adopted at the 11th Meeting of the Standing Committee of the Seventh National People's Congress on December 26, 1989, promulgated by Order No. 22 of the President of the People's Republic of China on December 26, 1989, and effective on the date of promulgation)

Contents

Chapter I General Provisions

Article 1 This Law is formulated for the purpose of protecting and improving people's environment and the ecological environment, preventing and controlling pollution and other public hazards, safeguarding human health and facilitating the development of socialist modernization.

Article 2 "Environment" as used in this Law refers to the total body of all natural elements and artificially transformed natural elements affecting human existence and development, which includes the atmosphere, water, seas, land, minerals, forests, grasslands, wildlife, natural and human remains, nature reserves, historic sites and scenic spots, and urban and rural areas

Article 3 This Law shall apply to the territory of the People's Republic of China and other sea areas under the jurisdiction of the People's Republic of China.

Article 4 The plans for environmental protection formulated by the State must be incorporated into the national economic and social development plans; the State shall adopt economic and technological policies and measures favourable for environmental protection with economic construction and social development.

Article 5 The State shall encourage the development of education in the science of environmental protection, strengthen the study and development of the science and technology of environmental protection, raise the scientific and technological level of environmental protection and popularize scientific knowledge of environmental protection.

Article 6 All units and individuals shall have the obligation to protect the environment and shall have the right to report on or file charges against units or individuals that cause pollution or damage to the environment.

Article 7 The competent department of environmental protection administration under the State Council shall conduct unified supervision and management of the environmental protection work throughout the country.

The competent departments of environmental protection administration of the local people's governments at or above the county level shall conduct unified supervision and management of the environmental protection work within areas under their jurisdiction.

The State administrative department of marine affairs, the harbour superintendency administration, the fisheries administration and fishing harbour superintendency agencies, the environmental protection department of the armed forces and the administrative departments of public security, transportation, railways and civil aviation at various levels shall, in accordance with the provisions of relevant laws, conduct supervision and management of the prevention and control of environmental pollution.

The competent administrative departments of land, minerals, forestry, agriculture and water conservancy of the people's governments at or above the county level shall, in accordance with the provisions of relevant laws, conduct supervision and managements in protecting and improving the environment.

Chapter II Supervision and Management of the Environment

Article 9 The competent department of environmental protection administration under the State Council shall establish the national standards for environment quality.

The people's governments of provinces, autonomous regions and municipalities directly under the Central Government may establish their local standards for environment quality for items not specified in the national standards for environment

quality and shall report them to the competent department of environmental protection administration under the State Council for the record.

Article 10 The competent department of environmental protection administration under the State Council shall, in accordance with the national standards for environment quality and the country's economic and technological conditions, establish the national standards for the discharge of pollutants.

The people's governments of provinces, autonomous regions and municipalities directly under the Central Government may establish their local standards for the discharge of pollutants for items not specified in the national standards; with regard to items already specified in the national standards, they may set local standards which are more stringent than the national standards and report the same to the competent department of environmental protection administration under the State Council for the record.

Units that discharge pollutants in areas where the local standards for the discharge of pollutants have been established shall observe such local standards.

Article 11 The competent department of environmental protection administration under the State Council shall establish a monitoring system, formulate the monitoring norm and, in conjunction with relevant departments, organize a monitoring network and strengthen the management of environmental monitoring.

The competent departments of environmental protection administration under the State Council and government of provinces, autonomous regions and municipalities directly under the Central Government shall regularly issue bulletins on environmental situations.

Article 12 The competent departments of environmental protection administration of the people's governments at or above the county level shall, in conjunction with relevant departments, make an investigation and assessment of the environmental situation within areas under their jurisdiction, draw up plans for environmental protection which shall, subject to overall balancing by the department of planning, be submitted to the people's government at the same level for approval before implementation.

Article 13 Units constructing projects that cause pollution to the environment must observe the State provisions concerning environmental protection for such construction projects.

The environmental impact statement on a construction project must assess the pollution the project is likely to produce and its impact on the environment and stipulate the preventive and curative measures; the statement shall, after initial examination by the authorities in charge of the construction project, be submitted by specified procedure to the competent department of environmental protection administration for approval. The department of planning shall not ratify the design plan descriptions of the construction project until after the environmental impact statement on the construction project is approved.

Article 14 The competent departments of environmental protection administration of the people's governments at or above the county level or other departments invested by law with power to conduct environmental supervision and management shall be empowered to make on-site inspections of units under their jurisdiction that discharge pollutants. The units being inspected shall truthfully report the situation to them and provide them with the necessary information. The inspecting authorities shall keep confidential the technological know-how and business secrets of the units inspected.

Article 15 Work for the prevention and control of the environmental pollution and damage that involve various administrative areas shall be conducted by the relevant local people's governments through negotiation, or by decision of the people's government at a higher level through mediation.

Chapter III Protection and Improvement of the Environment

Article 16 The local people's governments at various levels shall be responsible for the environment quality of areas under their jurisdiction and take measures to improve the environment quality.

Article 17 The people's governments at various levels shall take measures to protect regions representing various types of natural ecological systems, regions with a natural distribution of rare and endangered wild animals and plants, regions where major sources of water are conserved, geological structures of major scientific and cultural value, famous regions where karst caves and fossil deposits are distributed, traces of glaciers, volcanos and hot springs, traces of human history, and ancient and precious trees. Damage to the above shall be strictly forbidden.

Article 18 Within the scenic spots or historic sites, nature reserves and other zones that need special protection, as designated by the State Council, the relevant competent departments under the State Council, and the people's governments of provinces, autonomous regions and municipalities directly under the Central Government, no industrial production installations that cause environmental pollution shall be built; other installations to be built in these areas must not exceed the prescribed standards for the discharge of pollutants. If the installations that have been built discharge more pollutants than are specified by the prescribed discharge standards, such pollution shall be eliminated and controlled within a prescribed period of time.

Article 19 Measures must be taken to protect the ecological environment while natural resources are being developed or utilized.

Article 20 The people's governments at various levels shall provide better protection for the agricultural environment by preventing and controlling soil pollution, the desertification and alkalization of land into marshes, earth subsidence, tile damage of vegetation, soil erosion, the drying up of sources of water, the extinction of species and the occurrence and development of other ecological imbalances, by extending the scale of a comprehensive prevention and control of plant diseases and insect pest, and by promoting a national application of chemical fertilizers, pesticides and plant growth hormone.

Article 21 The State Council and the people's governments at various levels in coastal areas shall provide better protection for the marine environment. The discharge of pollutants and the dumping of wastes into the seas, the construction of coastal projects, and the exploration and exploitation of offshore oil must be conducted in compliance with legal provisions so as to guard against the pollution and damage of the marine environment.

Article 22 The targets and tasks for protecting and improving the environment shall be defined in urban planning.

Article 23 In urban and rural construction vegetation, waters and the natural landscape shall be protected and attention paid to the construction of gardens, green land and historic sites and scenic spots in the cities in the light of the special features of the local natural environment.

Chapter IV Prevention and Control of Environmental Pollution and Other Public Hazards

Article 24 Units that cause environmental pollution and other public hazards shall incorporate the work of environmental protection into their plans and establish a responsibility system for environmental protection, and must adopt effective measures to prevent and control the pollution and harms caused to the environment by waste gas, waste water, waste residues, dust, malodorous gases, radioactive substances, noise, vibration and electromagnetic radiation generated in the course of production, construction or other activities.

Article 25 For the technological transformation of newly-built industrial enterprises and existing industrial enterprises, facilities and processes that effect a high rate of the utilization of resources and a low rate of the discharge of pollutants shall be used, along with economical and rational technology for comprehensive utilization of waste materials and the treatment of pollutants.

Article 26 Installations for the prevention and control of pollution at a construction project must be designed, built and commissioned together with the principal part of the project. No permission shall be given for a construction project to be commissioned or used, until its installations for the prevention and control of pollution are examined and considered up to the standard by the competent department of environmental protection administration that examined and approved the environmental impact statement.

Installations for the prevention and control of pollution shall not be dismantled or left idle without authorization. If it is really necessary to dismantle such installations or leave them idle, prior approval shall be obtained from the competent department of environmental protection administration in the locality.

Article 27 Enterprises and institutions discharging pollutants must report to and register with the relevant authorities in accordance with the provisions of the competent department of environmental protection administration under the State Council.

Article 28 Enterprises and institutions discharging pollutants in excess of the prescribed national or local discharge standards shall pay a fee for excessive discharge according to State provisions and shall assume responsibility for eliminating and controlling the pollution. The provisions of the Law on Prevention and Control of Water Pollution shall be complied with where they are applicable.

The income derived from the fee levied for the excessive discharge of pollutants must be used for the prevention and control of pollution and shall not be appropriated for other purposes. The specific measures thereof shall be prescribed by the State Council.

Article 29 If an enterprise or institution has caused severe environmental pollution, it shall be required to eliminate and control the pollution within a certain period of time.

For enterprises and institutions directly under the jurisdiction of the Central Government or the people's government of a province, an autonomous region, or a municipality directly under the Central Government, the decision on a deadline for the elimination or control of pollution shall be made by the people's government of the province, autonomous region and the municipality directly under the Central Government. For enterprises and institutions under the jurisdiction of a people's government at or below the city or county level, such decision shall be made by the people's government of the city or county. Such enterprises and institutions shall accomplish the elimination or control of pollution within the specified period of time.

Article 30 A ban shall be imposed on the importation of any technology or facility that fails to meet the

requirements specified in the regulations of our country concerning environmental protection.

Article 31 Any unit that, as a result of an accident or any other exigency, has caused or threatens to cause an accident of pollution, must promptly take measures to prevent and control the pollution hazards, make the situation known to such units and inhabitants as are likely to be endangered by such hazards, report the case to the competent department of environmental protection administration of the locality and the departments concerned and accept their investigation and decision.

Enterprises and institutions that are likely to cause severe pollution accidents shall adopt measures for effective prevention.

Article 32 If the safety of the lives and property of inhabitants is endangered by severe environmental pollution, the competent department of environmental protection administration of the local people's government at or above the county level must promptly report to the local people's government. The people's government concerned shall take effective measures to remove or alleviate the hazard.

Article 33 The production, storage, transportation, sale and use of toxic chemicals and materials containing radioactive substances must comply with the relevant State provisions so as to prevent environmental pollution.

Article 34 No unit shall be permitted to transfer a production facility that causes severe pollution for use by a unit that is unable to prevent and control pollution.

Chapter V Legal Liability

Article 35 Any violator of this Law shall, according to the circumstances of the case, be warned or fined by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management for any of the following acts;

(1) refusing an on-site inspection by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management, or resorting to trickery and fraud while undergoing inspection;

(2) refusing to report or submitting a false report on items for which declaration is required by the competent department of environmental protection administration under the State Council;

(3) failing to pay, as provided for by the State, the fee for the excessive discharge of pollutants;

(4) importing technology or a facility that fails to meet the requirements specified in the State provisions concerning environmental protection; or

(5) transferring a production facility that causes severe pollution for use by a unit that is unable to prevent and control pollution.

Article 36 When a construction project is commissioned or put to use in circumstances where facilities for the prevention and control of pollution either have not been completed or fail to meet the requirements specified in State provisions, the competent department of environmental protection administration responsible for the approval of the environmental impact statement on the construction project shall order the suspension of its operations or use and may concurrently impose a fine.

Article 37 A unit which dismantles or leaves idle the installations for the prevention and control of pollution without prior approval by the competent department of environmental protection administration, thereby discharging pollutants in excess of the prescribed discharge standards, shall be ordered by the competent department of environmental protection administration to set up the installations or put them to use again, and shall concurrently be fined.

Article 38 An enterprise or institution which violates this Law, thereby causing an environmental pollution accident, shall be fined by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management in accordance with the consequent damage; in a serious case, the persons responsible shall be subject to administrative sanction by the unit to which they belong or by the competent department of the government.

Article 39 An enterprise or institution that has failed to eliminate or control pollution by the deadline as required shall, as provided for by the State, pay a fee for excessive discharge; in addition, a fine may be imposed on it on the basis of the damage incurred, or the enterprise or institution may be ordered to suspend its operations or close down.

The fine as specified in the preceding paragraph shall be decided by the competent department of environmental protection administration. An order for the suspension of operations or shut-down of an enterprise or institution shall be issued by the people's government that set the deadline for the elimination or control of pollution. An order for the suspension of operations or shut-down of an enterprise or institution directly under the jurisdiction of the Central Government shall be submitted to and approved by the State Council.

Article 40 A party refusing to accept the decision on administrative sanction may, within 15 days of receiving the notification on such a decision, apply for reconsideration to the department next higher to the authorities that imposed the sanction; if the party refuses to accept the decision of reconsideration, it may, within 15 days of receiving the reconsideration decision, bring a suit before a People's Court. A party may also bring a suit directly before a People's Court within 15 days

of receiving the notification on the sanction. If, upon the expiration of this period, the party has not applied for reconsideration or has neither brought a suit before a People's Court nor complied with the sanction, the authorities that imposed the sanction may apply to the People's Court for compulsory enforcement.

Article 41 A unit that has caused an environmental pollution hazard shall have the obligation to eliminate it and make compensation to the unit or individual that suffered direct losses.

A dispute over the liability to make compensation or the amount of compensation may, at the request of the partied, be settled by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management. If a party refuses to accept the decision on the settlement, it may bring a suit before a People's Court. The party may also directly bring a suit before the People's Court.

If environmental pollution losses result solely from irresistible natural disasters which cannot be averted even after the prompt adoption of reasonable measures, the party concerned shall be exempted from liability.

Article 42 The limitation period for prosecution with respect to compensation for environmental pollution losses shall be three years, counted from the time when the party becomes aware of or should become aware of the pollution losses.

Article 43 If a violation of this Law causes a serious environmental pollution accident, leading to the grave consequences of heavy losses of public or private property or human injuries or deaths of persons, the persons directly responsible for such an accident shall be investigated for criminal responsibility according to law.

Article 44 Whoever, in violation of this Law, causes damage to natural resources like land, forests, grasslands, water, minerals, fish, wild animals and wild plants shall bear legal liability in accordance with the provisions of relevant laws.

Article 45 Any person conducting supervision and management of environmental protection who abuses his power, neglects his duty or engages in malpractices for personal gains shall be given administrative sanction by the unit to which he belongs or the competent higher authorities; if his act constitutes a crime, he shall be investigated for criminal responsibility according to law.

Chapter VI Supplementary Provisions

Article 46 If an international treaty regarding environmental protection concluded or acceded to by the People's Republic of China contains provisions differing from those contained in the laws of the People's Republic of China, the provisions of the international treaty shall apply, unless the provisions are ones on which the People's Republic of China has announced reservations.

Article 47 This Law shall enter into force on the date of promulgation. The Environmental Protection Law of the People's Republic of China (for Trial Implementation) shall be abrogated therefrom.

Appendix 2
Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution

Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution

(Adopted at the 22nd Meeting of the Standing Committee of the Sixth National People's Congress on September 5, 1987 and amended according to the Decision on amending the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution adopted at the 15th Meeting of the Standing Committee of the Eighth National People's Congress on August 29, 1995 and revised at the 15th Meeting of the Standing Committee of the Ninth National People's Congress on April 29,2000)

Contents

Chapter I General Provisions

Article 1 This Law is formulated for the purpose of preventing and controlling atmospheric pollution, protecting and improving people's environment and the ecological environment, safeguarding human health, and promoting the sustainable development of the economy and society.

Article 2 The State Council and the local people's governments at various levels shall incorporate the protection of the atmospheric environment into the national economic and social development plans, make rational plans for the geographical distribution of industry, improve scientific research in the prevention and control of atmospheric pollution and adopt measures to prevent and control atmospheric pollution, in order to protect and improve the atmospheric environment.

Article 3 The State takes measures to control or gradually reduce, in a planned way, the total amount of the major atmospheric pollutants discharged in different areas.

The local people's governments at various levels shall be responsible for the quality of the atmospheric environment within the areas under their jurisdiction, making plans and taking measures to ensure that the quality of the atmospheric environment within the said areas meet the standards.

Article 4 The administrative departments for environmental protection under the people's governments at or above the county level shall exercise unified supervision over the prevention and control of atmospheric pollution.

The administrative departments for public security, transportation, railways and fishery at various levels shall perform their respective functions in conducting supervision over atmospheric pollution caused by motor vehicles and vessels.

The relevant competent departments under the people's governments at or above the county level shall, with the limits of their respective functions conduct supervision over the prevention and control of atmospheric pollution.

Article 5 All units and individuals shall have the obligation to protect the atmospheric environment and shall have the right to inform or lodge charges against units or individuals that cause pollution to the atmospheric environment.

Article 6 The administrative department for environmental protection under the State Council shall establish the national standards for atmospheric environment quality. The people's governments of provinces, autonomous regions and municipalities directly under the Central Government may establish their local standards for items not specified in the national standards for atmospheric environment quality and report the same to the administrative department for environmental protection under the State Council for the record.

Article 7 The administrative department for environmental protection under the State Council shall, on the basis of the national standards for atmospheric environment quality and the country's economic and technological conditions, establish the national norm for the discharge of atmospheric pollutants.

The people's governments of provinces, autonomous regions and municipalities directly under the Central Government may establish their local discharge norms for items not specified in the national norm for the discharge of atmospheric pollutants; with regard to items already specified in the national norms for the discharge of atmospheric pollutants, they may set local discharge norms which are more stringent than the national norm and report the same to the administrative department for environmental protection under the State Council for the record.

Where the local norms for the discharge of atmospheric pollutants by motor vehicles and vessels established by the people's governments of provinces, autonomous regions and municipalities directly under the Central Government are more stringent than the national norm, they shall be subject to approval by the State Council.

Units that discharge atmospheric pollutants in areas where local discharge norms have been established shall do so in

conformity with such norms.

Article 8 The State adopts economic and technological policies and measures to facilitate the prevention and control of atmospheric pollution and the relevant multi-purpose utilization.

Units or individuals that have made outstanding achievements in the prevention and control of atmospheric pollution or in the protection and improvement of the atmospheric environment shall be rewarded by the people's governments at various levels.

Article 9 The State encourages and supports scientific and technological research into the prevention and control of atmospheric pollution, promotes the wide use of advanced and applicable technologies for such prevention and control; encourages and supports the development and utilization of clean energy like the solar energy, wind energy and water energy.

The State encourages and supports the development of the environmental protection industries.

Article 10 The people's governments at various levels shall redouble their efforts in afforestation, grass planting, urban and rural greening, and take effective measures that are suited to local conditions to prevent and control desertification so as to improve the atmospheric environment.

Chapter II Supervision over the Prevention and Control of Atmospheric Pollution

Article 11 Projects which discharge atmospheric pollutants shall be built, expanded or rebuilt in compliance with the State regulations requiring environmental protection in respect of such projects.

In the statement regarding the environmental impact of a construction project, the atmospheric pollution the project is likely to product and its impact on the ecological environment shall be assessed and measures for its prevention and control be specified; and the statement shall, in accordance with the specified procedures, be submitted to the administrative department for environmental protection for examination and approval.

Before a construction project is put into operation or to use, its facilities for the prevention and control of atmospheric pollution shall be subject to inspection and acceptance by the administrative department for environmental protection; no construction projects that fail to meet the requirements specified in the State regulations requiring environmental protection in respect of such projects shall be permitted to be put into operation or to use.

Article 12 Units that discharge atmospheric pollutants shall, pursuant to the regulations laid down by the administrative department for environmental protection under the State Council, report to the local administrative department for environmental protection the facilities installed for discharging and treating pollutants and the categories, quantities and density of the pollutants discharged under regular operation conditions and submit to the same department the relevant technical data concerning the prevention and control of atmospheric pollution.

The units that discharge pollutants, as mentioned in the preceding paragraph, shall without delay report on any substantial change in the categories, quantities or density of the atmospheric pollutants discharged. They shall keep their facilities for treating atmospheric pollutants in regular operation; where the said facilities are to be dismantled or left idle, the matter shall be reported to the local administrative department for environmental protection under the people's government at or above the county level for approval in advance.

Article 13 No units may discharge atmospheric pollutants in excess of the density specified by the State of by local authorities.

Article 14 The State institutes a system under which fees are charged discharge of atmospheric pollutants on the basis of the categories and quantities of the pollutants discharged and establishes reasonable rates for such fees according to the need for improved prevention and control of atmospheric pollution and the contry's economic and technological conditions.

The rates fixed by the State shall be applied in collecting the fees for discharge of pollutants, specific measures and the procedures for their implementation shall be prescribed by the State Council.

All the fees collected for discharge of pollutants shall be turned over to the Treasury and shall be used for the prevention and control of atmospheric pollution as prescribed by the State Council and may not be used for other purposes. And the auditing authority shall, in accordance with law, exercise supervision over their use through auditing.

Article 15 With regard to the areas, where the specified standards for the quality of the atmospheric environment are not met, and the acid rain control areas and the sulfur dioxide pollution control areas designated as such with the approval of the State Council, the State Council and the people's government of provinces, autonomous regions and municipalities directly under the Central Government may delimit them as the areas where the total amount of the main atmospheric pollutants discharged is kept under control. The specific measures for such control shall be prescribed by the State Council.

The relevant local people's governments in the areas where the total amount of the atmospheric pollutants discharged is kept under control shall, in compliance with the requirements and procedures prescribed by the State Council and in line with the principles of openness, fairness and impartiality, check and fix the total amounts of the main atmospheric pollutants discharged by enterprises and institutions and issue them permits for discharge for such pollutants.

The enterprises and institutions that undertake to control their total amounts of atmospheric pollutants discharged shall discharge pollutants in conformity with the checked and fixed total amounts of the main atmospheric pollutants to be discharged and the requirements in respect of their discharge prescribed by the permits.

Article 16 Within the scenic or historic sites, nature reserves, the areas adjacent to historical or cultural sites under protection and other zones that need special protection, delimited as such by the State Council or the people's governments of provinces, autonomous regions and municipalities directly under the Central Government, no industrial production installations that cause environmental pollution shall be built; the pollutants discharged by other installations to be built in these areas may not exceed the norms prescribed. Enterprises and institutions which, before the enforcement of this Law, have built installations that discharge pollutants in excess of the specified norms shall, in accordance with the provisions of Article 48 of this Law, put such pollution under control within a time limit.

Article 17 The State Council shall designate key cities for prevention and control of atmospheric pollution in accordance with the overall plan for urban development, the planned target for environmental protection and the quality of the atmospheric environment of cities.

Municipalities directly under the Central Government, provincial capitals, open coastal cities and key tourist cities shall be included in the list of key cities for prevention and control of atmospheric pollution.

Key cities for prevention and control of atmospheric pollution that fail to meet the standards for the quality of the atmospheric environment shall be required to do so within the time limit specified by the State Council or the administrative department for environmental under the State Council. The people's governments of such cities shall make plans to meet the standards within the time limit and may, under the authorization of the State Council or on the basis of its regulations, adopt more stringent measures to fulfill such plans on schedule.

Article 18 The administrative department for environmental protection under the State Council together with the relevant departments under the State Council may, in light of the meteorological, topographical, soil and other natural conditions, delimit the areas where acid rain has occurred or will probably occur and areas that are seriously polluted by sulfur dioxide as acid rain control areas or sulfur dioxide pollution control areas, subject to approval by the State Council.

Article 19 Enterprises shall give priority to the adoption of clean production techniques that are instrumental to high-efficient use of energy and reduced discharge of pollutants so as to decrease the generation of atmospheric pollutants.

The State practices an elimination system for the outdated production techniques and equipment which cause serious pollution to the atmospheric environment.

The competent department for comprehensive economic and trade affairs under the State Council shall, in conjunction with the relevant departments under the State Council, publish a catalog of the techniques which cause serious pollution to the atmospheric environment and the use of which shall be prohibited within a time limit, and a catalog of the equipment which causes serious pollution to the atmospheric environment and the production, sale, importation and use of which shall be prohibited within a time limit.

Producers, sellers, importers or users shall, within the time limit specified by the competent department for comprehensive economic and trade affairs under the State Council in conjunction with the relevant departments under the State Council, discontinue the production, sale, importation or use of the equipment listed in the catalog as mentioned in the preceding paragraph. Users of the production techniques listed in the catalog mentioned in the preceding paragraph shall, within the tune limit specified by the competent department for comprehensive economic and trade affairs under the State Council in conjunction with the relevant departments under the State Council, stop using such techniques.

No equipment eliminated in accordance with the provisions of the preceding two paragraphs may be transferred to another for use.

Article 20 Any unit that, as a result of an accident or any other exigency, discharges or leaks toxic or harmful gas or radioactive substances, thereby causing or threatening to cause an accident of atmospheric pollution and jeopardize human health, shall promptly take emergency measures to prevent and control the atmospheric pollution hazards, make the situation known to such units and inhabitants as are likely to be endangered by the atmospheric pollution hazards, report the case to the local administrative department for environmental protection and accept its investigation and disposal.

Under the urgent circumstances of a severe atmospheric pollution that jeopardizes human health and safety, the local people's government shall make the matter known to the local inhabitants without delay and take compulsory emergency measures, including ordering the pollutant discharging unit concerned to stop discharging pollutant.

Article 21 The administrative departments for environmental protections and other supervisory departments shall have the power to make on-site inspections of the units under their jurisdiction that discharge pollutants. The units under inspection shall truthfully report the situation to them and provide them with the necessary data. The inspecting departments shall have the obligation to keep confidential the technological know-how and business secrets of the units inspected.

Article 22 The administrative department for environmental protection under the State Council shall set up a monitoring system for atmospheric pollution, organize a monitoring network and work out unified monitoring measures.

Article 23 The administrative departments for environmental protection under the people's governments of large and medium-sized citied shall regularly publish bulletins on the quality of the atmospheric environment ad gradually introduce the practice of forecasting the quality of the atmospheric environment.

A bulletin on the quality of the atmospheric environment shall include such contents as the characteristics of the urban atmospheric pollution, the types of the main pollutants and the degree of the harm caused by the pollution.

Chapter III Prevention and Control of Atmospheric Pollution by the Burning of Coal

Article 24 The State promotes the dressing of coal by washing to reduce the sulfur and ash in coal, and restricts the mining of high-sulfur or high-ash coal. If the coal mined from a newly-built coal mine is of high-sulfur or high-ash, supporting facilities for the dressing of coal by washing shall be installed to keep the sulfur and ash in coal within the limits prescribed.

If the coal mined from an established coal mine is of high-sulfur or high-ash, supporting facilities for the dressing of coal by washing shall, in accordance with the plan approved by the State Council, be installed within a time limit.

It is prohibited to mine the coal containing toxic or harmful substances, such as radioactive and arsenic substances, that exceed the limits prescribed.

Article 25 The relevant departments under the State Council and the local people's governments at various levels shall adopt measures to improve the mix of urban energy and popularize the production and utilization of clean energy.

The people's governments of key cities for prevention and control of atmospheric pollution may, within the regions under their respective jurisdiction, delimit areas as ones where sale and use of the seriously polluting fuels defined by the administrative department for environmental protection under the State Council are prohibited. The units and individuals in such areas, within the time limit prescribed by the local people's governments, stop using such seriously polluting fuels and shall instead use natural gas, liquefied petroleum gas, electricity or other clean energy.

Article 26 The State adopts economic and technical policies and measures conductive to the clean utilization of coal, encourages and supports the use of fine coal of low-sulfur or low-ash, and encourages and supports the development and popularization of the technology of coal cleaning.

Article 27 The competent department concerned under the State Council shall, pursuant to the norms for boiler discharge of atmospheric pollutants prescribed by the State, stipulate corresponding requirements in the boiler quality standards; no boilers that do not meet the prescribed requirements shall be manufactured, sold or imported.

Article 28 Urban construction shall be conducted on the basis of over-all planning. In areas of coal heating, unified provision of heat sources shall be practiced and central heating developed. In areas covered by central heating pipelines or networks, no coal heating boilers may be installed.

Article 29 People's governments of large or medium-sized cities shall make plans for catering service enterprises to start the use of clean energy such as natural gas, liquefied petroleum gas and electricity within a time limit.

For other users of domestic cooking ranges in urban areas of large or medium-sized cities not delimited as areas where the use of seriously polluting fuels is prohibited, they shall, within a time limit, start to use sulfur-fixed briquette of coal or other clean energy.

Article 30 Where heat-engine plants and other large or medium-sized enterprises that discharge sulfur dioxide are built or expanded, if the prescribed norms for pollutants discharge or the control quotas for total amounts of discharge are exceeded, supporting facilities for desulphurization and dust removal shall be installed or other measures for control of the discharge of sulfur dioxide or for dust removal adopted.

In the acid rain control areas or sulfur dioxide pollution control areas, if established enterprises discharge atmospheric pollutants in excess of the norms for pollutants discharge, they shall, in accordance with the provisions of Article 48 of this Law, be required to keep the discharge under control within a time limit.

The State encourages enterprises to adopt advanced technology for desulphurization and dust removal.

Enterprises shall adopt measures to control the nitrogen oxide generated by the burning of fuel.

Article 31 When coal, gangue, coal cinder, coal ashes, sandstone lime soil or other material is stored in densely inhabited areas, fire and dust prevention measures shall be taken in order to prevent atmospheric pollution.

Chapter IV Prevention and Control of Environmental Pollution and Other Public Hazards

Article 24 Units that cause environmental pollution and other public hazards shall incorporate the work of environmental protection into their plans and establish a responsibility system for environmental protection, and must adopt effective measures to prevent and control the pollution and harms caused to the environment by waste gas, waste water, waste residues, dust, malodorous gases, radioactive substances, noise, vibration and electromagnetic radiation generated in the course of production, construction or other activities.

Article 25 For the technological transformation of newly-built industrial enterprises and existing industrial enterprises, facilities and processes that effect a high rate of the utilization of resources and a low rate of the discharge of pollutants shall be used, along with economical and rational technology for comprehensive utilization of waste materials and the treatment of pollutants.

Article 26 Installations for the prevention and control of pollution at a construction project must be designed, built and commissioned together with the principal part of the project. No permission shall be given for a construction project to be commissioned or used, until its installations for the prevention and control of pollution are examined and considered up to the standard by the competent department of environmental protection administration that examined and approved the

environmental impact statement.

Installations for the prevention and control of pollution shall not be dismantled or left idle without authorization. If it is really necessary to dismantle such installations or leave them idle, prior approval shall be obtained from the competent department of environmental protection administration in the locality.

Article 27 Enterprises and institutions discharging pollutants must report to and register with the relevant authorities in accordance with the provisions of the competent department of environmental protection administration under the State Council.

Article 28 Enterprises and institutions discharging pollutants in excess of the prescribed national or local discharge standards shall pay a fee for excessive discharge according to State provisions and shall assume responsibility for eliminating and controlling the pollution. The provisions of the Law on Prevention and Control of Water Pollution shall be complied with where they are applicable.

The income derived from the fee levied for the excessive discharge of pollutants must be used for the prevention and control of pollution and shall not be appropriated for other purposes. The specific measures thereof shall be prescribed by the State Council.

Article 29 If an enterprise or institution has caused severe environmental pollution, it shall be required to eliminate and control the pollution within a certain period of time.

For enterprises and institutions directly under the jurisdiction of the Central Government or the people's government of a province, an autonomous region, or a municipality directly under the Central Government, the decision on a deadline for the elimination or control of pollution shall be made by the people's government of the province, autonomous region and the municipality directly under the Central Government. For enterprises and institutions under the jurisdiction of a people's government at or below the city or county level, such decision shall be made by the people's government of the city or county. Such enterprises and institutions shall accomplish the elimination or control of pollution within the specified period of time.

Article 30 A ban shall be imposed on the importation of any technology or facility that fails to meet the requirements specified in the regulations of our country concerning environmental protection.

Article 31 Any unit that, as a result of an accident or any other exigency, has caused or threatens to cause an accident of pollution, must promptly take measures to prevent and control the pollution hazards, make the situation known to such units and inhabitants as are likely to be endangered by such hazards, report the case to the competent department of environmental protection administration of the locality and the departments concerned and accept their investigation and decision.

Enterprises and institutions that are likely to cause severe pollution accidents shall adopt measures for effective prevention.

Article 32 If the safety of the lives and property of inhabitants is endangered by severe environmental pollution, the competent department of environmental protection administration of the local people's government at or above the county level must promptly report to the local people's government. The people's government concerned shall take effective measures to remove or alleviate the hazard.

Article 33 The production, storage, transportation, sale and use of toxic chemicals and materials containing radioactive substances must comply with the relevant State provisions so as to prevent environmental pollution.

Article 34 No unit shall be permitted to transfer a production facility that causes severe pollution for use by a unit that is unable to prevent and control pollution.

Chapter V Legal Liability

Article 35 Any violator of this Law shall, according to the circumstances of the case, be warned or fined by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management for any of the following acts;

(1) refusing an on-site inspection by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management, or resorting to trickery and fraud while undergoing inspection;

(2) refusing to report or submitting a false report on items for which declaration is required by the competent department of environmental protection administration under the State Council;

(3) failing to pay, as provided for by the State, the fee for the excessive discharge of pollutants;

(4) importing technology or a facility that fails to meet the requirements specified in the State provisions concerning environmental protection; or

(5) transferring a production facility that causes severe pollution for use by a unit that is unable to prevent and control pollution.

Article 36 When a construction project is commissioned or put to use in circumstances where facilities for the prevention and control of pollution either have not been completed or fail to meet the requirements specified in State

provisions, the competent department of environmental protection administration responsible for the approval of the environmental impact statement on the construction project shall order the suspension of its operations or use and may concurrently impose a fine.

Article 37 A unit which dismantles or leaves idle the installations for the prevention and control of pollution without prior approval by the competent department of environmental protection administration, thereby discharging pollutants in excess of the prescribed discharge standards, shall be ordered by the competent department of environmental protection administration to set up the installations or put them to use again, and shall concurrently be fined.

Article 38 An enterprise or institution which violates this Law, thereby causing an environmental pollution accident, shall be fined by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management in accordance with the consequent damage; in a serious case, the persons responsible shall be subject to administrative sanction by the unit to which they belong or by the competent department of the government.

Article 39 An enterprise or institution that has failed to eliminate or control pollution by the deadline as required shall, as provided for by the State, pay a fee for excessive discharge; in addition, a fine may be imposed on it on the basis of the damage incurred, or the enterprise or institution may be ordered to suspend its operations or close down.

The fine as specified in the preceding paragraph shall be decided by the competent department of environmental protection administration. An order for the suspension of operations or shut-down of an enterprise or institution shall be issued by the people's government that set the deadline for the elimination or control of pollution. An order for the suspension of operations or shut-down of an enterprise or institution directly under the jurisdiction of the Central Government shall be submitted to and approved by the State Council.

Article 40 A party refusing to accept the decision on administrative sanction may, within 15 days of receiving the notification on such a decision, apply for reconsideration to the department next higher to the authorities that imposed the sanction; if the party refuses to accept the decision of reconsideration, it may, within 15 days of receiving the reconsideration decision, bring a suit before a People's Court. A party may also bring a suit directly before a People's Court within 15 days of receiving the notification on the sanction. If, upon the expiration of this period, the party has not applied for reconsideration or has neither brought a suit before a People's Court nor complied with the sanction, the authorities that imposed the sanction may apply to the People's Court for compulsory enforcement.

Article 41 A unit that has caused an environmental pollution hazard shall have the obligation to eliminate it and make compensation to the unit or individual that suffered direct losses.

A dispute over the liability to make compensation or the amount of compensation may, at the request of the partied, be settled by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management. If a party refuses to accept the decision on the settlement, it may bring a suit before a People's Court. The party may also directly bring a suit before the People's Court.

If environmental pollution losses result solely from irresistible natural disasters which cannot be averted even after the prompt adoption of reasonable measures, the party concerned shall be exempted from liability.

Article 42 The limitation period for prosecution with respect to compensation for environmental pollution losses shall be three years, counted from the time when the party becomes aware of or should become aware of the pollution losses.

Article 43 If a violation of this Law causes a serious environmental pollution accident, leading to the grave consequences of heavy losses of public or private property or human injuries or deaths of persons, the persons directly responsible for such an accident shall be investigated for criminal responsibility according to law.

Article 44 Whoever, in violation of this Law, causes damage to natural resources like land, forests, grasslands, water, minerals, fish, wild animals and wild plants shall bear legal liability in accordance with the provisions of relevant laws.

Article 45 Any person conducting supervision and management of environmental protection who abuses his power, neglects his duty or engages in malpractices for personal gains shall be given administrative sanction by the unit to which he belongs or the competent higher authorities; if his act constitutes a crime, he shall be investigated for criminal responsibility according to law.

Chapter VI Supplementary Provisions

Article 46 If an international treaty regarding environmental protection concluded or acceded to by the People's Republic of China contains provisions differing from those contained in the laws of the People's Republic of China, the provisions of the international treaty shall apply, unless the provisions are ones on which the People's Republic of China has announced reservations.

Article 47 This Law shall enter into force on the date of promulgation. The Environmental Protection Law of the People's Republic of China (for Trial Implementation) shall be abrogated therefrom.

Appendix 3
Law of the People's Republic of China on Prevention and Control of Water Pollution

Law of the People’s Republic of China on Prevention and Control of Water Pollution

CHAPTER I GENERAL PROVISIONS

Article 1 This Law is enacted for the purposes of preventing and controlling water pollution, protecting and improving the environment, safeguarding human health, ensuring effective utilization of water resources and promoting progress of the socialist modernization drive.

Article 2 This Law applies to prevention and control of pollution of rivers, lakes, canals, irrigation channels, reservoirs and other surface water bodies and of ground water bodies within the territory of the People's Republic of China.

This Law is not applicable to prevention and control of marine pollution, which is provided for by a separate law.

Article 3 Relevant departments under the State Council and local people's governments at various levels must incorporate protection of the water environment into their plans and adopt ways and measures to prevent and control water pollution.

Article 4 The environmental protection departments of the people's governments at various levels shall be the organs exercising unified supervision and management of prevention and control of water pollution.

Navigation administration offices of the communications departments at various levels shall be the organs exercising supervision and management of pollution caused by ships.

Water conservancy administration departments, public health administration departments, geological and mining departments, municipal administration departments, and water sources protection agencies for major rivers of the people's governments at various levels shall, through performing their respective functions and in conjunction with environmental protection departments, exercise supervision over and management of prevention and control of water pollution.

Article 5 All units and individuals shall have the duty to protect the water environment and the right to supervise and inform against any pollution or damage to the water environment.

Any unit or individual that has suffered damage directly from a water pollution hazard shall have the right to demand elimination of the hazard and compensation for the damage by the polluter.

CHAPTER II ESTABLISHMENT OF STANDARDS FOR WATER ENVIRONMENT QUALITY AND FOR DISCHARGE OF WATER POLLUTANTS

Article 6 The environmental protection department under the State Council shall establish the national standards for water environment quality.

The people's governments of provinces, autonomous regions and municipalities directly under the Central Government may establish their own local standards for the items that are not specified in the national standards for water environment quality and report the same to the environmental protection department under the State Council for the record.

Article 7 The environmental protection department under the State Council shall, in line with the national standards for water environment quality and the country's economic and technological conditions, establish the national standards for discharge of water pollutants.

The people's governments of provinces, autonomous regions and municipalities directly under the Central Government may establish their own local standards for the items that are not specified in the national standards for discharge of water pollutants. With regard to the items that are already specified in the national standards for discharge of water pollutants, they may establish more stringent local standards than the national standards. All local standards must be reported to the environmental protection department under the State Council for the record.

Those who discharge pollutants into any water body for which local standards have been established shall observe such local standards.

Article 8 The environmental protection department under the State Council and the people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall, in line with the requirements of prevention and control of water pollution and the country's economic and technological conditions, amend in due time their standards for water environment quality and for discharge of water pollutants.

CHAPTER III SUPERVISION AND MANAGEMENT OF PREVENTION AND CONTROL OF

Article 9 Relevant departments under the State Council and local people's governments at various levels shall, when developing, utilizing, regulating and allocating water resources, make integrated plans for maintaining proper river flows, proper water levels of lakes, reservoirs and proper ground water tables, in order to retain the natural purification capacity of water bodies.

Article 10 To prevent and control water pollution, it is necessary to make unified plans on the basis of river basins or regions. Plans for preventing and controlling water pollution of basins of major rivers, designated as such by the State, shall be formulated by the environmental protection department under the State Council, together with the competent department

of planning, water conservancy administration department and other departments concerned as well as the people's governments of relevant provinces, autonomous regions and municipalities directly under the Central Government, and shall be submitted to the State Council for approval.

Plans for preventing and controlling water pollution of basins of other rivers that run across provinces or counties shall be formulated, in line with the plans for preventing and controlling water pollution of basins of major rivers, designated as such by the State, and in light of actual local conditions, by the environmental protection departments of the people's governments at or above the provincial level, together with the water conservancy administration departments and other departments concerned as well as the relevant local people's governments, and shall be submitted to the State Council or the people's governments at the provincial level for approval. Plans for preventing and controlling water pollution of basins of other rivers that run across counties but not provinces shall be submitted by the people's government of the province concerned to the State Council for the record.

Plans for preventing and controlling water pollution, once approved, shall serve as the essential basis for prevention and control of water pollution, and any modification of such plans shall be subject to approval of the original departments that approved the plans.

Local people's governments at or above the county level shall, in accordance with the approved plans for preventing and controlling water pollution of river basins, organize people to work out plans for preventing and controlling water pollution for their own administrative regions and incorporate such plans in the long-term, medium-term and annual plans of their administrative regions for national economic and social development.

Article 11 Relevant departments under the State Council and local people's governments at various levels shall make rational plans for the geographical distribution of industries, subject those enterprises that cause water pollution to rectification and technological updating, adopt comprehensive prevention and control measures, increase the rate of water recycling, utilize resources rationally and reduce discharge of waste water and pollutants.

Article 12 The people's governments at or above the county level may delineate protection zones for water bodies in scenic or historic sites, major fishery water bodies and other water bodies of special economic or cultural value, and take measures to ensure that the water quality in those protection zones complies with the standards for the designated uses.

Article 13 New construction projects and expansion or reconstruction projects and other installations on water that directly or indirectly discharge pollutants to water bodies shall be subject to relevant State regulations governing environmental protection for such projects.

In the environmental impact statement of a construction project an assessment shall be made regarding the water pollution hazards the project is likely to produce and its impact on the ecosystem, and measures for their prevention and control shall be prescribed. The statement shall be submitted, according to the specified procedure, to the relevant environmental protection department for examination and approval. The building of sewage outlets within any water conservancy projects such as canals, irrigation channels and reservoirs shall be subject to consent of the relevant department in charge of water conservancy projects.

The facilities for prevention and control of water pollution must be designed, constructed and put to use or into operation simultaneously with the main part of a construction project. Such facilities must be inspected by the environmental protection department. If they do not conform to the specified requirements, the said project shall not be permitted to be put into operation or to use.

An environmental impact statement shall contain comments and suggestions of the units and residents in the place where the construction project is located.

Article 14 Enterprises and institutions that discharge pollutants directly or indirectly into a water body shall, pursuant to the regulations of the environmental protection department under the State Council, report to and register with the local environmental protection department their existing facilities for discharging and treating pollutants, and the categories, quantities and concentrations of pollutants discharged under their normal operating conditions, and also provide to the same department technical information concerning prevention and control of water pollution.

The enterprises and institutions mentioned in the preceding paragraph shall report without delay any substantial change in the categories, quantities or concentrations of the pollutants discharged. Their facilities for treating water pollutants must be kept in normal operation; when such facilities are to be dismantled or left idle, the matter must be reported in advance to the environmental protection department of the local people's government at or above the county level for approval.

Article 15 Enterprises and institutions that discharge pollutants into a water body shall pay a pollutant discharge fee in accordance with State regulations; if the discharge exceeds the limits set by the national or local standards, they shall pay a fee for excess discharge according to State regulations.

The fees paid for pollutant discharge and for excess discharge must be used for prevention and control of water pollution and may not be used for any other purposes.

Enterprises and institutions that discharge pollutants in excess of the standards must work out plans to make the discharge conform to the standards, and shall submit, for the record, such plans to the environmental protection department of the local people's government at or above the county level in the place where they are located.

Article 16 With regard to water bodies where the standards for water environment quality established by the State still cannot be attained although the discharge of water pollutants has conformed to the discharge standards, the people's governments at or above the provincial level may institute a system for control of the total discharge of major pollutants, and a system for making an estimate before deciding on the quantity of major pollutants to be discharged by an enterprise that is

charged with the task of reducing its discharge. Specific measures shall be formulated by the State Council.

Article 17 The environmental protection department under the State Council may, together with the water conservancy administration department under the State Council and the provincial people's government concerned and in light of the utilization functions determined by the State for water bodies of major river basins as well as the economic and technological conditions of the related regions, establish water environment quality standards applicable to water bodies of such major river basins within the provincial boundaries, and such standards shall be put into practice after being reported to and approved by the State Council.

Article 18 Water resources protection agencies for major river basins determined as such by the State shall be responsible for monitoring the water environment quality conditions of such river basins within the boundaries of the provinces where they are located and shall, without delay, report the monitoring findings to the environmental protection department under the State Council and the water conservancy administration department under the State Council; where there are leading bodies for protection of water resources of the river basins that are set up with the approval of the State Council, such findings shall, without delay, be reported to those leading bodies.

Article 19 Urban sewage shall be centrally treated.

Relevant departments under the State Council and the local people's governments at various levels must incorporate protection of urban water sources and prevention and control of urban water pollution in their respective plans for urban construction, construct and improve networks of urban drainage pipelines, construct facilities for central treatment of urban sewage according to plans, and improve all-round treatment and control of urban water environment.

Facilities for central treatment of urban sewage shall be, according to State regulations, provided for use with compensation, that is, a sewage treatment fee shall be collected so as to ensure normal operation of the facilities. Those who discharge sewage to the central treatment facilities and pay the fees for sewage treatment shall be exempted from the pollutant discharge fee. Sewage treatment fees collected shall be used for the construction and operation of the facilities for central treatment of urban sewage and may not be used for other purposes.

Specific measures for collection, control and use of the fees for facilities for central treatment of urban sewage shall be formulated by the State Council.

Article 20 The people's governments at or above the provincial level may delineate surface sources protection zones for domestic and drinking water according to law. Such protection zones shall be divided into first-grade protection zones and protection zones of other grades. Certain water areas and land-based areas near the intakes of domestic and drinking surface water sources may be delineated as the first-grade protection zones. Certain water areas and land-based areas beyond the first-grade protection zones may be delineated as protection zones of other grades. Protection zones of all grades shall be indicated by clear geographic demarcations.

It is forbidden to discharge sewage into water bodies within the firstgrade surface sources protection zones for domestic and drinking water.

It is forbidden to travel, swim or carry out other activities within the first-grade surface sources protection zones for domestic and drinking water that may possibly cause pollution to the water body.

It is forbidden to construct or expand within the first-grade surface sources protection zones for domestic and drinking water, any projects that have noting to do with water supply facilities and protection of water sources.

With regard to sewage outlets already built in the first-grade surface sources protection zones for domestic and drinking water, the people's governments at or above the county level shall, pursuant to the limits of power authorized by the State Council, order that they be dismantled or treated within a time limit.

The protection of ground sources for domestic and drinking water shall be strengthened.

Specific measures for protection of domestic and drinking water sources shall be formulated by the State Council.

Article 21 In case of emergency, such as severe pollution of a domestic and drinking water source which threatens the safe supply of water, the environmental protection department shall, with the approval of the people's government at the same level, take compulsory emergency measures, including ordering the enterprises or institutions concerned to reduce or stop the discharge of pollutants.

Article 22 Enterprises shall employ clean production techniques that facilitate high utilization efficiency of raw and semi-finished materials and reduced discharge of pollutants and improve management to decrease water pollutants.

The State shall institute a system for eliminating outdated production techniques and equipment which seriously pollute the water environment.

The competent department for comprehensive economic and trade affairs under the State Council shall, together with the relevant departments under the State Council, publish the catalogue for techniques which seriously pollute the water environment and for stopping the use of which a time limit is fixed, as well as the catalogue of equipment which seriously pollute the water environment and for stopping the manufacture, sale, import and use of which a time limit is fixed.

Manufacturers, sellers, importers and users must, within the time limit fixed by the competent department for comprehensive economic and trade affairs under the State Council together with the relevant departments under the State Council, stop manufacturing, selling, importing or using the equipment listed in the catalogue mentioned in the preceding paragraph. Users of the production techniques listed in the catalogue mentioned in the preceding paragraph must stop using such production techniques within the time limit fixed by the competent department for comprehensive economic and trade affairs under the State Council together with relevant departments under the State Council.

No equipment that has been eliminated according to the provisions of the preceding two paragraphs may be transferred

to others for use.

Article 23 The State shall forbid construction of any small enterprises, devoid of measures for prevention and control of water pollution, that seriously pollute the water environment, such as chemical pulp mills, printing and dyeing mills, dyestuff mills, tanneries, electroplating factories, oil refineries and pesticides manufacturers.

Article 24 Any pollutant discharging unit that causes serious pollution to a water body shall be ordered to treat the pollution within a time limit.

For enterprises and institutions directly under the jurisdiction of the Central Government or the people's government of a province, autonomous region or municipality directly under the Central Government, a proposal on the time limit shall be made by the environmental protection department of the people's government of the province, autonomous region or municipality directly under the Central Government and submitted to the people's government at the same level for decision. For enterprises and institutions under the jurisdiction of the people's government at or below the county or city level, a proposal on the time limit shall be made by the environmental protection department of the people's government of the city or county and submitted to the people's government at the same level for decision. The pollutant discharging units shall accomplish treatment of the pollution as scheduled.

Article 25 Environmental protection departments and relevant supervision and management departments of the people's governments at various levels shall have the power to carry out on-site inspections of pollutant discharging units under their jurisdiction, and the units under inspection must report the situation truthfully and provide the necessary information. The inspecting authorities shall have the obligation to keep the technological and business secrets of the units inspected.

Article 26 Disputes over water pollution involving two or more administrative regions shall be settled through consultation by the local people's governments concerned, or through mediation by their people's government at a higher level.

CHAPTER IV PREVENTION OF SURFACE WATER POLLUTION

Article 27 No sewage outlet may be built in the protection zones for domestic and drinking water sources, for water bodies at scenic or historic sites, for important fishery water bodies and for other water bodies of special economic and cultural value. If a sewage outlet is to be built in the vicinity of such protection zones, the water bodies within those zones must be protected against pollution.

Sewage outlets that have already been built prior to promulgation of this Law, but that discharge pollutants in excess of the limits set by the national or local standards shall be tackled and brought under control. Any outlet that endangers drinking water sources shall be relocated.

Article 28 If a pollutant discharging unit, as a result of an accident or other exigency, discharges pollutants in excess of normal quantities and thus causes or may possibly cause a water pollution accident, it shall immediately take emergency measures, inform such units as are likely to be endangered or damaged by the water pollution and report the matter to the local environmental protection department. Where a ship has caused a pollution accident, it shall report the matter to the nearest navigation administration office for investigation and disposal.

Where a pollution accident occurs to fishery, the matter shall be investigated and handled by the fishery supervision and administration department.

Article 29 It is forbidden to discharge any oil, acid or alkaline solutions or deadly toxic liquid waste into any water body.

Article 30 It is forbidden to wash and clean in any water body any vehicles or containers which have been used for storing oil or toxic pollutant.

Article 31 It is forbidden to discharge or dump into any water body or directly bury deadly toxic soluble slag, tailings, etc. containing such substances as mercury, cadmium, arsenic, chromium, lead, cyanide and yellow phosphorus.

Sites for depositing deadly toxic soluble slag, tailings, etc. shall be made waterproof and protected against seepage and leaking.

Article 32 It is forbidden to discharge or dump industry waste residues, urban refuse or other wastes into any water body.

Article 33 It is forbidden to pile or deposit solid wastes and other pollutants on beaches and bank slopes below the highest water level of rivers, lakes, canals, irrigation channels and reservoirs.

Article 34 It is forbidden to discharge or dump radioactive solid wastes or waste water containing any high-or medium-level radioactive substances into any water body.

Any discharge of waste water containing low-level radioactive substances into any water body must comply with the regulations and standards of the State for radioactive protection.

Article 35 Where heated waste water is discharged into any water body, measures shall be taken to ensure that the temperature of the water body conforms to the standards for water environment quality, so as to prevent any heat pollution hazard.

Article 36 Pathogen-contaminated sewage may be discharged only after it is disinfected to meet the relevant standards of the State.

Article 37 Where industrial waste water or urban sewage is discharged into farmland irrigation channels, attention shall be paid to ensuring that the water quality at the nearest irrigation intake downstream conforms to the standards for the farmland irrigation water quality.

When industrial waste water or urban sewage is used for irrigation, attention shall be paid to guarding against pollution of the soil, ground water and agricultural products.

Article 38 The application of pesticides shall comply with the regulations and standards of the State for their safe use.

Transportation and storage of pesticides and disposal of expired or ineffective pesticides shall be strictly controlled to prevent water pollution.

Article 39 The administrative departments for agriculture and other departments concerned of the local people's governments at or above the county level shall take measures to provide guidance to agricultural producers as to how to apply fertilizers and pesticides scientifically and rationally, so as to prevent their excessive use and water pollution.

Article 40 The discharge of oil-bearing waste water or domestic ewage from ships shall comply with the standards for pollutant discharge by ships. Ocean-going ships, on entering inland rivers or harbors, shall observe the standards for pollutant discharge by inland river ships.

Residual oil or waste oil of ships must be recovered, and its discharge into any water body shall be forbidden.

It is forbidden to dump ship refuse into any water body.

Where ships are being loaded with or transporting oils or toxic cargoes, measures must be taken against any spillage or leakage of the oils and against such cargoes from falling into water, in order to prevent water pollution.

CHAPTER V PREVENTION OF GROUND WATER POLLUTION

Article 41 Enterprises and institutions shall be forbidden to discharge or dump waste water containing toxic pollutants or pathogens or other wastes into seepage wells or pits, crevices or karat caves.

Article 42 At places where no satisfactory impervious strata exist, enterprises and institutions shall be forbidden to use ditches, pits or ponds devoid of safeguards against seepage for conveyance or storage of waste water containing toxic pollutants or pathogens, or of other wastes.

Article 43 In exploiting ground water from multiple aquifers, layered exploitation shall be resorted to if the water quality differs greatly from one aquifer to another. No combined exploitation of paretic water and artesian water already polluted may be permitted.

Article 44 While constructing underground engineering facilities or carrying out underground prospecting, mining and other underground activities, protective measures shall be taken to prevent ground water pollution.

Article 45 Artificial recharge for ground water may not deteriorate the quality of ground water.

CHAPTER VI LEGAL LIABILITY

Article 46 Any one who, in violation of the provisions of this Law, commits any of the following acts, shall, in light of the seriousness of the case, be warned or fined by the environmental protection department or by the navigation administration office of the communications department:

(1) refusing to report or submitting a false report on items for which registration is required by the environmental protection department under the State Council for discharge of pollutants;
(2) refusing an on-site inspection by the environmental protection department or the supervision and management department concerned, or resorting to deception;
(3) storing, piling, abandoning, dumping or discharging any pollutant or waste in violation of the relevant provisions of Chapters IV and V of this Law; or
(4) failing to pay, as provided for by the State, the fee for pollutant discharge or for excess discharge.

The amount of fine and the procedure for its imposition shall be stipulated in the rules for implementation of this Law.

Article 47 If any unit, in violation of the provisions of the third paragraph of Article 13 of this Law, puts into production or to use a construction project for which the construction of facilities for prevention and control of water pollution has not been completed or whose facilities for prevention and control of water pollution fail to meet the requirements laid down by the State, the environmental protection department that approved the environmental impact statement of the said project shall order the unit to suspend production or use, and may also impose a fine on it.

Article 48 If any pollutant discharging unit, in violation of the provisions of the second paragraph of Article 14 of this Law, intentionally does not use the water pollutant treatment facilities in a normal manner, or dismantles or lays idle such facilities without approval of the environmental protection department and thus discharges pollutants in excess of the standards, the environmental protection department of the local people's government at or above the county level shall order the unit to restore the normal use or to re-install and use the facilities within a time limit, and may also impose a fine on it.

Article 49 If any unit, in violation of the provisions of the fourth paragraph of Article 20 of this Law, constructs or expands, within a first-grade surface sources protection zone for domestic and drinking water, the people's government at or above the county level shall, pursuant to the limits of power authorized by the State Council, order the unit to suspend operation or to close down.

Article 50 If any unit, in violation of the provisions of Article 22 of this Law, manufactures, sells, imports or uses equipment that is prohibited from being manufactured, sold, imported or used or employs production techniques that are prohibited from being employed, the competent department for comprehensive economic and trade affairs of the people's government at or above the county level shall order to set it right; if the violation is serious, the competent department for comprehensive economic and trade affairs of the people's government at or above the county level shall submit a proposal to the people's government at the same level that it, within the limits of its power authorized by the State Council, order the unit to suspend operation or to close down.

Article 51 If, in violation of the provisions of Article 23 of this Law, a small enterprise devoid of water pollution prevention and control measures is constructed and thus it causes severe pollution to the water environment, the people's government of the city or county where it is located or the people's government at a higher level shall order it to close down.

Article 52 An enterprise or institution which has caused severe pollution to a water body but has failed to eliminate such pollution on expiration of the time limit shall, according to regulations of the State, pay twice or more the fee for excess discharge, and may, in the light of consequent damage and loss, also be fined or ordered to suspend operation or close down.

The fine shall be decided by the environmental protection department. The order for suspension of operation or shutdown of an enterprise or institution shall be issued by the local people's government which sets the time limit for elimination of the pollution; The order for suspension of operation or shutdown of an enterprise or institution under direct jurisdiction of the Central Government shall be submitted to the State Council for approval.

Article 53 If a pollutant discharging unit, in violation of the provisions of this Law, causes a water pollution accident, the environmental protection department of the people's government at or above the county level in the place where the accident occurs shall, in light of the consequent damage and loss, impose a fine on it.

If a unit causes a fishery pollution accident or a ship causes a water pollution accident, the fishery supervision and administration department or the navigation administration office of the communications department in the place where the accident occurs shall impose a fine on the unit or ship in light of the consequent damage and loss.

If a water pollution accident is relatively serious, the persons who are responsible for the accident shall be given administrative sanctions by the unit to which they belong or by the competent department at a higher level.

Article 54 A party that refuses to accept the decision on administrative penalty may, within 15 days from the date of receiving the notification, bring a suit in a People's Court; if the party, upon expiration of the period, neither brings a suit nor complies with the decision, the organ which made the decision on the penalty shall apply to the People's Court for enforcement.

Article 55 A unit which has caused a water pollution hazard shall have the responsibility to eliminate it and make compensation to the unit or individual that has suffered direct losses.

A dispute over liability to make compensation or the amount of compensation may, at the request of the parties, be settled by the environmental protection department or by the navigation administration office of the communications department. If a party refuses to accept the settlement decision, he may bring a suit to a People's Court. The party may also bring a suit to a People's Court directly.

If the loss from water pollution is caused by a third party intentionally or negligently, the third party shall be liable to make compensation.

If the loss from water pollution is caused due to the victim's own fault, the pollutant discharging unit shall bear no liability for it.

Article 56 If the loss from water pollution is caused entirely by irresistible natural disasters which cannot be averted even after reasonable measures have been promptly taken, the party concerned shall be exempted from liability.

Article 57 If any one, in violation of the provisions of this Law, gives rise to a major water pollution accident which leads to any heavy loss to public or private property or serious injury to or death of a person, the persons who are responsible for it may be investigated for criminal responsibility by applying mutatis mutandis the provisions of Article 115 or Article 187 of the Criminal Law.

Article 58 If any supervisor or administrator from the environmental protection department or any other State functionary abuses his power, neglects his duty or engages in malpractice for personal gain, the unit to which he belongs or the competent department at a higher level shall give him an administrative sanction; if a crime is constituted, he shall be

investigated for criminal responsibility according to law.

CHAPTER VII SUPPLEMENTARY PROVISIONS

Article 59 The standing committees of the people's congresses of provinces, autonomous regions and municipalities directly under the Central Government shall, with reference to the principles of this Law, formulate control measures governing discharge of pollutants by private industrialists and businessmen who cause serious pollution.

Article 60 For the purpose of this Law, the definitions of the following terms are:

(1) "Water pollution" means the introduction into a water body of any substance which alters the chemical, physical, biological or radioactive properties of the water in such a way as to affect its effective use, endanger human health, damage the ecosystem or deteriorate the water quality.
(2) "Pollutant" means a substance that is capable of causing water pollution.
(3) "Toxic pollutant" means a pollutant that, when ingested by organisms directly or indirectly, leads to diseases, abnormal behaviour, genetic mutation, physiological functional disturbance, organism deformity or death of the organisms themselves or their offsprings.
(4) "Oil" means any kind of oils or its refined products.
(5) "Fishery water bodies" means those parts of water bodies designated for the spawning, feeding, wintering or migratory passage of fish or shrimp, and for breeding fish, shrimp or shellfish or growing algae.

Article 61 The environmental protection department under the State Council shall, on the basis of this Law, formulate detailed rules for implementation of this Law, which shall be put into effect after being submitted to and approved by the State Council.

Article 62 This Law shall come into force on May 15,1996.

(quoted from the website of *State Environmental Protection Administration (SEPA)*,
URL: http://www.zhb.gov.cn/english/chanel-3/detail-3.php3?chanel=3&column=1&id=5)

Appendix 4
Implementation of the Law of the People's Republic of China on Water Pollution Prevention and Control
(State Council of the People's Republic of China, Law No.284)

Implementation of the Law of the People's Republic of China on Water Pollution Prevention and Control

(Promulgated by Decree No.284 of the State Council on March 20, 2000, and entry into operation on the day of promulgation)

Chapter I General Provisions

Article 1 In accordance with the Law of the People's Republic of China on the Prevention and Control of Water Pollution (hereinafter referred to as the Law on the Prevention and Control of Water Pollution), these Rules are formulated.

Chapter II Supervision and Management of the Prevention and Control of Water Pollution

Article 2 The plan on the prevention and control of water pollution for the basin formulated according to the provisions of Article 10 of the Law on the Prevention and Control of Water Pollution shall contain the followings:

1. environmental function requirements of the water body;
2. water quality goals and time limits at different stages;
3. key zones for the prevention and control of water pollution and the major pollution sources, and the concrete measures for the control; and
4. the construction plan on urban drainage and waste water treatment facilities within the basin.

Article 3 The competent administrative departments of water of people's governments at and above the county level shall, when determining the minimum water effusion from the dams of large and medium reservoirs, guarantee the natural purification capability of the downstream water body and solicit the opinions of the departments of environmental protection of people's governments at the same level.

Article 4 An enterprise or institutional unit must, if discharging a pollutant into a water body, submit an Application Form for the Registration of Pollutant Discharge to the department of environmental protection of the local people's government at or above the county level in the place where it is located.

If an enterprise or institutional unit discharges a pollutant in excess of the pollutant discharge standards established by the State or the locality, it shall give the reasons therefor and the measures of treatment within a given time limit at the time of submitting the Application Form for the Registration of Pollutant Discharge.

Article 5 If an enterprise or institutional unit needs to dismantle or set idle its pollutant treatment facilities, it must apply to the department of environmental protection of the local people's government at or above the county level in the place where it is located in advance and give the reasons therefor. Within one month from the date of receiving the application, the department of environmental protection shall make a decision of approval or disapproval and give a written reply. If no reply is given as scheduled, it is deemed an approval.

Article 6 If a water body is not in compliance with the water environmental quality standards established by the State even after the discharge of pollutants has been in compliance with the standards, the system of control of the total discharge of major pollutants may be employed.

The plans on the control of total discharge for important river basins determined by the State are formulated by the department of environmental protection of the State Council, jointly with the relevant departments of the State Council and in consultation with the people's governments of related provinces, autonomous regions and municipalities directly under the Central Government, and reported to the State Council for approval. The plans on the control of total discharge for other water bodies are formulated by the departments of environmental protection of the people's governments of provinces, autonomous regions and municipalities directly under the Central Government, jointly with the relevant departments at the same level and in consultation with the local people's governments concerned, and reported to the people's governments of provinces, autonomous regions and municipalities directly under the Central Government for approval. Of them, the plans on the control of total discharge for the water bodies involving two or more provinces, autonomous regions and municipalities directly under the Central Government are formulated through consultation by the people's governments of related provinces, autonomous regions and municipalities directly under the Central Government.

Article 7 A plan on the control of total discharge shall contain the area of the control of total discharge, types and total discharge of major pollutants, and the pollutant discharge to be reduced and the time limit for the reduction.

Article 8 If the control of total discharge of major pollutants is imposed on a water body according to law, the local people's government at or above the county level shall organize to formulate the implementing program for the control of total discharge for the said water body within its own administrative area in accordance with the quantity of the control of total discharge allocated by the plan on the control of total discharge.

The implementing program for the control of total discharge shall determine the units required to reduce their pollutant discharges, the types and the quantities of the control of total discharge of key pollutants of each pollutant discharging unit, and the pollutant discharge to be reduced and the time limit for the reduction.

Article 9 The allocation of quantities of the control of total discharge of major pollutants shall be in compliance with the principle of openness, fairness and impartiality and be carried out in a scientific and unified method. The measures for the allocation of quantities of the control of total discharge are formulated by the department of environmental protection of the State Council in consultation with the relevant departments of the State Council.

Article 10 The departments of environmental protection of local people's governments at and above the county level examine and approve the discharge quantities of major pollutants being discharged into the water bodies of the units within their respective administrative areas according to the implementing program for the control of total discharge and issue the pollutant discharge permit to those whose discharge does not exceed the quantities of the control of total discharge; order those whose discharge exceeds the quantities of the control of total discharge to make treatment within a given time limit and issue the interim pollutant discharge permit for the treatment period. The concrete measures therefor are formulated by the department of environmental protection of the State Council.

Article 11 The units reducing the pollutant discharge determined under the implementing program for the control of total discharge must construct pollutant discharge outlets and install monitoring equipment for the control of total discharge according to the regulations of the department of environmental protection of the State Council.

Article 12 The people's governments of provinces, autonomous regions and municipalities directly under the Central Government in the places where the major river basins determined by the State are located shall implement the water environmental quality standards applicable to water bodies within provincial boundaries approved by the State Council.

Article 13 The monitoring of water environmental quality for water bodies of the major river basins within provincial boundaries determined by the State must be governed strictly by the water environmental quality monitoring norms formulated by the department of environmental protection of the State Council.

Article 14 The administration departments of urban construction shall, according to the overall urban planning, organize to formulate the specialized plans on urban drainage and waste water treatment, and organize to construct the central treatment facilities for urban waste water according to the requirements of the plans.

Article 15 The quality of water flowing out of the central treatment facilities for urban waste water is governed by the pollutant discharge standards established by the State or the localities.

The operating units of central treatment facilities for urban waste water shall be responsible for the quality of water flowing out of the central treatment facilities for urban waste water.

The departments of environmental protection shall carry out sample inspections into the quality and quantity of water flowing out of the central treatment facilities for urban waste water.

Article 16 A pollutant discharge unit which is ordered to make treatment within a given time limit shall submit its treatment plan to the department of environmental protection of the people's government which made the decision of treatment within the given time limit, and shall report the progress of the treatment regularly.

The department of environmental protection of the people's government which made the decision of treatment within a given time limit shall inspect the treatment progress of the pollutant discharge unit which is ordered to make treatment within a given time limit, and shall carry out the acceptance inspection into the project of treatment within a given time limit when completed.

The pollutant discharge unit which is ordered to make treatment within a given time limit must finish the treatment task as scheduled. If it is unable to do so due to force majeure, it must, within one month after the occurrence of the force majeure, submit an application for a extension of the treatment time to the department of environmental protection of the people's government which made the decision of treatment within the given time limit, and the people's government which made the said decision examines the application and makes a decision therefor.

Article 17 When the departments of environmental protection and the maritime and fishery administration bodies conduct on-spot inspections into the units which discharge pollutants into water bodies within the scope of their jurisdiction, they shall show the certificates of administrative law enforcement or wear badges of administrative law enforcement.

Article 18 When the departments of environmental protection and the maritime and fishery administration bodies conduct on-spot inspections, they may, according to the needs, demand the units being inspected to provide the following information and materials:

1. information about the discharge of pollutants;
2. information about the pollutant treatment facilities, and their use, operation and management;
3. models and specifications of the monitoring equipment, instruments and facilities and information about their inspection and calibration;
4. the monitoring analytical methods employed and monitoring records;
5. information about the progress of treatment within a given time limit;

6. information about accidents and related records;
7. materials about the production process and the use of raw materials relevant to pollution; and
8. other information and materials related to the prevention and control of water pollution.

Article 19 An enterprise or institutional unit which causes a water pollution accident must take measures without delay, stop or reduce its pollutant discharge and within 48 hours after the occurrence of the accident, make a preliminary report on the time, site and type of the accident, the types and quantity of pollutant discharged, economic loss, personal harms and emergency measures taken to the local department of environmental protection; and after the accident is clearly investigated into, it shall make a written report on the cause of the accident, process, harms, measures taken, treatment results, potential harms of the accident or indirect harms, social impact, leftover problems and precaution measures, and provide relevant documentary evidences.

After receiving the preliminary report on the water pollution accident, the department of environmental protection shall immediately report it to the people's government at the same level and the department of environmental protection of the people's government at the next higher level, and the local people's government concerned shall organize the relevant departments to investigate into the cause of the accident and take effective measures to reduce and eliminate the pollution. The department of environmental protection of the people's government at or above the county level shall organize to monitor the water areas that are likely to be affected by the pollution accident and investigate and deal with the accident.

When a ship causes a water pollution accident, an immediate report must be made to the nearby maritime administration body. If a pollution accident is caused to a water body of fishery, an immediate report must be made to the fishery administration body in the place of the accident. The maritime or fishery administration body shall, after receiving such a report, notify it to the department of environmental protection of the people's government at the same level and immediately start to investigate and deal with it.

If a water pollution accident causes or is likely to cause harms or damages in two or more administrative areas, the local people's government at or above the county level in the place of accident shall immediately inform the people's governments in the places that are harmed or damaged or are likely to be harmed or damaged by the accident of the time, site and type of the accident, the types and quantity of pollutants discharged and the required precaution measures.

Chapter III Prevention of Surface Water Pollution

Article 20 The surface water source protective zones for domestic and drinking water involving two or more provinces, autonomous regions and municipalities directly under the Central Government are determined through consultation by the relevant people's governments of provinces, autonomous regions and municipalities directly under the Central Government; and if they fail to do so, the department of environmental protection of the State Council proposes a plan of determination jointly with the relevant departments of water resources, land resources, health and construction of the State Council and report it to the State Council for approval.

In determining other surface water source protective zones for domestic and drinking water, the people's governments of the cities or counties concerned propose the plans of determination through consultation, and report them to the people's governments of provinces, autonomous regions and municipalities directly under the Central Government for approval; and if they fail to do so, the departments of environmental protection of the people's governments of provinces, autonomous regions and municipalities directly under the Central Government, jointly with the relevant departments of water resources, land resources, health and construction at the same level, propose the plans of determination and report them to the people's governments of provinces, autonomous regions and municipalities directly under the Central Government for approval.

The surface water source protective zones for domestic and drinking water are classified into the Grade I protective zone and Grade II protective zone.

Article 21 The State's Surface Water Environmental Quality Standards of Category II is applicable to the quality of domestic and drinking water in the Grade I protective zones of surface water sources; and the State's Surface Water Environmental Quality Standards of Category III is applicable to the water quality in the Grade II protective zones.

Article 22 The protection of the Grade I protective zones for surface water sources for domestic and drinking water is governed by the provisions of Article 20 of the Law on the Prevention and Control of Water Pollution.

Article 23 It is forbidden to start or expand the construction projects discharging pollutants into the water bodies within the Grade II protective zones of surface water sources for domestic and drinking water. If a project is reconstructed within the Grade II surface water source protective zone for domestic and drinking water, the quantity of pollutant discharge must be reduced

Within the Grade II protective zones of surface water sources for domestic and drinking water, it is forbidden to discharge pollutants in excess of the pollutant discharge standards established by the State or the localities.

Within the Grade II protective zones of surface water sources for domestic and drinking water, it is forbidden to construct docks for handling rubbish, oils or other toxic or harm materials.

Article 24 If the industrial waste water and urban waste water are used for irrigation, the competent administrative departments of agriculture of local people's governments at or above the county level shall organize the regular monitoring over the quality of water used for irrigation, soil after irrigation and farm produces, and take corresponding measures to prevent pollution to the soil, ground water and farm produces.

Article 25 Ships in inland rivers shall be equipped with pollution prevention equipment that are in compliance with the State's regulations, and have the quality certificates issued by the ship inspection departments.

A ship which does not have pollution prevention equipment or whose pollution prevention equipment is not in compliance with the State's regulations shall meet the specified standards within a given time limit.

Article 26 Ships in inland rivers must have pollution prevention documents or log documents required by the maritime administration bodies. Oil tankers with a tonnage at or above 150 tons or non-oil tankers with a tonnage at or above 400 tons in inland rivers must have their records of types of oils.

Article 27 Ports or docks shall be equipped with the receiving and treatment facilities of waste water containing oil and refuses. The port management units are responsible for the construction, management and maintenance of such receiving and treatment facilities.

No ship in the inland river may discharge waste oil, residue oil or rubbish into the water body. Passenger and tourist ships in inland rivers must establish the rubbish control system.

Article 28 The following operations carried out by ships at the ports must be applied for in advance to the maritime administration bodies and may be started within the designated areas only after being approved:

1. to wash the decks of ships loaded with toxic goods and bulk goods with dust or the cabins;
2. to discharge ballast, cabin washing or engine room waste water and other residue substances; or
3. to use chemical oil detergent.

Article 29 When oils and other toxic, harmful, corrosive and radioactive goods are loaded onto or unloaded from ships at ports or docks, the ship parties and the operation units must take precaution measures to prevent pollution to water bodies.

Article 30 If a ship accident causes or is likely to cause pollution to a water body, the maritime administration body shall organize compulsory salvage or tugging, and all expenses therefrom are borne by the ship party at fault.

Article 31 The units engaging in ship building, repairing, dismembering and ship salvaging must be equipped with pollution prevention equipment and facilities. When conducting such operations, they shall take precaution measures to prevent pollution to water bodies by oils, oil mixtures and other refuses.

Chapter IV Prevention of Ground Water Pollution

Article 32 The departments of environmental protection of local people's governments at or above the county level, jointly with the relevant administrative departments such as water resources, land resources, health and construction at the same level, propose the plans of determination for ground water source protective zones for domestic and drinking water in accordance with the geographic location of water sources for domestic and drinking water, hydrogeological conditions, capacity of water supply, exploration method and distribution of sources of pollution, and report them to the people's governments at the same level for approval.

The State's Ground Water Quality Standards of Category II are applicable to the quality of water in ground water source protection zones for domestic and drinking water.

Article 33 It is forbidden to carry out the following activities within the ground water source protective zones for domestic and drinking water:

1. to use waste water for irrigation;
2. to use sludge containing toxic pollutants as manure;
3. to use farm chemicals with hypertoxic or high residues; or
4. to use cracks or cavity of the water storage stratum, karst caves or deserted mine pits to store oils, radioactive substances, toxic chemicals or farm chemicals.

Article 34 When extracting ground water involving multiple strata, the following water storage strata shall be extracted separately and may not be extracted in a mixed manner:

1. semi-saltwater, saltwater and bittern strata;
2. water storage stratum already polluted;
3. water storage stratum that contains toxic, harmful elements and the percentage exceeds the health standards for domestic and drinking water; and
4. ground hot water, hot springs and mineral water with medical values and special economic values.

Article 35 If a prospecting project exposes or penetrates through the water storage strata, the work to block water by stratum and close the holes must be done well strictly according to the relevant requirements.

Article 36 When toxic or harmful waste water is discharged from mining shaft or mining pits, water collection projects shall be constructed in the surrounding areas of the mine beds and the effective measures are taken to prevent pollution to the ground water.

Article 37 The quality of water siphoned back into underground to supplement drinking ground water shall be in compliance with the quality standards of water sources for domestic and drinking water, and shall be approved by the competent administrative departments of health of local people's governments at or above the county level.

Chapter V Legal Responsibility

Article 38 The imposition of fines under the provisions of Sub-paragraphs (1), (2) and (4) of Paragraph 1 of Article 46 of the Law on the Prevention and Control of Water Pollution is governed by the following provisions:

1. If refusing to apply or applying falsely for a pollutant discharge registration item required by the department of environmental protection of the State Council, a fine not exceeding 10,000 yuan may be imposed thereon;
2. If refusing an on-spot inspection from the department of environmental protection or maritime or fishery administration body or resorting to fraudulence, a fine not exceeding 10,000 yuan may be imposed thereon; and
3. If failing to pay the pollutant discharge fee or the excessive pollutant discharge fee, a fine not exceeding 50% of the fee payable may be imposed thereon, in addition to press for the payment of the pollutant discharge fee or the excessive pollutant discharge fee and the overdue fine.

Article 39 The imposition of fines under the provisions of Sub-paragraph (3) of Paragraph 1 of Article 46 of the Law on the Prevention and Control of Water Pollution is governed by the following provisions:

1. If discharging or dumping waste liquid containing hypertoxic or dissolvable hypertoxic waste residues containing mercury, cadmium, arsenic, chromium, cyanide or yellow phosphorus into the water body or directly burying them underground, a fine not exceeding 100,000 yuan may be imposed thereon;
2. If discharging or dumping radioactive solid wastes, oils, acid solutions or alkali solutions or waste water containing high or medium level radioactive substances into the water body, a fine not exceeding 50,000 yuan may be imposed thereon;
3. If discharging residue oils or waste oils into the water body or cleaning vehicles or containers used to carry or contain oils and toxic pollutants in the water body, a fine not exceeding 10,000 yuan may be imposed thereon;
4. If discharging or dumping industrial waste residues or urban living refuses into the water body, or piling solid wastes at the tidal land or bank slopes below the highest water marks of rivers, lakes, canals, ditches or reservoirs, a fine not exceeding 10,000 yuan may be imposed thereon;
5. If dumping rubbish from the ship into the water body, a fine not exceeding 2,000 yuan may be imposed thereon;
6. If an enterprise or institutional unit uses karst caves to discharge or dump waste water containing pathogens or any other refuses, a fine not exceeding 20,000 yuan may be imposed thereon; and if it uses a seepage well, seepage pit or crack to discharge waste water containing toxic pollutants, a fine not exceeding 50,000 yuan may be imposed thereon; and
7. If an enterprise or institutional unit uses a ditch or pond without anti-seepage measures to transport or store waste water containing pathogens or any other refuses, a fine not exceeding 10,000 yuan may be imposed thereon; and if it uses a ditch or pond without anti-seepage measures to transport or store waste water containing toxic pollutants, a fine not exceeding 20,000 yuan may be imposed thereon.

Article 40 If a fine is imposed according to the provisions of Article 47 of the Law on the Prevention and Control of Water Pollution, the fine not exceeding 100,000 yuan may be imposed.

Article 41 If a fine is imposed according to the provisions of Article 48 of the Law on the Prevention and Control of Water Pollution, a fine not exceeding 100,000 yuan may be imposed.

Article 42 If a fine is imposed according to the provisions of Paragraph (1) of Article 52 of the Law on the Prevention and Control of Water Pollution, a fine not exceeding 200,000 yuan may be imposed.

Article 43 The fines under the provisions of Article 53 of the Law on the Prevention and Control of Water Pollution are governed by the following provisions:

1. If an enterprise or institutional unit causes a water pollution accident; the fine is calculated at 20% of the direct loss, but the maximum amount may not exceed 200,000 yuan; and
2. If a serious economic loss is caused, the fine is calculated at 30% of the direct loss, but the maximum amount may not exceed 1 million yuan.

Article 44 If failing to discharge pollutants according to the provisions of the pollutant discharge permit or the interim pollutant discharge permit, the department of environmental protection which issued the permit orders the party concerned to make corrections within a given time limit and may impose a fine not exceeding 50,000 yuan thereon; and may revoke the pollutant discharge permit or the interim pollutant discharge permit in the case of serious circumstance.

Article 45 If, in violation of the provisions of Article 11 of these Rules, failing to construct the pollutant discharge outlet or the total discharge control monitoring equipment as required, the department of environmental protection orders the

violator to make corrections within a given time limit and may impose a fine not exceeding 10,000 yuan thereon.

Article 46 If, in violation of the provisions of Paragraph 1 of Article 23 of these Rules, a construction project which discharges pollutants into the water body within a Grade II surface water source protective zone for domestic and drinking water is constructed or expanded, or a reconstructed project fails to reduce the pollutant discharge, the people's government at or above the county level orders the violator to suspend operation or shut down according to the specified limits of power.

If, in violation of Paragraph 2 of Article 23 of these Rules, a pollutant is discharged in excess of the State or local standards on pollutant discharges within the Grade II surface water source protective zone for domestic and drinking water, the people's government at or above the county level orders the violator to make treatment within a given time limit and may impose a fine not exceeding 100,000 yuan thereon; and if it fails to finish the treatment task at the expiry of the given time limit, the people's government at or above the county level orders the violator to suspend operation or shut down according to the specified limits of power.

If, in violation of the provisions of Paragraph 3 of Article 23 of these Rules, a dock for handling rubbish, oils and other toxic or harmful articles within a Grade II surface water source protective zone for domestic and drinking water is constructed, the department of environmental protection of the people's government at or above the county level orders the violator to dismantle it and may impose a fine not exceeding 100,000 yuan thereon.

Article 47 If, in violation of Sub-paragraph (4) of Article 33 of these Rules, cracks or cavity of the water storage stratum, karst caves or deserted mining pits are used to store oil, radioactive substance, toxic chemical or farm chemical, the department of environmental protection of the local people's government at or above the county level orders the violator to make corrections and may impose a fine not exceeding 100,000 yuan thereon.

Article 48 The units which pay the pollutant discharge fee or the excessive pollutant discharge fee or are warned or fined are not exempt from the responsibilities to eliminate pollution and harm and to compensate the loss.

Chapter VI Supplementary Provisions

Article 49 These Rules enter into operation on the day of promulgation. The Rules for Implementation of the Law of the People's Republic of China on the Prevention and Control of Water Pollution approved by the State Council and promulgated by the State Environmental Protection Administration on July 12, 1989 are repealed at the same time.

(quoted from the website of *Lehman Lee & Xu*,
URL: http://www.lehmanlaw.com/lib/library/Laws_regulations/environment/rule_water.htm)

Appendix 5
Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boiler (Tianjin local standard DB12/151-2003)

Appendix 5

Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boiler (Tianjin local standard DB12/151-2003)

Preface

All the technological articles in this standard are compulsory.

The previous Tianjin/DHJB1-1999 [Emission standard of air pollutants for coal-burning oil-burning gas-fired boiler] is amended for the sake of fulfilling continuous development strategy, protecting environment, meliorating environmental quality in Tianjin, and keeping healthy. The supervision over emission of air pollutants is expected to be reinforced and the total amount of emission of air pollutants is expected to be reduced via strict restriction on emission of air pollutants from boilers in Tianjin Thermal Power Plant and boilers used in industry, heating, and living. This standard is stipulated in accordance with the provisions of 19th article, the 25th article, the 26th article, and the 30th article in [the Environment Protection Act of China] and [the Air Pollutants Prevention Act of China] and Chapter 3 in [Tianjin Air Pollution Prevention Regulation].

This standard is submitted by Tianjin Environment Protection Agency and is ratified by Tianjin Municipal Government on July 18th, 2003.

This standard substitutes Tianjin/DHJB1-1999 [Emission standard of air pollutants for coal-burning oil-burning gas-fired boiler].

Compared with Tianjin/DHJB1-1999 [Emission standard of air pollutants for coal-burning oil-burning gas-fired boiler] this standard makes the following main amendments:

----Restricted amount of emission density of air pollutants from ?45.5 MW boiler and boilers in thermal power plant (station) is increased;

----Restricted amount of emission density of air pollutants from boiler is amended. Restricted amount of emission density of NOx in air pollutants from coal-burning boiler and boilers in thermal power plant (station) is increased;

----Restricted amount of emission density of soot and sulfur dioxide from oil-burning and gas-filled boiler is amended;

----Excessive air coefficient of emission density of air pollutants from thermal power plant (station) is stipulated. Stipulations on installment of on-line successive monitors in 14 MW and above boilers are strengthened;

----Expiration date for boilers-in-use, newly-built boilers, enlarged boilers and altered boilers is divided by time;

----Location of boilers in Tianjin is divided by zones.

This standard is submitted by Tianjin Environment Protection Agency.

This standard is ratified by Tianjin Municipal Government.

This standard is drafted by Tianjin Environment Monitor Center.

This standard is drafted by Wang Tongjian, Weiwei, Tian Xiuhua, Liubo, and Tian Jianli.

Tianjin Environment Protection Agency is responsible for interpreting this standard.

1 Range of Application

This standard is applied to boilers-in-use, newly-built boilers, enlarged boilers and altered boilers. This standard stipulates the maximal permissible emission density and restricted emission amount of smoke blackness for all types of boilers' soot, sulfur dioxide, and nitric oxide.

This standard stipulates the restricted emission amount of air pollutants for thermal power plant (station) and boilers used in industry, heating, and living.

This standard is valid to boilers in Tianjin Thermal Power Plant and all types of coal-burning, oil-burning, and gas-filled boilers. The execution of other solid fuel can refer to the restricted emission amount of air pollutants for coal-burning boiler in this standard.

This standard is not valid to any other sizes of coal-feeder boilers and boilers burning living waste and various unsafe refuses.

2 Standard Cited Documents

Articles in the following documents are cited to form valid articles in this standard. All the subsequent rectified articles (excluding errata) or amended versions of dated documents do not apply to this standard, but parties reaching to an agreement in accordance with this standard are encouraged to make their own choices on whether or not they will employ any up-to-date versions.

GB5468 Testing method of boiler soot

GB/T16157-1996 Measurement of granule from emission of fixed pollutant origins and sampling method of vapor pollutants

GB13271-2001 Emission standard of air pollutants for boiler

GB13223-1996 Emission standard of air pollutants for thermal power plant

HJ/T42-1999 Measurement of nitric oxide from emission of stable pollutant origins Ultraviolet spectral analysis

HJ/T56-2000 Measurement of sulfur dioxide from emission of stable pollutant origins Iodine instillation method

HJ/T57-2000 Measurement of sulfur dioxide from emission of stable pollutant origins Fixed current electrolysis

HT/T75-2001 Successive monitoring standard for smoke emission from thermal power plant

HJ/Y76-2001 Technological requirement and testing method of successive monitoring system for smoke emission from stable pollutant origins

Air and exhaust monitoring and analysis method

(China Environmental Science Publication, 1990)

Practical soot and smoke testing
(China Environmental Science Publication,1990)

3 Terminologies and Definitions

The following terminologies and definitions are valid to this standard.

3.1 Boiler

Equipment that turns chemical energy of fuels into heat energy, and then passes the heat energy to water, gas, or heat-conduct oil, hence produces vapor, hot water, or heat via heat-conduct material.

The maximal emission amount of pollutants from boilers is determined by specified capacity (producing heat) by this standard. Production of 0.7MW is equivalent to 1t/h vapor amount.

3.2 Standard State

The state when smoke temperature arrives at 273k and pressure arrives at 101325Pa, or "SS" as it is abbreviated. All the stipulated emission density of air pollutants in this standard is referring to the amount of dry smoke under standard state.

3.3 Excessive Air Coefficient

The ratio of actual air amount to theoretical air amount when fuels are burned, designated as 'α'.

3.4 Successive Monitor on Smoke Emission

Successive and timely monitor on smoke emission of boilers, also designated as on-line successive monitor on smoke emission.

3.5 Height of Chimney

Vertical distance from +o ground surface where the boiler is located to the boiler's outlet. Height of boilers located under the ground should deduct the part from the ground surface where the boiler is located to the +o ground surface.

3.6 Initial Emission density of Soot

Emission density of soot at boiler's outlet or before it is sent into purifier.

3.7 Emission Density of Air Pollutants of Boilers

Emission density of pollutants of boilers whose smoke has been purified. For boilers not being installed purifiers, its outlet pollutant density is the emission density. Emission density of air pollutants of boilers is referring to the average density within an hour via adopting on-line successive monitor or manual successive monitor.

4 Technological Requirements

4.1 Division of Time

4.1.1 Executive period of boilers-in-use

By this standard, boilers-in-use (excluding emission-prohibited boilers stipulated in 4.3) should execute respective amount restrictions on emission density of pollutants in two periods.

Period I: From effective date of this standard to the date prior to December 31, 2005.

Period II: Since January 1, 2006

4.1.2 Executive period of newly-built boilers, enlarged boilers and altered boilers

This standard executes Period II to newly-built boilers, enlarged boilers and altered boilers (including boilers ratified before issue of this standard, which are under construction and have not been put into production).

4.2 Division of Zones

Tianjin is divided into two zones of A and B by this standard.

Zone A: Existing area within exterior belt highway, Tianjin Economy and Technology Developing Zone, Tianjin Tariff Protection Zone, Tianjin New Technological Industry Zone, Nature Protection Zone, the Scenic Spot, the National Geography Park, the National Forest Park, and other zones required special protection.

Zone B: Other zones except for Zone A.

Boilers in thermal power plant (station) are not divided by zones.

4.3 Stipulation on Prohibition of Emission of Coal-burning Boiler

Since the effective date of this standard, coal-burning boilers are prohibited from being built, enlarged, or altered in Zone A. Beginning from Period II, coal-burning boilers whose output is less than 7MW (included) are prohibited from being used in Zone A.

Boilers burning heavy oil and residue oil are prohibited from being built, enlarged, or altered. Boilers-in-use burning heavy oil and residue oil are executed as coal-burning boilers.

Coal-burning boilers less than 7MW (included) and coal pits having equivalent emission amount of air pollutants are prohibited from being built in existing area of Zone B.

Coal-burning boilers less than 7MW (included) are prohibited from being used in existing area and First Type area stipulated in [Quality Standard of Environment and Air] GB3095-1996. For coal-burning boilers less than 7MW (included) in non-existing area, soot is executed by 80mg/m3, sulfur dioxide is executed by 400mg/m3.

4.4 Restricted Amount of Air Pollutants for Boiler

Refer to Table 1 the maximal permitted emission density and restricted amount of smoke blackness of boiler's soot, sulfur dioxide, and nitric oxide. The initial emission density of soot is executed by stipulations in GB13271-2001. Refer to Table 2 the restricted emission amount of air pollutants for thermal power plant (station) and vapor boiler bigger than 45.5MW.

Table 1 Restricted emission amount of air pollutants for boilers

Pollutants	Types of boiler	valid zones	Coal-burning boiler				Boiler burning light diesel oil	Gas-burning boiler
			< 7MW		> 7MW			
			Period I	Period II	Period I	Period II	all period	all period
Soot (mg/m^3)	Boiler-in-use	A	150	prohibited	150	80	30	10
		B	150	100	150	80		
	Newly-built, enlarged, and altered boiler	B	100		80			
Sulfur dioxide (mg/m^3)	Boiler-in-use	A	400	prohibited	400	200	50	20
		B	400	250	400	200		
	Newly-built, enlarged, and altered boiler	B	250		200			
Nitric oxide (mg/m^3)	Boiler-in-use	A	400	prohibited	400	400	300	300
		B	400	400	400	400		
	Newly-built, enlarged, and altered boiler	B	400		400			
Smoke blackness (Ringelmen Level)	All boilers	all zones	Level 1					

Note: Restricted soot emission amount of coal-burning boiler in First Type area stipulated in [Quality Standard of Environment and Air] GB3095-1996 is $80mg/m^3$.

Table 2 Restricted emission amount of air pollutants for thermal power plants (stations)

pollutants		types of boilers	coal-burning boiler		boiler burning light diesel oil	gas-burning boiler
			Period I	Period II	all period	all period
soot mg/m^3		boiler-in-use	100	30	30	10
		enlarged, altered, and under-building boilers	30			
sulfur dioxide mg/m^3		boiler-in-use	1800	100	50	20
		enlarged, altered, and under-building boilers	100			
nitric oxide mg/m^3		boiler-in-use	650	450	300	300
		enlarged, altered, and under-building boilers	450			
smoke blackness	Ringelmen blackness (Level)	all boilers	Level 1		Level 1	Level 1
	accumulative time (minutes)		6		--	--

a: Prohibited from building new coal-burning power plant (station) boilers.
b: Prohibited from newly building, enlarging, or altering boilers burning heavy oil and residue oil. Boilers-in-use burning heavy oil and residue oil are executed as coal-burning boilers.

4.5 Restriction on Lowest Chimney Height

4.5.1 Restriction on lowest chimney height of heating boilers used in Industries

Restriction on lowest chimney height of boilers is executed by Table 3. Other cases are executed by 4.6.1.2, 4.6.2, 4.6.3, and 4.6.4 in GB13271.

Table 3 Restriction on lowest chimney height of coal-burning boilers

Total loading amount of boiler room	< 0.7	0.7 ~ < 1.4	1.4 ~ < 2.8	2.8 ~ < 7	7 ~ < 14	14 ~ < 28
Restriction on lowest chimney height	20	25	30	35	40	45

4.5.2 Restrictions on minimum chimney height in thermal power plants (stations)

Restrictions on minimum chimney height in thermal power plants (stations) are listed in Table 4. Other cases follow 4.6.1.2, 4.6.2, 4.6.3, and 4.6.4 of GB13271.

Table 4 Minimum allowable chimney height in thermal power plants (stations)

Total loading amount (ten thousand kilowatt)	< 30	30 ~ < 60	> 60
Coal or heavy (residue) oil (m)	150	180	210
Gas, light diesel oil, kerosene (m)	30	60	

5. Monitoring

5.1 Monitoring Method

The sampling method of the emission density of soot, sulfur dioxide, and nitric oxide is executed in accordance with stipulations given in GB5468 and GB/T16157. Analysis of sulfur dioxide and nitric oxide is carried out in accordance to the relevant National Environment Protection Agency stipulations.

5.2 Conversion of Excessive Air Coefficient

Measured emission density of boiler soot, sulfur dioxide, and nitric oxide is converted according to the excessive air coefficient α stipulated in Table 5.

Table 5 Conversion of excessive air coefficient for boilers

Types of boilers	Conversion item	Excessive air coefficient α
Coal-burning boiler	Initial emission density of soot	α =1.7
	Emission density of soot, sulfur dioxide, and nitric dioxide	α =1.8
Oil-burning and gas-burning boilers	Emission density of soot, sulfur dioxide, and nitric dioxide	α =1.2
Boilers in power plant (station)	Emission density of soot, sulfur dioxide, and nitric dioxide	α =1.4

Conversion formula of excessive air coefficient for boilers:

$$C = C' \times \frac{\alpha'}{\alpha}$$

Note: C = converted emission density of boiler soot, sulfur dioxide, and nitric dioxide; mg/m^3

C' = measured emission density of boiler soot, sulfur dioxide, and nitric dioxide; mg/m^3

α ' = measured excessive air coefficient

α = stipulated excessive air coefficient

5.3 Conversion of Boiler Load Coefficient

In any case where the output of a boiler does not reach full load, the emission density of a measured boiler's soot, sulfur dioxide, and nitric dioxide is re-converted in accordance with the stipulated operative coefficient K of boiler output indicated in Table 6.

Table 6 Operative coefficient of boiler output

Appendix 5

Percentage of boiler's actual output by designed output (%)	70 ~ < 75	75 ~ < 80	80 ~ < 85	85 ~ < 90	90 ~ < 95	> 95
Output operative coefficient below 3-year operation	1.6	1.4	1.2	1.1	1.05	1
Output operative coefficient above 3-year operation	1.3	1.2	1.1	1	1	1

5.4 Density Conversion of Nitric Oxide

Quality density of nitric oxide stipulated in the standard is calculated by nitric dioxide, i.e., volume density is converted to quality density by 1mo1/mo1×10-6 nitric oxide equals to 2.05mg/m3.

5.5 Successive Monitor on Smoke Emission of Boiler

Coal-burning boilers with specified power above 14MW (including 14MW) must install testing apparatus for successive monitor on boiler's smoke emission in accordance with stipulations in HJ/T75 and HJ76. Maintenance and use of testing apparatus must be executed in accordance with related stipulations for environment protection and measurement supervision.

5.6 Restriction on Total Amount of Soot and Sulfur Dioxide

The maximal permitted emission speed rate for thermal power plant (station) is executed by related stipulations in present national emission standard of air pollutants for thermal power plant.

Total emission amount of soot and sulfur dioxide of newly-built, enlarged, and altered boilers should meet the requirement for total amount index of permissible emission of pollutants ratified by municipal environment protection agencies.

6 Execution of Standard

Boilers located in restricted zone for sulfur dioxide must also follow local restriction index for total emission amount in their located restricted zone besides executing this standard for emission of sulfur dioxide.

Appendix 6
Contacts for Environmental Information in China and Japan

1. in China (in no particular order)

(1) Chinese government agencies and other institutions

1) 国家环境保护总局 (State Environmental Protection Administration of China : SEPA)
No.115 Xizhimeinei Nanxiaojie, Beijing 100035
URL http://www.zhb.gov.cn/

2) 北京市环境保护局 (Beijing Municipal Bureau of Environmental Protection)
No. 14, Chegongzhuang Xilu, Haidian District, Beijing 100044
URL http://www.bjepb.gov.cn/ E-mail webmaster@bjepb.gov.cn

3) 天津市环境保护局 (Tinajin Environmental Protection Bureau)
17 Kangfu Road, Nankai Distinct, Tianjin 300191
URL http://www.tjhb.gov.cn/ E-mail tjhbj@nankai.net.cn

4) 中国环境报 (cenews)
3A Longtan Road,Chongwen District Beijing 100061
phone +86-10-67122478
fax +86-10-67113772
URL http://www.cenews.com.cn E-mail cenv@public3.bta.net.cn

5) 中国环保商情网 (China-EPA.com)
phone + 86-10-84638416
fax + 86-10-84638674
URL http://www.china-epa.com/ E-mail linker@mail.china-epa.com

6) 国家环境保护总局环境认证中心 (Environmental Certification Center of SEPA) /
中环联合认证中心 (China Environmental United Certification Center : CEC)
No. 1 Yuhuinanlu, Chaoyang District, Beijing 100029
URL http://www.sepacec.com/ E-mail sepacec@sepacec.com

(2) Japanese government agencies and other institutions

1) 日本驻华大使馆 (Embassy of Japan in China)
北京市建国門外日壇路 7 号
phone +86-10-6532-2361
fax +86-10-6532-4625
URL http://www.cn.emb-japan.go.jp/jp/01top.htm E-mail: info@japan.org.cn

2) 中国日本商会 (The Japanese Chamber of Commerce and Industry in China)
北京市建国門外大街甲 26 号 長富宮公寓 1 層 104 室
phone +86-10-6513-0829
fax +86-10-6513-9859
URL http://www.cjcci.biz E-mail cjcci@postbj.net

3) 中日友好环境保护中心
(The Sino-Japan Friendship Centre for Environmental Protection)
北京市朝陽区育慧南路 1 号 中日友好環境保護中心 511 室 日本人専家組
phone +86-10-8463-4263
fax +86-10-8462-5053
URL http://www.zhb.gov.cn/japan/

2. in Japan (in no particular order)

(1) Japanese government agencies and other institutions

1) Office of Overseas Environmental Cooperation, Global Environment Bureau, Ministry of the Environment
1-2-2 Kasumigaseki, Chiyoda-ku, Tokyo 100-8975 Japan
phone +81-3-3581-3351
fax +81-3-3581-3423
URL http://www.env.go.jp/

2) The Japan and Tokyo Chambers of Commerce and Industry, International Division
3-2-2 Marunouchi, Chiyoda-ku, Tokyo 100-0005 Japan
phone +81-3-3283-7850
fax +81-3-3216-6497
URL http://www.jcci.or.jp/ (JCCI)
http://www.tokyo-cci.or.jp/ (Tokyo-CCI)

3) Japan External Trade Organization: JETRO
2-2-5 Toranomon, Minato-ku, Tokyo 105-8466 Japan
phone +81-3-3582-5511 / +81-3-3582-1775 (Library)
URL http://www.jetro.go.jp/top-j/

4) Institute of Developing Economies : IDE
3-2-2 Wakaba, Mihama-ku, Chiba-shi, Chiba 261-8545 Japan
phone +81-43-299-9500
URL http://www.ide.go.jp/Japanese/index4.html

5) Japan Bank for International Cooperation
1-4-1 Otemachi, Chiyoda-ku, Tokyo 100-8144 Japan
phone +81-3-5218-3101
fax +81-3-5218-3955
URL http://www.jbic.go.jp/

6) Development Bank of Japan
1-9-1 Otemachi, Chiyoda-ku, Tokyo 100-0004 Japan
phone +81-3-3244-1900
URL http://www.dbj.go.jp/

7) Nippon Keidanren
1-9-4 Otemachi, Chiyoda-ku, Tokyo 100-8188 Japan
phone +81-3-5204-1500
fax +81-3-5255-6233
URL http://www.keidanren.or.jp/indexj.html

8) Global Environmental Forum
Toranomon 10 Mori Bldg. 5th floor, 1-18-1 Toranomon, Minato-ku, Tokyo 105-0001 Japan
phone +81-3-3592-9735
fax +81-3-3592-9737
URL http://www.gef.or.jp/

(2) Chinese government agencies and other institutions

1) Embassy of the People's Republic of China in Japan
4-33, Moto-Azabu 3-Chome, Minato-ku, Tokyo 106-0046 Japan
phone +81-3-3403-3388

2) Consular Section of Chinese Embassy
4-33, Moto-Azabu 3-Chome, Minato-ku, Tokyo 106-0046 Japan
phone +81-3-3403-3065 / +81-3-3403-0995

3) Commercial Section of Chinese Embassy
5-8-16 Minami-Azabu, Minato-ku, Tokyo 106-0047 Japan
phone +81-3-3440-2011

References

(1) in Japanese

・「中国の環境保護システム」（李 志東 著、東洋経済新報社、1999 年）
・「平成 12 年度日中環境協力情報資料集 2000 年版」（社団法人海外環境協力センター、2001 年）
・「海外進出企業総覧＜国別編＞2002 年版」（東洋経済新報社、2002 年）
・「中国データ・ファイル 2002/2003 年版」（日本貿易振興会、2003 年）
・「在アジア日系製造業の経営実態　2003 年版」（日本貿易振興会、2003 年）
・「ジェトロ貿易投資白書　2003 年版」（日本貿易振興会、2003 年）
・「環日本海環境白書 2003」（財団法人環日本海環境協力センター、2003 年）
・「資源環境対策 2003 年 1 月号」（環境コミュニケーションズ、2003 年）

* Website of the Sino-Japan Friendship Centre for Environmental Protection (Japanese)　http://www.zhb.gov.cn/japan/

(2) in Chinese

・*State Environmental Statistic Report 2002*
(State Environmental Protection Administration, 2003)
・中国环境年鉴 2003（中国环境年鉴出版社、2003 年）
・2002 年天津市环境状况公报（天津市环境保护局、2003 年）

Acknowledgements

We would like to express great gratitude to the following organizations for their help in creating this report.

・国家环境保护总局 (State Environmental Protection Administration of China)
・天津环境保护局 (Tianjin Environmental Protection Bureau)
・中日友好环境保护中心 (The Sino-Japan Friendship Centre for Environmental Protection)
・国家环境保护总局环境认证中心 (Environmental Certification Center of SEPA)
・The Japanese Chamber of Commerce and Industry in China
・all the staff of the Japanese companies in China

・International Division, The Japan and Tokyo Chambers of Commerce and Industry
・Nippon Kokan Techno Service Co., Ltd.

Survey Team

Nakadera, Ryoei	Director, Planning and Survey, Global Environmental Forum
Suzuki, Akio	Visiting Researcher, Global Environmental Forum, Senior Environmental Specialist, Nippon Kokan Techno Service, Ltd.
Sakurai, Noriko	Researcher, Planning and Survey, Global Environmental Forum

Original version of this report is written in Japanese.
Printed on 100% post-consumer recycled paper

Overseas Environmental Measures of Japanese Companies (China-Beijing, Tianjin)

- Research Report on Trends in Environmental Considerations related to Overseas Activities of Japanese Companies FY2003 -

March 2004

GLOBAL ENVIRONMENTAL FORUM
Toranomon 10 Mori Bldg. 5th Floor, Toranomon 1-18-1,
Minato-ku, Tokyo 105-0001 Japan
TEL. +81-3-3592-9735 / FAX. +81-3-3592-9737
http://www.gef.or.jp/
Email:gef-nsakurai@nifty.com