

Chapter 2 Cases of Environmental Conservation Activities of Japanese Companies in Indonesia

Japanese companies in Indonesia have been seriously promoting various measures for environmental conservation so that they may not cause environmental problems out of their own discharges. This chapter introduces 18 cases of practical environmental conservation activities taken by Japanese companies in Indonesia on the basis of information collected by a field survey. First, section 1 outlines their environmental conservation activities. Then following sections give some examples of environmental conservation measures, with their waste water treatment as the main theme, the top priority objective in the environmental conservation policy of the government of Indonesia. They are divided into three sections as follows; Section 2 for cases in which plants are dealing with stringent effluent standards, 3 for cases of plants located industrial estates taking appropriate measures under their particular circumstances, and 4 for cases where plants are coping with various types of environmental problems. Section 5 explains the cases in which companies are formulating advanced environmental management systems.

Section 1 Japanese Companies in Indonesia and Environmental Conservation

This section outlines the environmental conservation activities taken by Japanese companies in Indonesia and presents problems and challenges they have encountered in implementing these measures, on the basis of the information collected through interviews made during the field survey.

In this section, a summary was made of the characteristics of the environmental conservation measures taken by these companies, and also problems and challenges they encountered, on the basis of information collected by the field survey. Section 2 and the parts thereafter of Chapter 2 present 18 cases of environmental conservation measures taken by Japanese companies in Indonesia. The companies of Japanese capitals the field survey team visited indicated without exception that proper environmental conservation was a vital element to promotion of business activities in Indonesia. These companies have encountered, steadily overcome a variety of problems and challenges by adopting measures comparable to or, in certain cases, more demanding than those taken in Japan. They have been actively coping with waste water treatment by installing expensive waste water treatment units, and by exercising utmost caution in the operation of these facilities. In anticipation of the restrictions to be enforced in future, they would also duly deal with the issues of treatment and disposal of solid and hazardous waste and air pollution, which still do not have a high priority in Indonesia presently. The forward-looking policies of these companies are highly evaluated by the officials in charge of environmental conservation of the local governments.

1. Companies of Japanese Capitals in Indonesia

Many of companies of Japanese capitals in Indonesia, as in the case of other Southeast Asian countries, belong to the manufacturing sector.

The breakdown of 96 companies of Japanese capitals in Indonesia that responded to the survey is; 57.3% for manufacturing -- more than half, 12.5% for construction, and 10.4% for financing/insurance sectors. This is from a survey conducted in 1995 by the Environment Agency of Japan entitled "Research on the Trends of Environmental Considerations related Overseas Activities of Japanese Capitals". According to BKPM(National Investment Coordinating Board) of the government of Indonesia, the manufacturing-related investments represented as much as 97% of the US Dollars 2.5 billion approved in 1995 for new Japanese investments in Indonesia, indicating a very high rate of investments in the manufacturing sector.

The companies that accepted the survey team during the field survey were mostly manufacturing industries. The 18 cases of measures explained in Section 2 and thereafter were those of manufacturing industries except for one company that manages an industrial estate.

The Japan External Trade Organization, JETRO, studied from November 1996 to January 1997 the status of the manufacturing companies of Japanese capitals in Indonesia as part of the Research on the Activities of Asia Manufacturing Companies of Japanese Capitals. Those 211 manufacturing companies which supported the study consisted 15% each of fiber/fiber products, chemical/pharmaceutical products and electric/electronic products, 14.2% of other manufacturing industries and 13.3% of transportation machinery industries. As many as 45.1% of them started operation in and after 1991, while 33.2% started in the 1970s. Those which started operation in the 1970s are mainly basic material industries like fiber and chemicals while those which started operation in and after 1991 include increasing numbers of parts manufacturing or fabrication industries with electric/electronic industries representing the largest group.

Before 1994 when a company 100%-owned by foreign capitals was not permitted by law, those with 70 to less than 100% Japanese equity ratios were the largest in number, accounting for about 40% of the companies of Japanese capitals in Indonesia. Since the restriction on the equity ratio was lifted in 1994, an increasing number of companies 100%-owned by Japanese capitals have been established in Indonesia, most notably in the field of electric/electronic products.

The JETRO study also indicated that about 30% of the companies of Japanese capitals in Indonesia employed 100 or more but less than 300 workers, followed by companies employing 1,000 and more workers, and subsequently followed by companies employing 300 or more but less than 500 workers. The number of employees averaged at 598, falling into the group of Indonesian medium-sized industries. The number of Japanese staff averaged at seven people per company.

The JETRO study asked the reasons why the Japanese parent companies had chosen to invest to Indonesia among many candidate countries. The 70% of them pointed out promising future of the Indonesian domestic market. Many companies also indicated inexpensive and high quality labor.

The government of Indonesia keenly promotes development of export-oriented industries. The policy measures include permission of 100% foreign capital investments, disclosure of a bold tariff-cutting program scheduled for 2003, a number of preferential treatments and relaxation of restrictions, all intended to invite foreign capitals. In the suburbs of and in the areas surrounding Jakarta a number of industrial estates have been developed, spearheaded by

Japanese trading houses, which has improved infrastructure and business climate, a condition necessary to invite foreign capitals. It is expected that, with such a background taken into consideration, an increasing number of Japanese companies, perhaps mostly manufacturing ones, will advance to Indonesia.

Among environmental conservation measures, the government of Indonesia urgently promotes conventional pollution prevention measures with a special focus upon waste water treatment. Whether the companies of Japanese capitals in Indonesia are highly evaluated or not depends upon how the manufacturing industries of the Japanese capitals cope with the waste water treatment problems.

The examples of the environmental conservation measures taken by companies of Japanese capitals in Indonesia shown in this report represent cases in which the companies execute necessary environmental conservation measures in the circumstances quite different from those of Japan and overcoming difficulties associated with developing infrastructure of various kinds.

2. Environmental Conservation Activities by Companies of Japanese Capitals

The results of previously mentioned “Research on the Trends of Environmental Considerations related Overseas Activities of Japanese Capitals” by the Environment Agency of Japan indicates that 63.6% of the companies interviewed expressed willingness to spend more than the minimum requirement to clear the standards. Of the 63.6 percent, 19.8% said that they should bear the cost regardless of the financial performances of the companies because of the gravity of the problem; while 43.8% said that they would bear the cost if it did not seriously affect the performance of the companies. Regarding the standards they set for the operation of the plants, 53.1% of them observed the Indonesian effluent standards; 11.5% of them observed the Japanese effluent standards; 5.5% of them applied their own standards more stringent than the Indonesian standards.

The companies the study team visited during the survey expressed very positive attitudes and said without exception that they were willing to do everything they could and actually were doing so. The study team visited some local governments. The officers of the departments in charge of environmental conservation of the local governments said that, although there used to be some cases in the past companies of Japanese capitals caused problems, now they are steadily promoting activities for environmental conservation, and they were comparable or

better than companies of European or American capitals. This statement may be taken to show their high esteems to the behaviors of the companies of Japanese capitals.

(1) Positive Countermeasures against Waste Water Treatment

As Chapter 1 pointed out, the problem of water contamination is the environmental problem that must be most urgently addressed in Indonesia. Therefore the companies of Japanese capitals give top priority to the solution of water contamination. The study team was able to collect information on a number of cases of environmental conservation measures which consisted mostly of incidents of waste water treatment.

The Indonesian standards for effluent water are better prepared and organized than those for other environmental subjects. On top of the national standards, there are occasionally more stringent local standards imposed by the local governments. The effluent standards are for the most parts comparable to the Japanese standards, with some exceptions where either more stringent standards or standards non-existent in Japan are enforced. Local governments visit the plants to inspect them.

For these reasons most companies of Japanese capitals are keenly promoting measures to clean up waste water. Many of them have constructed excellent waste water treatment units, incorporating their Japanese parent companies' technology and experiences. Although some built the units of their own, many of them let Japanese water treating companies with their branch offices in Indonesia design and construct the units. Their investments in water treatment were fairly large. For example, an industrial estate managing company, one of the 18 cases, invested as much as 10% of the total development cost in the central waste water treatment unit of the industrial estate.

The companies the study team visited properly operated their waste water treatment facilities. Some companies complained of the higher operation costs of the waste water treatment facilities they had been experiencing since outbreak of the currency crisis in the summer of 1997, which had lowered the value of Rupiah and consequently raised the prices of mostly imported chemicals used for water treatment. The rise of the cost was so high that the product prices must have reflected the increased prices of the waste water treatment, despite the companies' effort to absorb the increased cost.

The measures for waste water treatment taken by the companies were quite varied from one

company to another. Some companies installed laboratories in the premises of the plants so that they might be able to promptly respond to any abnormalities that might occur to the effluent water streams. Some companies sent their local staff to their parent companies in Japan to learn advanced waste water treating technologies. In one of these cases, the local staff who had learned advanced technologies in Japan designed the waste water treatment facility of the Indonesian plant.

Environment Impact Management Agency of the government of Indonesia (BAPEDAL) promotes, in cooperation with the local governments, a program called PROKASIH to clean up river water. PROKASIH ranks the companies according to performance of their measures for water cleanup. In the 1996 ranking of West Jawa Province, one of the companies whose measures are presented in the case study was classified into the green rank, the best of all in this ranking.

(2) Measures for Other Environmental Issues

Next to the waste water treatment, the companies of Japanese capitals are very concerned about measures for solid and hazardous wastes treatment and disposal. The administration is paying increasing attention to this issue as the amount of wastes rapidly increases. Treatment of solid and hazardous wastes is now considered to assume importance comparable to waste water treatment in the environmental management of the companies of Japanese capitals. The "Government regulation concerning Hazardous and Toxic Waste Management" issued by the chief secretary of BAPEDAL minutely specify the treatment and disposal of solid and hazardous wastes. However, the infrastructure for solid and hazardous waste treatment and disposal is not well prepared as may be exemplified by the fact that there is only one authorized treating site throughout Indonesia. It is simply difficult for business establishments to treat and dispose of the wastes in the manner required by laws and regulations.

Many companies of Japanese capitals, nonetheless, transport their waste to the only authorized treating and disposal site in Bogor, and pay high costs in US Dollars to have their wastes to be disposed of.

In Indonesia, there were a number of wastes treating companies which recovered valuable substances from wastes except hazardous ones. The most companies let these waste treating companies take their non-hazardous wastes, and promote recycling of wastes and thereby

reducing their production. Some companies were also keen to reduce solid wastes to meet the previously set targets.

Regarding the measures for air pollution control, the study team did not see real measures, because the companies of Japanese capitals the study team visited did not include such industries as iron-and-steel making, paper/pulp-making which were subject to air pollution control in Indonesia. Although laws have been instituted for air pollution control, no systematic monitoring of air quality has been done. It would take some time before policy measures and controls are effectively implemented. The companies of Japanese capitals take such easy measures as using LNG or diesel fuel which impose relatively less loads on the environment. The measures for air pollution control apparently do not seem to have high priorities.

Some companies of the Japanese capitals, with Japanese parent companies being major ones exercising global strategies in particular, have already obtained or are preparing for obtaining the certification of ISO14001, an international environmental standard. These companies are basically intended to promote in Indonesia environmental conservation measures comparable to those promoted by their parent companies in Japan. These companies are also very keen in the training and education of their employees. In some of the companies with several years of operation, the selected local staff has obtained professional levels of knowledge about environmental conservation, actually manages the environmental management measures of the plants and is engaged in environmental education and training of employees.

(3) Problems and Challenges in Environmental Conservation

Thus, the companies of Japanese capitals in Indonesia stick to the laws and regulations and positively promote measures for environmental conservation. The company told the survey team challenges and difficulties they had encountered while promoting environmental conservation measures. Most of the challenges and difficulties, as explained below, stemmed from remaining ambiguity on enforcement of the environment-related restrictions and their application and also from low efficiency of environmental administration of the government. Some examples are given below.

- Inconsistency between the legal system and actual environmental restrictions
- The Indonesian legal system on environmental conservation is well organized to the level

comparable to those of Western countries, equipped with the Environmental Management Act and other laws and regulations on environment covering water quality, air quality, solid wastes, noise and odor. However, the financial and human resources allocation seems not to be enough to establish an administrative structure necessary to implement the legal system fully. It is said that some of the existing laws are not actually implemented, leaving nothing but confusions.

- **Difficulty with obtaining information on environmental conservation**
 Certain companies had difficulty on advancing to Indonesia in obtaining information on the environmental restriction to which these companies were related. Some experienced difficulty with identifying the sources of information. The information on environmental conservation is generally not transmitted fast enough. Take revision of the Environmental Management Act for example, many companies of Japanese capitals did not know it until they received letters of invitation to a seminar on the revision of law from a Japanese consulting company operating in Indonesia. Some companies did not know the revision of the law until the survey team visited them.
- **Distrust of implementation of the restrictions**
 Legal restrictions are becoming increasingly stringent with penalties attached. Actually, however, the local government bodies in charge generally lack facilities and technologies with which to properly implement environmental restrictions. Some companies feel that this could mean a company charged with having violated the standards may not necessarily be convinced of the judgment and may find the demand for a fine unfair. Similar criticism are heard not only in the field of water quality conservation but also in other fields of environmental conservation. For example, regarding environmental impact assessment required for construction of a plant, there are concerns about insufficient capability and knowledge of concerned authorities.
- **Equality of restrictions**
 Some complained that while companies of Japanese capitals observed the standards, some local companies disregarded the standards, and that more stringent standards were imposed on the companies of the Japanese capitals than the companies of local capitals situated in the same area. Some voiced a request that all companies be treated fairly and equally irrespective of the source of capital.
- **Limited consulting function at the administration side**

The companies have difficulties in talking with the administration regarding environmental conservation measures, because the administrations have limited functions for providing consultations to the private sector.

- Limited experts in environmental technologies in administration

There are some cases where standards are instituted in spite they are too stringent to comply, items impossible to measure are added to the standards, and apparently unreasonable restrictions are imposed. Some voiced the need for developing professionals in environmental technologies in the administration to become able to implement regulations effectively.

Section 2 Cases of Complying with Stringent Effluent Standards

The Indonesian effluent standards for water quality are well prepared to the level comparable to those of European countries or of the United States. The Indonesian standards specify more stringent values for certain parameters than their Japanese counterparts. A number of the items specified in the Indonesian standards are not specified in the corresponding Japanese standards. This section presents some examples of companies of Japanese capitals which strive to comply with the Indonesian standards by installing advanced waste water treatment facilities and by severely controlling the operation of the waste water treatment facilities.

Case 1 Example to Meet a Severe Standard for Lead in the Effluent Water

1. Outline of the Company

Company: A

Business line: Manufacture of batteries for automobiles

Number of employees: 770

Start of operation: 1977

Location of the plant: An industrial area in Tangerang, 20 km to the west of Jakarta

Japanese equity ratio: 50%

2. Background

The area where the plant is located is placed on a basin along the Cisadane River, that was developed more than 20 years ago. A number of large and small plants are located in this industrial area. Since source water for public supply is tapped downstream of the discharge point of the plant to the river, the city authority has set severe effluent standards for the plant. The head office plant of the Japanese parent company operates under the most stringent of the Japanese standards set by the local autonomous body authority. The head office plant of the parent company has established highly advanced water treating technology to meet these stringent standards. This Indonesian affiliate has adopted parent company's advanced technology to improve its waste water treatment unit. The plant operates under the principle that the environmental problem should be properly addressed before it becomes too big and gets out of hand.

Company A plans to obtain certification of ISO9000 by the end of this year and is preparing for it. The Japanese parent company is in the process of obtaining certification of ISO14001 but Company A does not have any practical plan for ISO14001. When the company needs to obtain the certification of ISO14001, the company will coordinate with the parent company about this issue.

3. Activities

a. Waste Water Treatment

The waste water has two sources: the kneading process and the chemical process. The kneading process kneads electrolytic grade lead powders in a dilute sulfuric acid into a pasty material and forms electrode plates on lead-alloy frames. The chemical process forms a layer of lead oxide on the electrodes by subjecting the dried electrodes to electrolysis in sulfuric acid. An acid waste water stream at a pH value of about 2 containing lead and lead oxides is

generated from both processes. Presently, the flow of effluent water is 200 m³ per day at the current production rate, though it used to be 300 m³ per day when the plant operated at capacity.

Figure 2-2-1 shows the effluent standards for the discharge water the city authority has set for company A. The standard for lead was at first 1 mg/liter but was gradually made more stringent and was finally set at 0.03 mg/liter in 1996. The government of Indonesia has set the lead standard for water source for drinking water at 0.05 mg/liter and the river water is known to generally contain lead at 0.03 to 0.06 mg/liter by analysis. This means that the city authority requires that the plant reduce the lead content of the effluent water to less than these values. The plant modified the waste water treatment unit in 1997 to meet this standard. At first a Japanese company specializing in this field quoted a price of 30 million yen for the modification of the unit; however, the modification by the local contractors based on the experiments and design by the local staff of the company cost only six million yen. Figure 2-2-2 shows the flow scheme of the modified water treatment unit. The modification added a set of facilities including a control unit and a tank where a flocculant to capture heavy metals is added. The water treatment unit receives the waste water and neutralizes it by caustic soda, adds an agent for capturing heavy metals and a flocculant for settling and separating lead in a sediment. The supernatant clear water from the sedimentation tank is made to pass a two-stage sand filter to arrest fine particles of lead and discharged. The sediment is handed over to agents specializing in recovery of lead after being sun-dried. The treated water meets all the requirements of the standards including that on lead. Since the Asian currency crisis the price of the agent for capturing lead has risen, resulting in the rise of the operating cost of the water treatment unit from 350 thousand yen a month to 450 thousand yen a month.

Figure 2-2-1 Effluent Standards Set for Company A

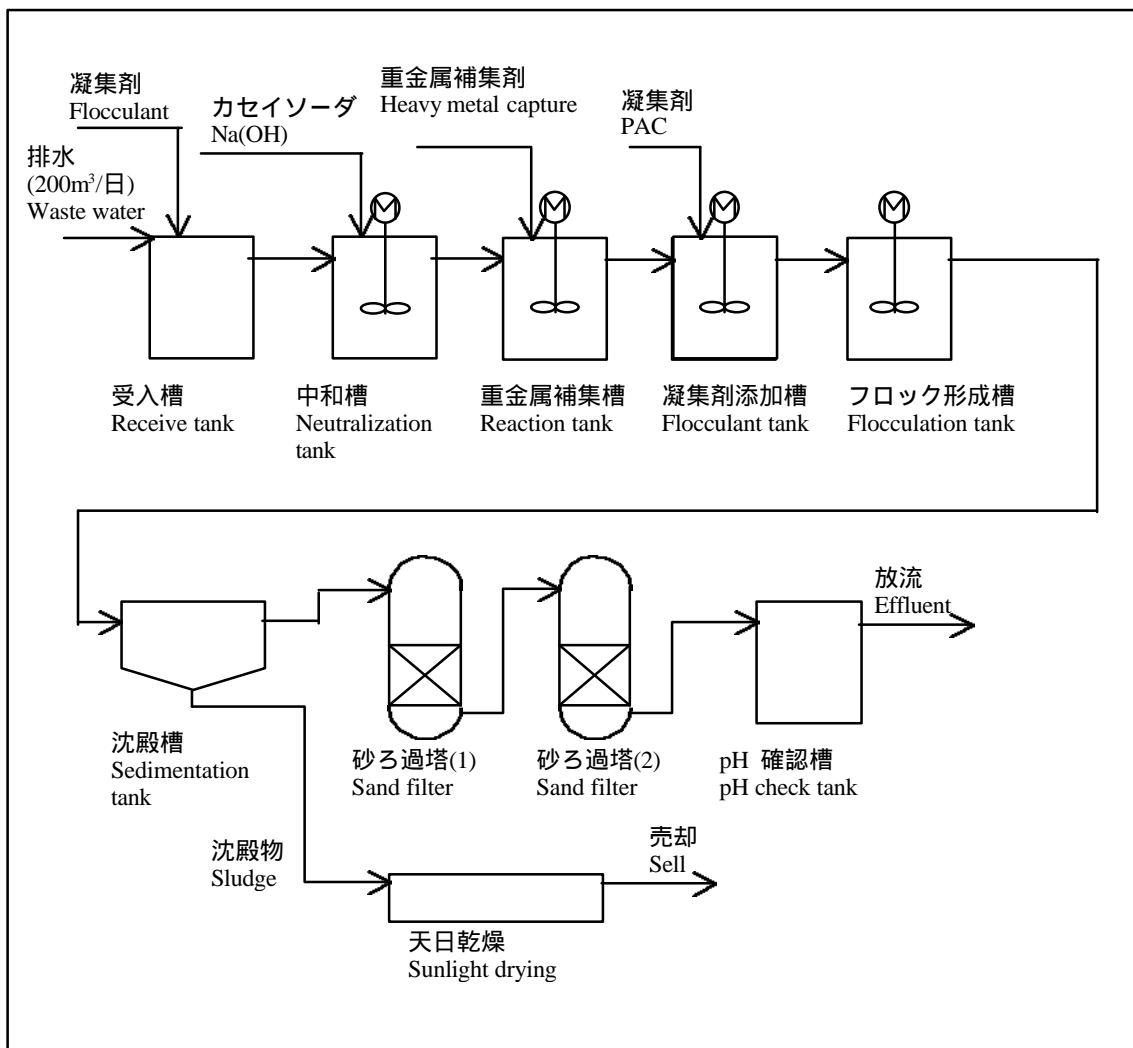
(Unit: mg/liter)

Parameters	Temp.	pH	Dissolv- ed solid	Fe	Mn	Cu	Zn	Cr	Cd	T-Hg	Pb	Ni	COD
Standards	<35	6-9	1500	1.0	0.5	1.0	2.0	0.1	0.01	0.001	0.03	0.1	40

The Japanese parent company has a plant in the Nagata Industrial Park in Fukuchiyama City of Kyoto Prefecture where the most stringent standards are imposed on the effluent water. Some of the local staff of Company A had been trained in the plant in Nagata on technologies on battery manufacturing and highly advanced water treatment. Those people who were trained in the plant in Nagata designed the modification of the water treatment unit of the plant.

A private testing company designated by the city authority comes to the plant twice a month to take samples of the effluent water and analyzes them. The company reports the results of the analysis to the city. The analysis costs Company A 120,000 Rp. each time. Company A tells the testing company that the company may come to take samples any time without prior notice so that the samples may reflect the real quality of the effluent water. The city authority itself comes to the plant to take samples twice a year, sometimes without prior notice.

Figure 2-2-2 Flow of the Waste Water Treatment of Company A



b. Solid Waste Treatment

Of the total lead consumption, 4.5% finds its way to the waste, of which lead is molten and reused. An amount equivalent to 1.5% of the total consumption ends up in the unrecoverable

waste which is sold to a waste regenerating company. Company A purchases from the waste regenerating company the recovered lead for reuse. The off-specification plastic products become a waste which is also purchased by the same waste regenerating company at a price of 200 Rp. per kg. The waste plastics seem to be used as fuel.

The lead-containing waste recovered at the waste water treatment unit is sun-dried and packed in used cement bags and sold to the waste regenerating company. The waste amounts to 60 bagfuls of 25-kg used cement bags per week.

c. Coordination with Local People

Company A invites to the plant the city officers in charge and representatives of the local people to see how the plant operates to manufacture the products and treats the waste water once a year at its anniversary. This helps avoid difficulties arising from misunderstanding stemming from groundless hearsay. The company also makes donations to help repairing school facilities, subsidies for education and construction of the mosques. The company also presents gifts to the Islamic employees at the end of the period of religious fasting.

Case 2 Example to Meet Severe Standards for BOD and COD

1. Outline of the Company

Company: B
Business line: Manufacture and assembly of automobiles
Number of employees: 500
Start of operation: 1996
Location of the plant: an industrial estate in West Jawa Province to the east of Jakarta
Japanese equity ratio: 45%

2. Background

Company B manufactures automobiles of its Japanese parent company's models and assembles on commission automobiles of German, Swede and Korean and other models. The Japanese models account for 70% of its outputs and other models 30%. The capacity is 1,000 cars per month on one-shift operation and 2,000 cars per month on two-shift operation. Until two years ago the company had operated in Jakarta when the plant was moved to the present industrial estate because of the residential area expanding close to the plant. The industrial estate was developed by an Indonesian financial combine without participation of the Japanese capitals. The process of automobile manufacturing tends to discharge effluent water containing heavy metals and such organic compounds as paints.

The industrial estate has a central water treatment unit. In the industrial estate, each plant sends its own effluent water after primary treatment to the central water treatment unit where water is given final treatment and discharged to a river. The office of the industrial estate has disclosed that the effluent water standards which the central water treatment unit of the estate can receive for treatment should be same as the standards of West Jawa Province. Therefore Company B decided to install the waste water processing facility to obtain the standards of West Jawa Province. The standards are so severe that the company requires high-technology processing of waste water. Although the cost of processing could be large, Company B put the first priority to the achievement of the standards.

3. Activities

a. Waste Water Treatment

The process of automobile manufacturing produces three kinds of waste water streams: the painting waste water containing paints/solvents, acid/alkaline waste water containing heavy metals from the surface treatment of steel sheets, and ordinary waste water from such works as

floor cleaning. Figure 2-2-3 shows the standards for effluent water of West Jawa Province. The standards of West Jawa Province for BOD and COD_{Cr} are very stringent, the former being 20mg/liter and the latter 40mg/liter. (The corresponding Japanese standards are 160 mg/liter for BOD and 160 mg/liter for COD_{Mn} for reference.) It was found necessary to employ sand filtering and adsorption by activated carbon to meet these standards, both incurring high operating costs.

Figure 2-2-3 Effluent Standards Set for Company B¹⁾

Parameters	Temp.	DSS	SS	Color Pt.co ²⁾	pH	BOD	COD	T-Hg	Pb	Cr ⁶⁺	Cd
Standards mg/liter	35	1000	100	300	6-9	20	40	0.005	0.1	0.1	0.01
Parameters	Zn	Fe	Mn	Cu	As	Se	Ni	CN	H ₂ S	F	Cl ₂
Standards mg/liter	5	5	0.5	0.5	0.05	0.01	0.1	0.02	0.01	1.5	1
Parameters	Cl ⁻	SO ₄ ²⁻	NH ₃ - N	NO ₃ -N	NO ₂ -N	Blue Methyl ³⁾	Phe- nol	Vege. oil	Mine oil	-	-
Standards mg/liter	600	400	0.5	10	1	0.5	0.002	10	10	-	-

1) Ordinance of the governor of Jawa Barat No.660.31 / SK / 694-BKPM D / 83, May 26, 1982

2) Requirement Department of Health No. 416 / MENKES / IX / 1990

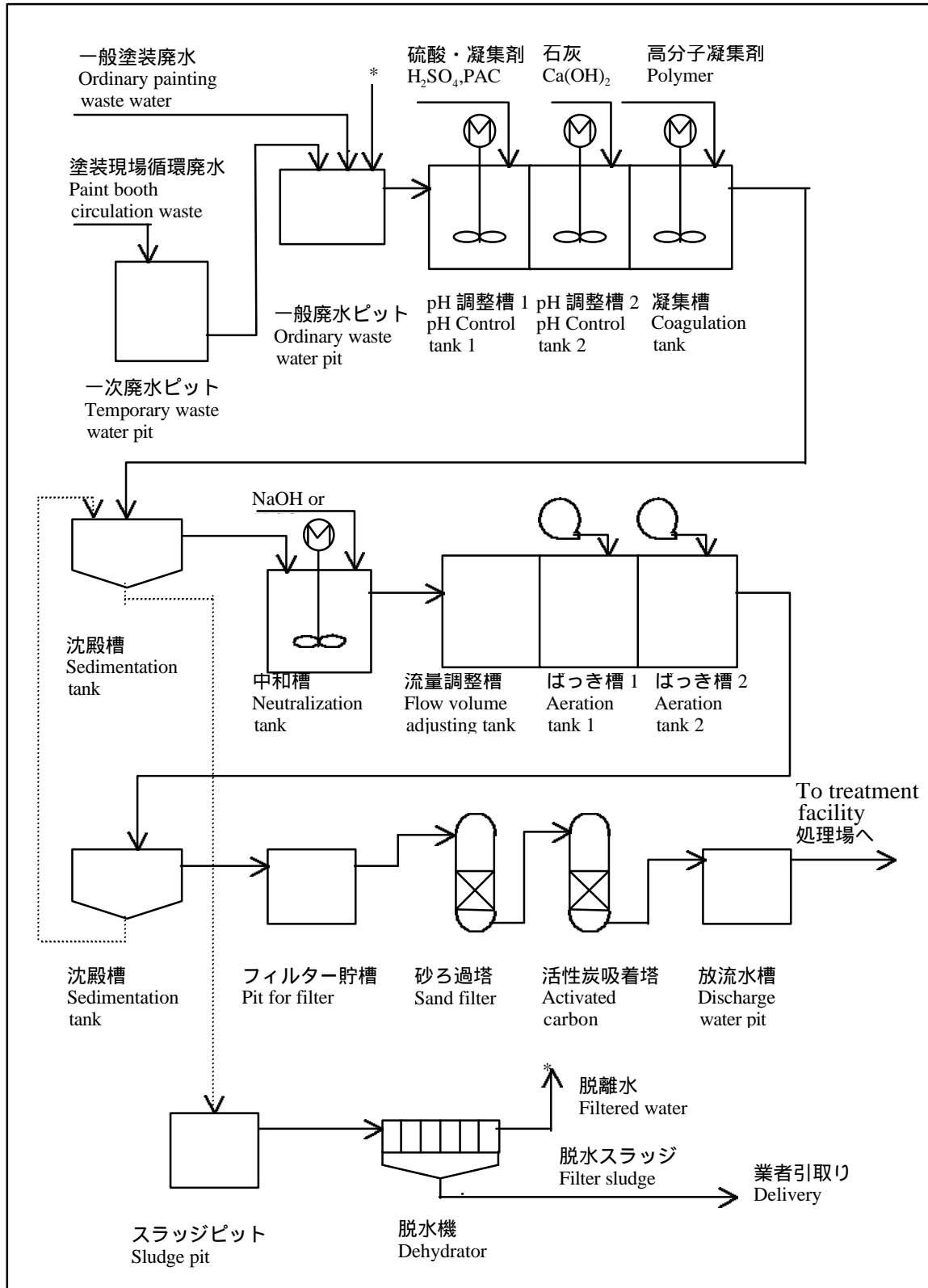
3) Blue Methyl Active Compound

The plant installed a waste water treatment unit of a 480 m³ per day capacity, of which the flow scheme is shown in Figure 2-2-4, to meet the above standards. The painting waste water is rid of paint fragments and the likes at the places of origin and the acid/alkaline waste water is primarily neutralized before being sent to this waste water treatment unit. The waste water is collected in an ordinary waste water pit where heavy metals and paint particles are removed by sedimentation through coagulation. The waste water from which the suspended matters have been removed is subjected to biological treatment by aeration, followed by sand filtering and adsorption by activated carbon and transferred to the central water treatment unit of the industrial estate. The sludge generated by sedimentation through coagulation is dehydrated by the filter press. The dehydrated filter sludge is regarded as B3-grade hazardous waste and handed over to a waste treating company in Borgor.

Items of water quality include contents of Cl⁻ and SO₄²⁻. These items however naturally increase when the alkaline waste water is neutralized by hydrochloric acid or sulfuric acid. Therefore, it may not be proper to include them in water quality standards. Fortunately, the plant does not consume a large amount of acid for neutralization and consequently meets the

standards for these items.

Figure 2-2-4 Flow of the Waste Water Treatment of Company B



It is up to the office of the industrial estate to control the quality of the water effluent from the estate to outside. The plant does not conduct analysis on the effluent water. The authority has not come to the plant to take samples yet.

b. Solid Waste Treatment

The dehydrated waste and paints wastes recovered at the waste water treatment unit are handed over to a waste treating company in Borgor as poisonous waste.

Large quantities of wood frames, corrugated fiberboards and steel frames used for packing automobile parts end up being wastes. These are classified according to kind and sold to companies dealing in these materials. Some of the European automobile manufacturers require that the wooden frames be recycled and an organization for environmental conservation be established within the company. The company complies with their requests as found necessary considering the circumstances in which these automobile manufacturers are placed.

Case 3 Example to Meet a Severe Standard for the Total Cyanide

1. Outline of the Company

Company: C
 Business line: Manufacturing of automobile parts
 Number of employees: 274
 Start of operation: 1978
 Location of the plant: In an industrial area 27 km to the south of the center of Jakarta
 Japanese equity ratio: 60%

2. Background

During the initial period of the operation the company was engaged only in assembling and therefore its load on the environment was very light. On introduction of the plating process in 1979 the plant began producing waste water containing cyanides and hexavalent chromium and acid and alkali waste water. Simultaneously with the plating process, a waste water treatment unit was installed and operated, with the introduction of the technology of the Japanese parent company.

The surrounding areas, once used to be industrial areas, are now being converted into residential areas and the company had to pay more attention to environmental conservation. The Cipinang River to which the plant discharges treated water is the subject of PUROKASIH, a project to clean the river water being promoted by BAPEDAL; therefore, the company was required by the Jakarta City authority to improve the quality of the effluent water under the intensified effluent water standards of 1994.

The Japanese parent company's policy for globalization of business calls for products of uniform quality and the environmental conservation measures based upon the technologies of the same specifications being applied in Japan, irrespective of where the products are produced. Therefore the plant is well supported by the parent company's highly advanced technologies to remove poisonous cyanides and hexavalent chromium from the waste water before it is discharged.

3. Activities

a. Waste Water Treatment

Figure 2-2-5 shows the effluent standards set by the Jakarta City authority. The standards for hexavalent chromium and total cyanides are 0.3 mg/liter and 0.05 mg/liter, respectively; these are far more severe than those of Japan: 0.5 mg/liter and 1.0 mg/liter, respectively. To meet these requirements the plant expanded and improved the waste water treatment unit in 1995. The waste water treatment unit treats 170 m³ of water a day. Figure 2-2-6 shows the flow scheme of the unit. The cyanides are decomposed by oxidation by sodium hypochlorite. The hexavalent chromium in the waste water is reduced to trivalent chromium by sodium sulfite. The waste water streams so treated mix with the acid alkali waste water, followed by neutralization and sedimentation by flocculation. The supernatant clear water is discharged. The settled sludge is dehydrated to be formed into cake.

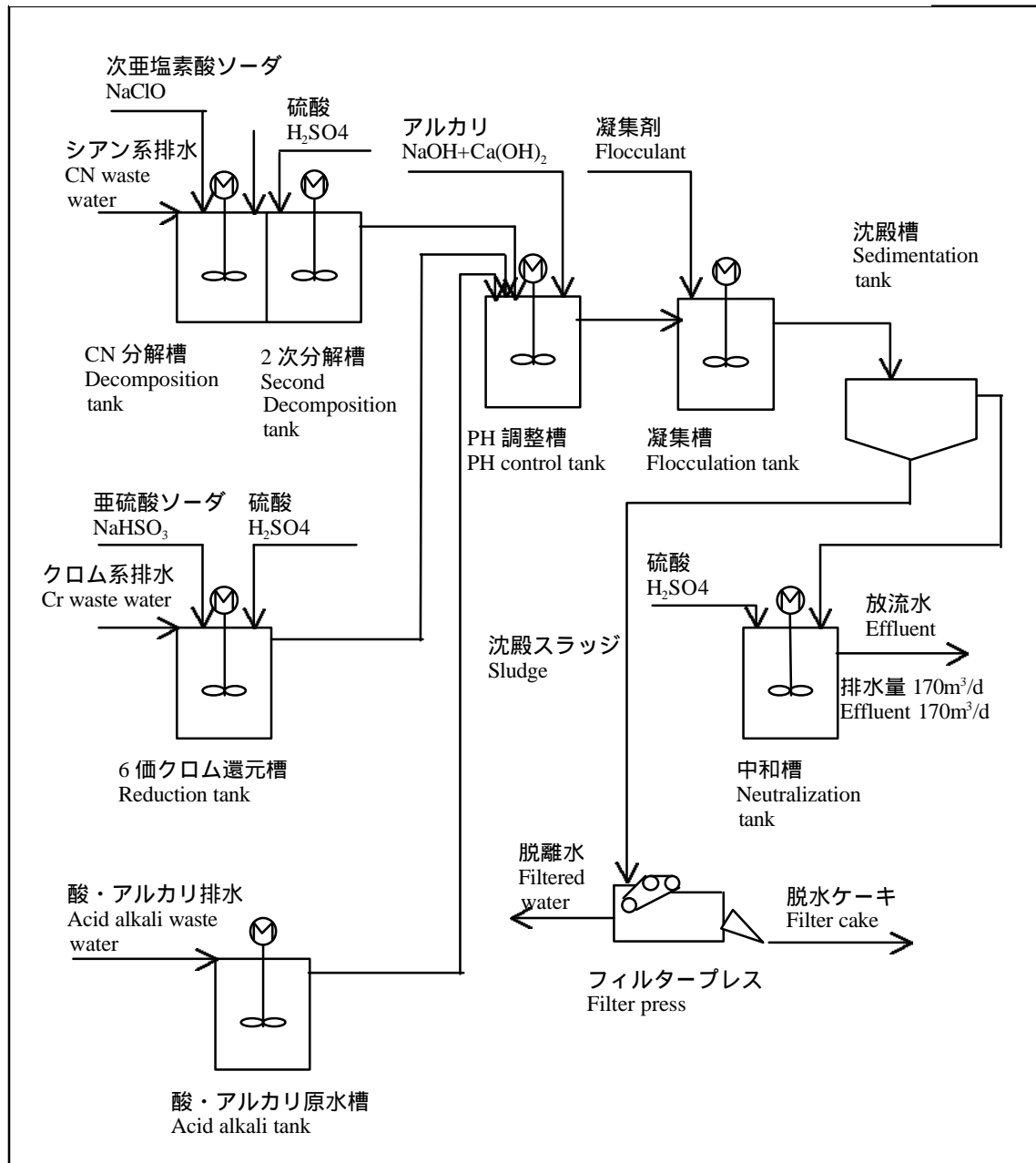
Figure 2-2-5 Effluent Standards and an Example of Analysis for Company C

Parameters	pH	COD	SS	T-Metal	Zn	Cu	Cr	Cr ⁶⁺	Cd	Ni	T-CN	Org.
Standards mg/liter	6.0 -9.0	75	60	8.0	2.0	1.0	1.0	0.3	0.05	0.2	0.05	50
Analyzed mg/liter	7.5	39.8	10.0	0.31	0.11	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	26.5

Figure 2-2-5 shows an example of analysis of treated water. An automatic recorder is used to monitor pH values and analysis is done on daily basis of the contents of Cr⁶⁺ and CN. A company specializing in analysis is doing analysis of other items.

Treatment of Cr⁶⁺ and CN is done until these are no longer detected. The effluent water satisfies all the requirements of the standards. The plant submits to the Jakarta City authority the results of analysis of the effluent water once in four months. The city officials in charge sometimes visit the plant without prior notice. They came twice in 1997. The plant has never violated the effluent standards.

Figure 2-2-6 Flow of the Waste Water Treatment of Company C



The waste water treatment unit consumes a number of chemicals, most of them imported. The devaluation of rupiah increased the prices of the imported goods and hence the operation cost of the waste water treatment unit, thereby increasing the costs of the products.

The waste water treatment unit is the most modern and advanced of this kind in Indonesia. When a seminar on waste water treatment was held in Jakarta in 1993, the vice-governor of the

province came to see the unit. The plant permits staffs of the plants in the vicinities to see the unit.

b. Solid Waste Treatment

The waste water treatment unit produces 4.0 to 4.5 tons of dehydrated cake a month. This cake is regarded as B3 grade poisonous substance and therefore must be brought to the designated treating sites within 90 days of production. A waste treating company in Bandung is commissioned to transport the cake to the designated sites at a price of US Dollars 170 per ton. Until 1995 the plant has stored the cake in a concrete pit in the premises of the plant, because of the absence of such a waste treating company. The plant accumulated as much as 450 tons of cake but all the accumulated cake has been taken away by this company.

Metal fines consisting mainly of iron and spent oil are produced at a rate of 20 tons and one ton a month, respectively. These are given to companies dealing in them almost at zero prices. Iron rod scraps are also produced which are sold at a price of 200,000 Rupiahs per ton.

c. Others

Two Indonesian managers have been appointed to be in charge of environmental management. They attend seminars and training held by testing companies and BAPEDAL.

The vice-president is in charge of coordination with the local communities. The company holds soccer games in the premises on the Independence Day.

Case 4 Example to Meet a Severe Standard for Fluorine

1. Outline of the Company

Company: D
 Business line: Manufacture of cathode ray tubes for television sets
 Number of employees: 1,050
 Start of operation: 1996
 Location of the plant: In an industrial estate in Bekasi, West Jawa Province developed by Company J, 40 km to the east of Jakarta
 Japanese equity ratio: 50%

2. Background

Company D manufactures cathode ray tubes for the domestic and export markets. The manufacturing processes use and discharge a large amount of water. This industrial estate was selected as plant site because of the availability of good quality water and measures for environmental conservation being reliable. The industrial estate has a central waste water treatment unit which collects effluent waste water streams from the plants and conducts a terminal biological treatment. If a plant has a waste water which contains a substance not amenable to the biological treatment, the plant has to treat the waste water for itself. The processes for manufacturing cathode ray tubes discharges streams of waste water which contain fluorine and acid and alkali waste water containing nitrates of heavy metals, both not amenable to the central waste water treatment of the industrial estate. The industrial estate showed the company the severe effluent standards and the company sealed a contract agreeing with the standards. The standards were based on an ordinance of the governor of West Jawa Province and are imposed on the effluent water discharged to the river. The plant had to build a waste water treatment unit incorporating highly advanced functions to meet the standards.

3. Activities

a. Waste Water Treatment

The plant generates 400 m³ a day of a fluorine containing waste water stream and 1,100 m³ a day of an acid/alkali waste water stream. Figure 2-2-7 shows the effluent standards presented by the office of the industrial estate. The standards include a total of 31 items, of which the standards for cadmium (0.01 mg/liter), cyanides (0.02 mg/liter) and fluorine (1.5 mg/liter) are very stringent; namely, 1/10, 1/50 and 1/10 the Japanese standards, respectively. The standards for cadmium and fluorine are technically very difficult to meet. The standards on the other hand tolerate relatively high contents for SS, BOD and COD. These are amenable to the biological treatment of the central waste water treating unit of the industrial estate; therefore,

more generous values than covered by the ordinance of the governor of West Jawa Province are tolerated at the discharge points of the plants.

Figure 2-2-7 Effluent Standards Set for Company D by the Industrial Park

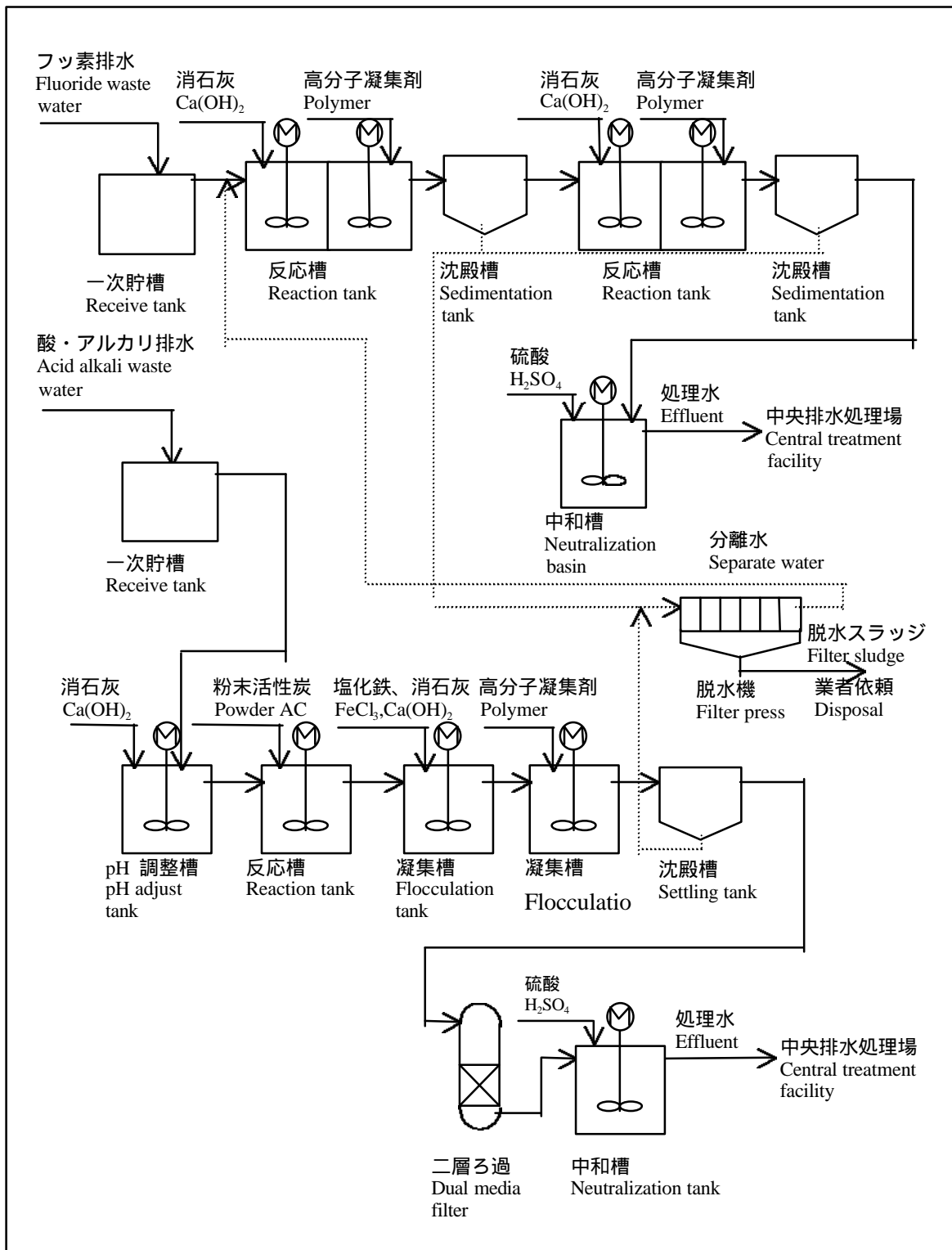
Parameters	Temp.	DSS	SS	Color Pt.co	pH	BOD	COD	T-Hg	Pb	Cr ⁶⁺	Cd
Standards mg/liter	35	1000	300	300	6-9	500	800	0.005	0.1	0.1	0.01
Parameters	Zn	Fe	Mn	Cu	As	Se	Ni	CN	H ₂ S	F	Cl ₂
Standards mg/liter	5	5	0.5	0.5	0.05	0.01	0.1	0.02	0.01	1.5	1
Parameters	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	NO ₃ -N	NO ₂ -N	Blue Methy ^P	Phenol	Vege. oil	Mine. Oil	-	-
Standards mg/liter	600	400	0.5	10	1	0.5	0.002	10	10	-	-

1) Requirement Department of Health No. 416 / MENKES / IX / 1990

2) Blue Methyl Active Compound

Figure 2-2-8 shows the flow scheme of the waste water treatment unit constructed to meet the standards. The unit receives separately the fluorine-containing waste water stream and the acid/alkali waste water stream. Slaked lime, Ca(OH)₂, is added to the fluorine-containing waste water to form calcium fluoride, followed by addition of a coagulant to effect sedimentation by coagulation. This process is repeated twice to assure removal of fluorine. Sulfuric acid to neutralize the water is then added to this stream to complete treatment. The acid/alkali waste water is neutralized by addition of slaked lime, Ca(OH)₂, followed by addition of activated carbon powders. To this stream is then added ferric chloride, FeCl₃, and a polymer coagulant in a stepwise fashion to effect sedimentation of heavy metals compounds. The supernatant clear water is filtered to assure removal of heavy metals. The sludge produced associated with treatment of fluorine-containing water and heavy metal-containing water is dehydrated and treated by a waste disposal company of Bogor. The effluent water, after being treated by this waste water treatment unit, satisfies all the requirements of the office of the industrial estate and sent to the central treatment unit of the industrial estate. The company has the treated water tested by the testing company once a month for important 15 items and also conducts tests at its own laboratory. Such important items as fluorine content and pH are shown in a graphical form and other items in a tabulated form to be effectively controlled.

Figure 2-2-8 Flow of the Waste Water Treatment of Company D



b. Exhaust Gas

The glass furnace generates exhaust gas at a rate of 1,000 normal m³ per hour. This does not present any environmental problem since the fuel is LNG. The plant consumes 180 thousand normal m³ per month of LNG. The process of applying hydrofluoric acid generates an exhaust gas containing a fume of fluorine at a rate of 600 normal m³ per hour. Fluorine is removed by a scrubber to a level less than 0.01 ppm before the gas is allowed to be emitted. The boiler burns diesel fuel which generates exhaust gas of about 900 normal m³ per hour. The total exhaust gas is therefore about 2,500 normal m³ per hour.

c. Solid Waste Treatment

The faulty products produced in the process of cathode ray tube manufacturing are disintegrated to recover parts which are repaired as necessary and returned to the manufacturing process. The fraction defective of this plant is still higher than the plant of the Japanese parent company and therefore the plant endeavors to improve the yields by recovering the parts and recycling them. This practice, in addition to its economic advantage, contributes greatly to the reduction of waste and therefore the company is keen in this practice. Debris of glass, wood frames, corrugated fiberboards and metal scraps are generated as waste. These are classified according to kind in a place called recycle center and sold to dealers specializing in them, or these dealers are commissioned to dispose of them.

d. Others

To obtain certification of ISO14001, the company has to comply with the environmental standards, the standards of Indonesia, the standards of the province, the standards of the industrial estate and also the standards of the Japanese parent company. The company's sister company in Thailand obtained certification of ISO14001 in February 1998 in accordance with the policy of the Japanese parent company. Company D was scheduled to obtain the certification following its Thai sister company, but it was postponed by one year because of the sluggish economy of Indonesia.

Section 3 Cases of Companies Located in Industrial Estate

In Indonesia establishing new plants in the existing city areas is restricted. As new industrial estates are being developed particularly in the areas surrounding Jakarta, the government invites the existing plants to move to these industrial estates. If the Japanese companies would need to either establish their new plants or move their existing ones, they should go to these industrial estates. To serve as a reference for such cases, this section summarizes the environmental conservation measures taken by the plants of the Japanese capitals already located in industrial estates.

Case 5 Example of Industrial Estate to Accommodate Environmentally Conscious Tenants

1. Outline of the Company

Company: E

Business line: Development and management of industrial estates

Number of employees: 100

Start of operation: 1992

Location: Bekasi in West Jawa Province, 40 km to the east of the center of Jakarta

Japanese equity ratio: 60%

2. Background

The name of the industrial estate contains the word, “park,” indicating the design concept that the industrial estate should represent harmony between development and conservation of the environment with rich vegetation. Environmental conservation is the policy of the Japanese investor. The company started development in 1990 and completed the works on the entire 320 hectares of land in 1995. The site used to be a barren terrain without agricultural production, only with brick kilns sporadically operating. Trees were intensively planted after development to fill the site with green vegetation.

The industrial estate asks the candidate entrants to comply with the “ordinance of the governor of West Jawa Province” on emission standards for water and air and on standards for prevention of noise. The industrial estate does not allow those companies which cannot comply with the standard to advance to the industrial estate. The industrial estate constructed a central waste water treatment unit which accepts the effluent waste water streams of the tenants after being treated by the tenants themselves and gives final treatments to them before discharging to the river. The industrial estate spent as much as 10% of the total construction cost solely on this central waste water treatment unit. To prevent the river water from being contaminated, the industrial estate accepted the tenants after the central treatment unit had been completed.

The tenant which wishes to construct a plant in this industrial estate purchases a prorated portion of the comprehensive construction right from the industrial estate. The effective term of the construction right is 30 years. If the tenant continues to use the site for the same purpose, an extension of 20 years and a further extension of 30 years are allowed. The tenant can use the site for a total of 80 years. So far 81 companies have advanced to the industrial estate. Among them, 90% are companies of Japanese capitals and the rest French, Taiwanese

and Indonesian.

3. Activities

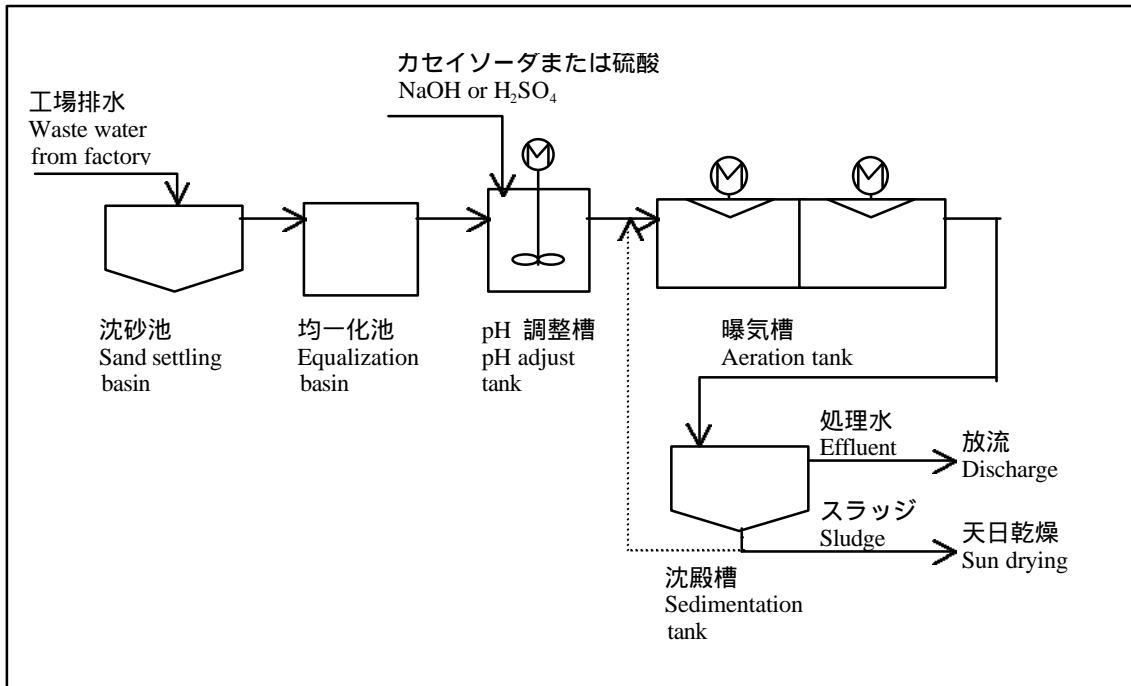
a. Waste Water Treatment

The initial design of the central waste water treatment unit assumed that the industrial estate would distribute 9,000 m³ a day of industrial water to the tenants, and 80% of which, or 7,200 m³ per day, would be returned by them as effluent water. Afterwards the industrial estate distributed as much as 15,000 m³ a day but the capacity of the central water treatment unit has remained unchanged at 7,200 m³ a day. It was found that about 50 % of the water supplied to the tenants is either evaporated at their cooling towers or sprayed on the ground. The central waste water treatment unit gives a terminal treatment to the 7,200 m³ a day of effluent water from the tenants by means of a system shown in Figure 2-3-1. The effluent water received from the tenants enters the sand settling basin where sands are removed. The water is treated by the activated sludge process after its pH value is adjusted. The treated water is discharged to the Cikudokang River 4 km away. The standards for the quality of the water discharged are set by an ordinance of the governor of West Jawa Province as shown in Figure 2-3-2. The standards set 31 items including BOD, COD, heavy metals and nitrogen compounds. The standards for nickel, Ni, and color are set by the industrial estate. The industrial estate gives only biological treatment and therefore those contaminants which are not amenable to the biological treatment, heavy metals and bio-undegradable organic compounds for example, must be treated by the tenants which generate such contaminants down to the levels indicated in the standards. The standards for SS (suspended solids), BOD and COD, which are amenable to the biological treatment, are 300 mg/liter, 500 mg/liter and 800 mg/liter, respectively. The values of BOD and COD of the effluent water the central treatment unit receives range from 200 to 500 mg/liter and from 400 to 600 mg/liter, respectively. These values are reduced to less than the standards.

The excess sludge produced by the activated sludge process does not contain hazardous substances. It is dumped in concrete pits and sun-dried and used as fertilizer.

The central treatment unit has an attached laboratory which analyzes the treated water every day. The office of the industrial estate has access right to the effluent water pits of the tenants. The office takes a sample from the pit of each tenant once a month and analyzes it for all items of the standards. Unless the tenant satisfies all the requirements of the standards, the office warns the tenant of it by issuing an yellow card. Each tenant bears the cost of monthly analysis, 200,000 rupiah a month.

Figure 2-3-1 Flow of the Waste Water Treatment of Company E

Figure 2-3-2 Effluent Standards for Water Set for Company E by West Jawa Province¹⁾

Parameters	Temp.	DSS	SS	Color Pt. co ²⁾	PH	BOD	COD	T-Hg	Pb	Cr ⁶⁺	Cd
Standards mg/liter	35	1000	100 (300)	300	6-9	20 (500)	40 (800)	0.005	0.1	0.1	0.01
Parameters	Zn	Fe	Mn	Cu	As	Se	Ni	CN		F	Cl ₂
Standards mg/liter	5	5	0.5	0.5	0.05	0.01	0.1	0.02	0.01	1.5	1
Parameters	Cl	SO ₄ ²⁻	NH ₃ -N	NO ₃ -N	NO ₂ -N	Blue Methyl ³⁾	Phenol	Vege. Oil	Mine. Oil	-	-
Standards mg/liter	600	400	0.5	10	1	0.5	0.002	10	10	-	-

1) Based upon the Ordinance by the governor of West Jawa Province No.660.31/SK/694-BKPMMD/83, May 26, 1982. Figures in the parenthesis represent standards indicated to the tenants by the industrial estate.

2) Requirement Department of Health No. 416/MENKES/IX/1990 (Unit : Pt.Co)

b. Exhaust Gas and Noise

Although standards have been set for emission gas as shown in Figure 2-3-3 as ordinance by the governor, no measurement is done. Ordinary wastes are burned by the tenants in their incinerators. The office of the industrial estate gives warning when tangible smoke is emitted.

Figure 2-3-3 Emission Standards for Exhaust Gas Set for Company E by West Jawa Province¹⁾

Parameters	Smoke ²⁾	Dust g/m ³ ³⁾	H ₂ SO ₄ - SO ₃ g/Nm ³	HCl g/Nm ³	Cl ₂ g/Nm ³	H ₂ S ppm	NO ₂ g/Nm ³
Standards	2	0.20	0.10	0.20	0.1	5	2.0
Parameters	CO g/Nm ³	Cu g/Nm ³	Pb g/Nm ³	As g/Nm ³	Sb g/Nm ³	Cd g/Nm ³	Hg g/Nm ³
Standards	1.0	0.02	0.02	0.02	0.01	0.01	0.01

- 1) Ordinance by the governor of West Jawa Province No.660.31/SK/694-BKPMMD/82
- 2) Ringelmann smoke chart (not exceeding 5 minutes/hour)
- 3) 12 % as CO₂ equivalent

Figure 2-3-4 Environmental Standards for Noise Set for Company E by West Jawa Province¹⁾ (Unit: decibel)

Place	Night	Morning and evening	Daytime
Office and plant area	85 max.		
Hospitals and clinics area	35 max.	40 max.	45 max.
Residential area	40 max.	45 max.	50 max.
Shopping centers, roads, periphery of plants	50 max.	55 max	60 max.

- 1) Ordinance by the governor of West Jawa Province No. 660.31/SK/694-BKPMMD/82

Likewise, although standards have been set for noise as shown in Figure 2-3-4 as ordinance by the governor, no measurement is done.

The entrant to the industrial estate first applies to BKPM (National Investment Coordinating Board) for permission for construction of the plant. At this time the prospective entrant submits its plan for environmental conservation for examination. When the plant is completed, the plant has to obtain permanent permission for operation. When this application is made, a team of representatives of the concerned ministries and agencies comes to see whether the plant is constructed as planned. The plant is requested to conduct analysis of effluent water and

emitted gas depending upon the scale of the plant. No analysis is requested of the plant which does not discharge water and gas.

c. Others

There was no law concerning industrial estate when this industrial estate was developed. Afterwards, relevant laws were instituted and the industrial estate now has a number of obligations to fulfil. The tenant has to submit through the office of the industrial estate such documents as those concerning environmental conservation and requests for building inspection. Permissions are sometimes granted automatically if the requests are filed through the office of the industrial estate. The office of the industrial estate is partly responsible for conservation of environment within the industrial estate, because the industrial estate itself has obtained AMDAL (Environmental Impact Assessment System).

Treatment of hazardous wastes like those generated associated with waste water treatment are consigned by the tenants to a disposal company in Bogor. Ordinary wastes are either consigned to treating companies or incinerated by the tenants.

The industrial estate receives water from the nearby Cikarang River. Jakarta city takes source water for public supply from the river further downstream where it enters Jakarta. Therefore the industrial estate cannot discharge the treated effluent water of the central treatment unit to this river and conducts water by an underground pipeline to the remote Cikudokang River. The Cikudokang River empties into the sea without being used for any special purposes. West Java Province has the authority to decide the use of river water and the industrial estate abides by the instructions from the Bureau of Environment of West Java Province located at Bandung.

The industrial estate extends cooperation to the people in the neighborhood in the forms of assistance to schools, preparation of sewage systems and supply of water.

Case 6 Example of Thorough Treatment of Heavy Metals

1. Outline of the Company

Company: F
Business line: Manufacturing of automobiles
Number of employees: 600 (New Plant), 5300 (Old one)
Start of operation: 1998(New Plant), 1972(Old one)
Location of the plant: An industrial park in West Jawa Province 50 km to the east of Jakarta(New Plant), an industrial area near the center of Jakarta(Old one)
Japanese equity ratio: 49%

2. Background

The company was unable to expand the Jakarta Plant because of the surrounding areas having become residential areas. The Jakarta City Authority urged plants in the city to move out of the city. Under such a circumstance, the company built a new plant in an industrial park in the suburbs. The new plant started operation in the spring of 1998.

The industrial park has been shown by the West Jawa Province authority the standards for the quality of effluent water, discharged gas and noise. The industrial park has a central waste water treatment unit operated by the office of the industrial park. The streams of effluent water of the tenants are channeled to the central waste water treatment unit of the industrial park which treats the waste water to the quality level satisfying the effluent standards and discharges to the Citarum River. Presently, the central waste water treatment unit has nothing but activated sludge treatment facilities; therefore, the tenants have to remove heavy metals, such poisonous substances as cyanides, unbiodegradable organic compounds from their effluent water streams before sending them to the central waste water treatment unit.

The processes of automobile manufacturing produce a large quantity of waste water containing organic compounds like debris of paints and heavy metals. The office of the industrial park has indicated the effluent standards to the plant. The plant therefore was obliged to install a waste water treatment unit to comply with the standards.

3. Activities

a. Waste Water Treatment

The capacity of the plant is 2,500 cars a month. With only one month after the start of the operation, the plant now operates at a rate of 200 cars a month. The waste water from the

manufacturing processes may be broadly broken down into three kinds: (1) Acid alkali waste water, a waste water stream from the surface treatment plants containing heavy metals such as iron and zinc, and degreasing sludge, (2) Painting waste water, a highly contaminated waste water stream from the painting plants containing paint debris and solvents, with COD content at around 700 mg/liter, (3) General waste water, a waste water stream of a relatively low degree of contamination from the kitchens and sanitary facilities. Figure 2-3-5 shows the effluent standards the office of the industrial park has indicated to the plant. The plant has installed a waste water treatment unit which collects the waste water streams of the plant and centrally treats the waste water. Figure 2-3-6 shows the flow scheme of the unit. The capacity is 500 m³ per day.

Figure 2-3-5 Effluent Standards Set for Company F by the Industrial Park

Parameters	Temp. °C	DSS	SS	Color Pt.co	pH	BOD	COD	T-Hg	Pb	Cr ⁶⁺	Cd
Standards mg/liter	35	1000	200	200	6-9	300	500	0.005	0.1	0.1	0.01
Parameters	Zn	Fe	Mn	Cu	As	Se	Ni	CN	S	SO ₄	F
Standards mg/liter	5	5	0.5	0.5	0.05	0.01	0.2	0.02	0.01	400	1.5
Parameters	Cl ₂	NH ₃ -N	NO ₃ ⁻ N	NO ₂ .N	Blue Methyl	Phenol	Vege. Oil	Mine. Oil	Cl		
Standards mg/liter	1	0.5	10	1	0.5	0.002	10	10	600		

The surface treatment plants and painting plants give their waste water primarily treatment at points of origin to remove large suspended materials and adjust pH values before sending the waste water to the central waste water treatment unit. The waste water from surface treatment plants contains heavy metals and grease at high concentrations, then they are removed as scum floating on the water. The waste water after removal of the scum is mixed with the painting waste water. The painting debris and other pollutants are removed from the mixed waste water as flocculated floating scum followed by a biological contact treatment to decompose organic substances. The treated water is then mixed with the general waste water. The mixed waste water is sent to the central waste water treatment unit of the industrial park after its pH value has been adjusted.

The scum produced from the painting waste water and acid alkali waste water is dehydrated by

the dehydrator. The dehydrated scum is delivered to the poisonous substance treating facility in Bogor.

The laboratory in the plant measures COD, BOD, Oil and SS contents once a day. The results of the measurements are shown on the wall of the laboratory in the form of chart to facilitate effluent water quality control. The plant is always ready to take remedial measures as soon as an abnormality is found. Other items are tested by the office of the industrial park once a month at the cost of the plant on the sample taken by the office officials. The effluent water satisfies all the items of the effluent standards.

b. Solid Waste Treatment

The plant hands over to a solid waste treating company in Bogor the sludge generated from the waste water treatment unit as B3 class poisonous substance. The plant generates such wastes as paint debris but their amounts have not been determined, because the plant has not been operated long enough to quantify them.

c. Environmental Impact Assessment

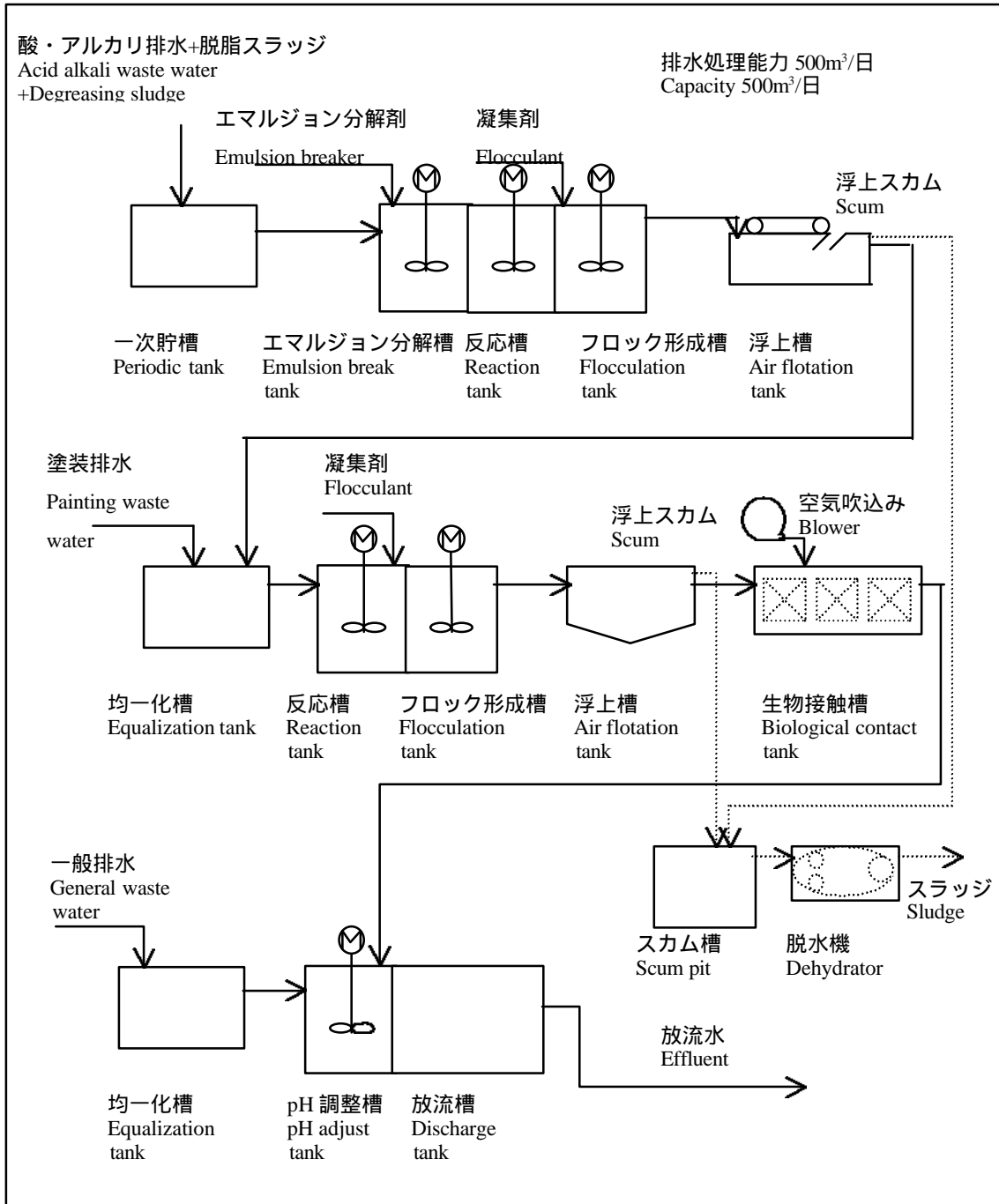
Before a large plant is constructed, an environmental impact assessment, AMDAL, by the government of Indonesia is necessary. In the case of plants in an industrial park, the applications may be made collectively by the office of the industrial park. Besides, permission for operation must be granted by the Ministry of Industry before the operation can actually start. The plan for construction with relevant documents and that for environmental conservation measures are submitted to the Ministry of Industry and to the office of the industrial park. In about two months, the ministry returns the application to the plants with comments, which for example specify the kinds of trees to be planted in the plant premises. The ministry does not give detailed instructions on the quality of effluent water from individual plants, because the office of the industrial park controls the quality of waste water. Responding to the revised application complying with the ministry's comments, the ministry grants the permission for operation in about two months. Altogether, the permission is granted in an about half-a-year period after the first application is made.

d. Others

The exhaust gas from the drying furnace containing the solvent used in the painting plants is used as combustion air for the drying furnace. Care was exercised to completely burn the solvents so that the plant may not emit odors to the surroundings. An emergency tank has been installed voluntarily according to the global standards of the parent company of Japan to

collect rain water containing waste oil before it is discharged to outside.

Figure 2-3-6 Flow of the Waste Water Treatment of Company F



Case 7 Example of Using Neutralization and Aeration to Meet Effluent Water Standards

1. Outline of the Company

Company: G
Business line: Production and sales of surfactants for fibers and paper
Number of employees: 106
Start of operation: 1997
Location of the plant: An industrial estate in West Jawa Province in the suburbs of Jakarta 80 km to the south of Jakarta
Japanese equity ratio: 90%

2. Background

The company produces a variety of chemicals used to activate the surface of fibers when fabrics are made. The production processes generate waste water. The company advanced to Indonesia 24 years ago and had operated a plant in Jakarta until last year. The surroundings of the site in Jakarta, which used to be sparsely populated, turned into a congested residential area. This made it difficult to take appropriate environmental measures to the satisfaction of the residents and to obtain a suitable piece of land for plant expansion. For these reasons the company moved the plant to this industrial estate.

There was a river near the Jakarta site in which black and bad-smelling water flowed. The Jakarta plant discharged effluent water to this river. People living upstream of the discharge point complained to the company that the plant was responsible for the bad odor. As a matter of fact, the effluent water was more transparent and odorless. There was no solving this problem, however, by just explaining the above fact to the residents and their supporters. Besides, the company found it very difficult to purchase a new piece of land, because the ownership of the land in the neighborhood of the plant was very complicated. Under such a circumstance the company decided to move the plant to an already developed industrial estate where effluent water might be centrally treated.

3. Activities

a. Waste Water Treatment

The production process generates 50 m³ a day of waste water from washing of drum containers and reactor vessels. The plant sends the waste water to the central waste water treatment unit of the industrial estate after the plant have given a primary treatment. The central treatment

unit gives the terminal treatment to the waste water to the level satisfying the standards of West Jawa Province and discharges it. The plant is required by the office of the industrial estate that the plant comply with the same effluent standards as those for other plants (the same as those for Company F). The primary treatment of the plant consists only of neutralization and aeration which are unable to meet the effluent standards required by the office of the industrial estate. Because the plant has been operated for only a short while and the production is still small, the plant is now given probation and being watched by the office of the industrial estate. The company will consider the primary treatment processes by the time production increases.

b. Others

Ordinary wastes are taken away by the waste treating companies. The plant does not produce poisonous wastes. The plant runs a small boiler which burns diesel fuel and therefore does not cause air pollution.

Case 8 Example of Removing Oil from Waste Water

1. Outline of the Company

Company: H
 Business line: Manufacture and sales of ferrite magnets
 Number of employees: 480
 Start of operation: 1991
 Location of the plant: An industrial estate in West Jawa Province, 100 km to the west of Jakarta
 Japanese equity ratio: 100%

2. Background

The plant, located in an industrial estate in Cilegong to the west of Jakarta accessible in two hours by a highway, produces small magnets from iron oxide for speakers and electric motors. There has been a direct reduction iron mill that produces a large quantity of iron oxide as a byproduct in this industrial estate. The plant was located just next to the iron mill so that the plant might easily receive the supply of raw material. The raw material is, to be exact, an oxide of iron called mill scale produced in the process of hot rolling. The mill scale is roasted in a furnace to further increase the degree of oxidation and cooled and ground. The ground iron oxide is put into water to form slurry that is further finely ground by a ball mill. Some auxiliary raw materials are added to the slurry and the slurry is dehydrated into a cake. This is where waste water is generated. A portion of the separated water becomes waster water. The dehydrated cake is dried into powders that are shaped in molds and calcined to form solids. The magnets are made from the solid forms. A mold-releasing agent is applied on the surface of the molds so that the shaped powders may easily be detached from the molds. The mold-releasing agent contains oil that finds its way into the waste water. The oil is included as a subject to be controlled in the effluent standards.

3. Activities

a. Treatment of Oil in the Waste Water

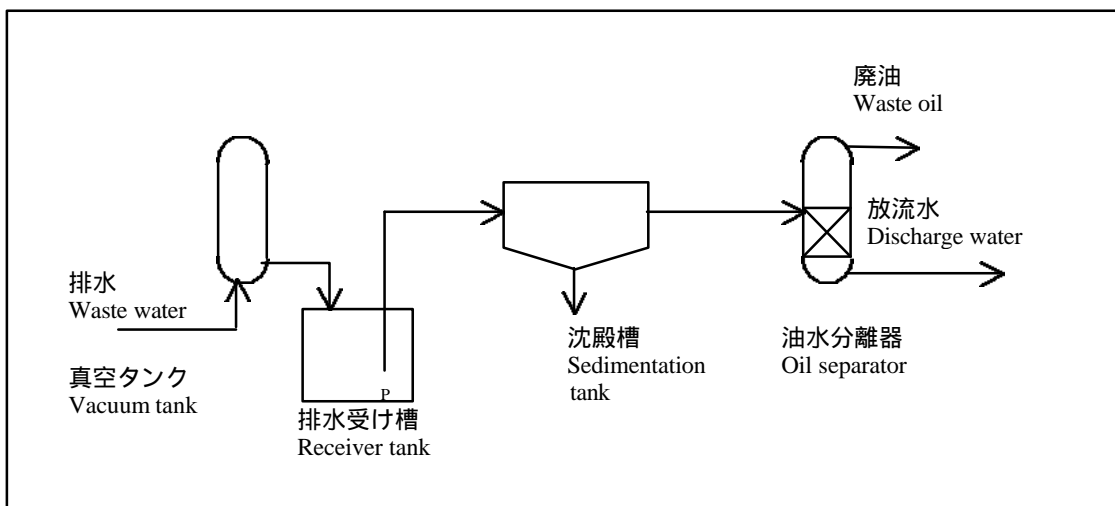
Figure 2-3-7 shows the effluent standards indicated to Company H by the industrial estate. The standard for mineral oil is 50 mg/liter. The plant employs a waste water treatment system, of which the flow scheme is as shown in Figure 2-3-8, to meet the standard for mineral oil. A stream of waste water generated by vacuum dehydration in the process of molding of magnets containing mold releasing agent and fine particles of raw materials is received in the vacuum tank. The waste water is then transferred via the receiver tank to the sedimentation tank where

solids are separated as sludge. The waste water still containing oil is separated into oil and water in the oil separator from which the treated water is discharged. The discharged water contains oil that has escaped the separator and the resultant oil content sometimes exceeds the standard. The plant is studying measures to further remove oil including modification of the oil separator. This industrial estate does not have a central waste water treatment unit and therefore the tenants discharge their effluent water directly to the river.

Figure 2-3-7 Effluent Standards Set for Company H by the Industrial Estate

Parameters	Temperature	DSS	SS	pH	BOD	COD	T-Hg	Pb	Cr ⁶⁺	T-Cr	Cd
Standards mg/liter	40	4000	400	6-9	150	300	0.005	1.0	0.5	1	0.1
Parameters	Zn	Fe	Mn	Cu	As	Se	Ni	CN	H ₂ S	F	Cl ₂
Standards mg/liter	10	10	5	3	0.5	0.5	0.5	0.5	0.1	3	2
Parameters	Ba	Co	NH ₃ -N	NO ₃ -N	NO ₂ -N	Blue Methyl	Phenol	Veg. oil	Mine. oil	Sn	
Standards mg/liter	3	0.6	5	30	3	10	1	10	50	3	

Figure 2-3-8 Flow of Waste Water Treatment of Company H



b. Solid Waste Treatment

The plant promotes recycling of its wastes into resources. Faulty magnets produced at the molding and calcining processes are crushed and ground for reuse as raw material for the molding process. The dust collected by the bag filters at the process of mixing iron oxide and auxiliary raw material is recovered and reused. The plant plans to reuse the sludge collected in the sedimentation tank.

The raw material iron oxide contains as impurities: silicon dioxide, SiO_2 , and calcium carbonate, CaCO_3 , which end up being wastes. The plant sees no way of using them. Accordingly, the plant hands them over to a disposal company together with other wastes.

c. Others

The crushing and grinding processes generate dust. To maintain a good working environment and to recover resources, thorough countermeasures are taken against dust including installation of bag filters wherever dust is generated.

The plant is keen to make a positive contribution to the community that it belongs to. The plant accepts high school students as trainees, gives them training including basic disciplines as a member of society, and pays them salaries, small as they are. The plant gives scholarship totaling 2,500,000 rupiah a month to the selected 100 high school and junior high school students of good performance. This is accepted with gratitude by the principals of the high schools and junior high schools. Though a temporary measure, the plant has distributed rice to the poor people in the neighborhood of the plant since of occurrence of the currency crisis and it was appreciated.

Section 4 Cases of Various Environmental Conservation Activities

Companies of Japanese capitals aggressively promote a variety of environmental conservation measures other than waste water treatment. In the waste water treatment in particular, these companies give special consideration to their circumstances as locations in which they are placed, incorporating special features in the designs of their waste water treatment facilities suited to their proper environmental conditions, for example. This section presents such special features of environmental conservation activities.

Case 9 Example of Installing a Facility to Remove a Pungently Smelling Fume to Consider People in the Neighborhood

1. Outline of the Company

Company: I (Company A of Case 1)

Business line: Manufacture of batteries for automobiles

Number of employees: 770

Start of operation: 1977

Location of the plant: An industrial area in Tangerang, 20 km to the west of Jakarta

Japanese equity ratio: 50%

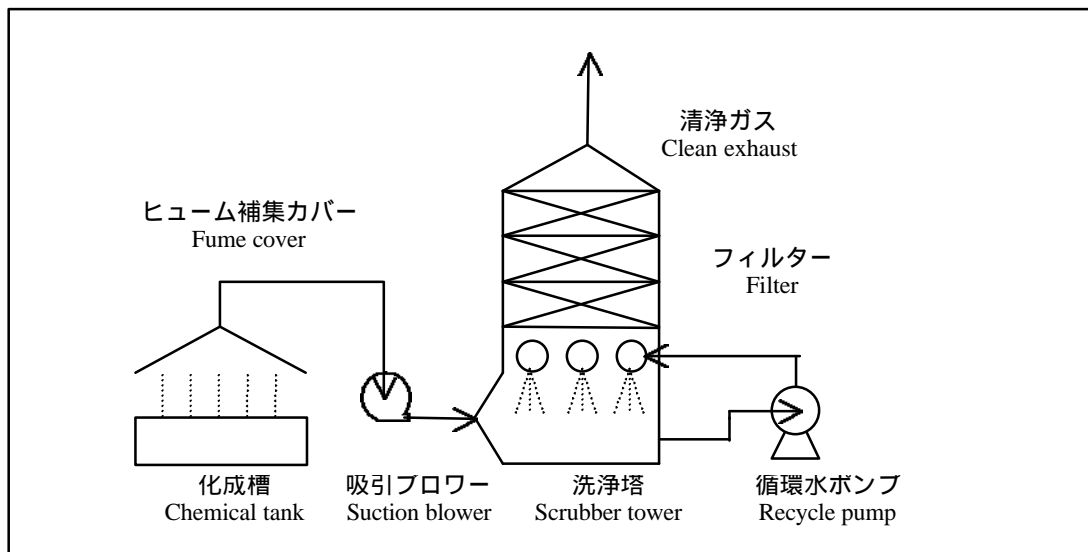
2. Background

The manufacturing batteries include a process in which electrodes are subjected to electrolysis in dilute sulfuric acid. During the course of electrolysis fine bubbles are generated on the surface of electrodes. These bubbles combine to form a fume of pungent smell and disperse in the atmosphere. The area in which the plant is situated, a basin along the Cisadane River, used to be an industrial area developed some 20 years ago. Recently, more complaints are raised against this smell as more houses are built in this area.

3. Activities

The plant first tried to prevent the fume from dispersing in the air by forming a layer of bubbles on the surface of the electrolysis solution by spraying a solution of soap. This measure was not completely successful. The plant installed eight years ago a fume scrubbing facility as shown in Figure 2-4-1. The facility collects the fume by sucking gas through a polyvinyl chloride cover placed on the chemical tank. The sucked gas is conducted to the scrubber tower through a duct. The scrubber tower sprays water on the gas and removes the mists of water through three-stage filters. Since installation of this facility, the plant has not received any complaints from the local residents.

Figure 2-4-1 Flow of the Fume Scrubbing Facility of Company I



Case 10 Example of Minimizing Environmental Load by Reducing Emission

1. Outline of the Company

Company: J
 Business line: Manufacture of power cables, low-voltage cables, 20kv cross-linked polyethylene, telecommunication cables, optical fiber cables
 Number of employees: 684
 Start of operation: 1994
 Location of the plant: An industrial area in Tangerang, 28 km to the west of Jakarta
 Japanese equity ratio: 88%

2. Background

The plant is located in an industrial area in Tangerang 28 km to the west of Jakarta. Imported electrolytic copper of more than 99.9% purity is molten and molded into copper rods. The copper rods are drawn into copper wires which are covered with insulators to be produced into a variety of cables. The plant relies on rich rain water characteristics of the tropical zone for supply of water since there is no river nearby. The rain water is stored in an underground tank and the stored water is used throughout the year. There is no means of discharging water to outside. Accordingly, the plant operates without generating effluent water.

This plant was established by local businessmen in 1981. Until when this plant was taken over by Company J with all the employees, almost no measure had been taken for environmental conservation. Since then the plant has been keenly engaged in recycling of wastes and recovery of waste oil. The plant has already obtained certification of ISO9000 but is not obtaining certification of ISO14001.

3. Activities

a. Waste Water Treatment

The process of drawing molten copper into wires uses a large amount of water for cooling. The water is not contaminated in this process and therefore is recycled back to the process. Water is supplemented from the underground tank to make up for the evaporation loss. The plant therefore does not produce waste water that must be discharged. Since there is no discharge, the officers in charge of environmental conservation in the City of Tangerang do not visit the plant. Normally, the rain water stored during the rainy season suffices throughout the year. Last year, with an exceptionally small amount of rain, the plant had to purchase water delivered by tank trucks to make up for the shortage.

b. Solid Waste Treatment

About 10 tons per day of PVC scraps are produced. Formerly, the plant handed them over to the waste treating companies. Now the plant crushes them in the plant and reuses them as coating material. About 7 to 8 tons of polyethylene scraps are produced a month. They are sold to a waste treating company at a price of Rp.500/kg. They are reportedly used as fuel for baking bricks.

A lubricant, or an emulsion of lubricating oil in water, is applied to the dies which draw copper wires. The degraded lubricating oil floats on the lubricant and is collected as waste oil. Lubricating oils leaking from machines are also collected as waste oil. One to five drumfuls of waste oil is collected a year. Formerly, waste oil was allowed to flow to the sewers in the plant. Now, waste oil is handed over to waste treating companies which uses it as fuel.

c. Exhaust Gas

The plant has a furnace which melts 3,000 tons of copper a month. This furnace burns LNG and therefore does not produce sulfur compounds nor dust.

d. Others

Trichloroethane was used to protect the surface of copper wires from oxidation. Trichloroethane was replaced by an isopropyl alcohol based agent to avoid using organic chlorine compounds. Flons that used to be employed in the cleaning process have been totally replaced by alcohol-based solvents, following the practices of the Japanese parent company.

Case 11 Example of a Plant Building its Own Waste Water Treating Facility

1. Outline of the Company

Company: K
 Business line: Manufacture of materials for wire drawing
 Number of employees: 300
 Start of operation: 1972
 Location of the plant: An industrial area in Tangerang to the west of Jakarta
 Japanese equity ratio: 60%

2. Background

The plant is located along the Mookervaart River in Tangerang 16 km to the west of the center of Jakarta. This area is an old industrial area developed 27 years ago. Nothing but plants was seen in those days; however, residential complexes have been developed recently in this area. Under such a circumstance the city authority is intensifying administrative guidance to the plant for improvement of quality of the effluent water from the plants.

For example, the raw material of 7 mm diameter is washed with hydrochloric acid to remove the scales and chemically surface treated, followed by being drawn through dies into wires of from 3 to 5 m diameter. The produced wires are shipped to the manufacturers of nails, bolts and springs. Waste water is generated at the water washing process following the acid washing and also at the chemical surface treatment process to apply coating of zinc phosphate. The waste water is acidic with a pH value of from 2 to 3 containing such heavy metals as iron, Fe, and zinc, Zn, and is produced at a combined rate of 25 m³ per hour. The plant used to discharge the waste water to the river without treatment. The city authority warned the plant that the waste water did not meet the standards for pH and heavy metals. The plant decided to install a waste water treatment unit in response to the warning.

3. Activities

Figure 2-4-2 shows the effluent standards indicated by the authority of the City of Tangerang. The plant built a waste water treatment unit in 1996 at a cost of about 10 million yen to comply with the standards. Figure 2-4-3 shows the flow scheme of the unit. Slaked lime and a flocculant is added to the incoming waste water to neutralize the water and to form flocs of hydroxides of heavy metals. Addition of slaked lime is automatically controlled by an automatic pH controller. The flocs are allowed to coagulate to grow in size in the flocculation tank and to settle in the sedimentation tank, thus the supernatant clear water is separated. The

sediment, being a slurry, is sucked by a pump to be sent to the filter press which separates the sediment into water and dehydrated filter cake. The separated water from the filter press and the supernatant clear water are discharged after being aerated. The dehydrated filter cake is generated at a rate of five tons over a six-month period. It is handed over to a waste treating company in Bogor. The sanitary waste water from the toilets and likes is discharged to the river as it is.

Figure 2-4-2 Effluent Standards and an Example of Analysis for Company K

Analysis by EMC								Unit: mg/liter		
Parameters	SS	Cr ⁶⁺	T-Cr	Cu	Zn	Ni	Cd	T-CN	Fe	pH
Standard*	20	0.1	0.5	0.6	1.0	1.0	0.05	0.2	5.0	6.0-9.0
Analytical data	1.0	0.01	0.04	0.01	0.84	0.06	0.014	<0.01	0.1	6.0-8.0

Date of sampling: September 25, 1996

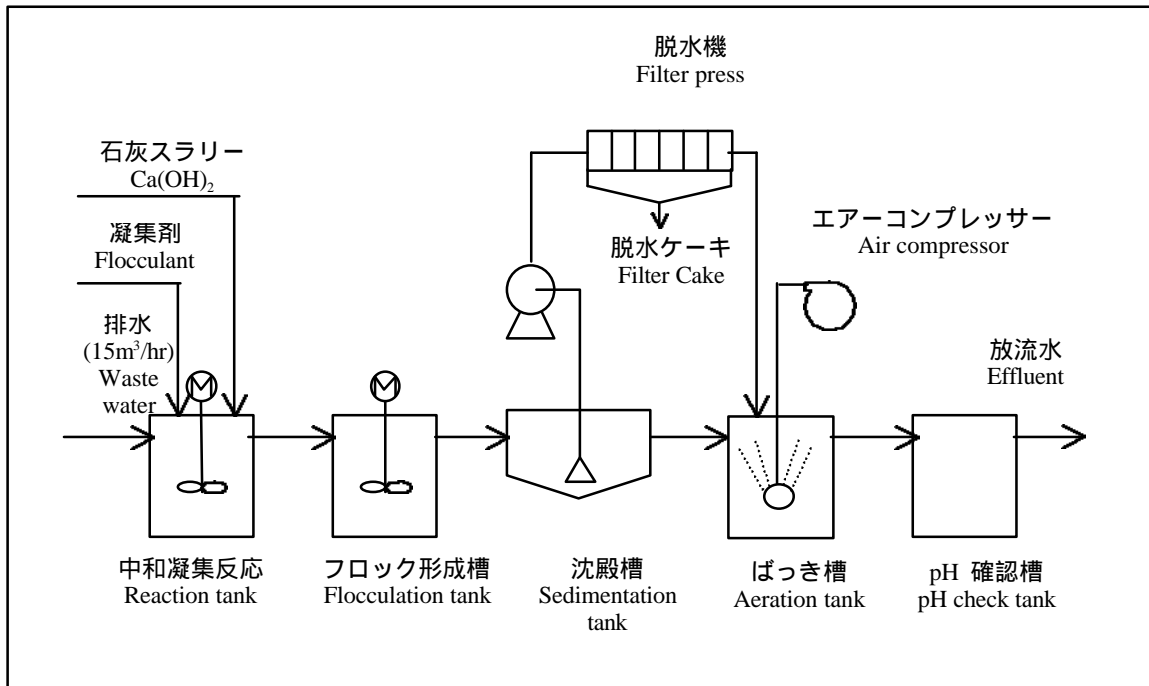
*The standards are based upon the Ministerial Order KEP-51/MENLH/10/1995, BAKU MUTU LIMBAH CAIR BAGI KEGIATAN INDUSTRI, 23 OKTOBER 1995

On completion of the unit in 1996, the plant had its treated water analyzed by the Environmental Management Center, EMC for short, of BAPEDAL.

The results of the analysis indicated that the sample water met all the standards for heavy metals and total cyanides, T-CN, but the pH value was slightly on the alkaline side outside of the allowable range, because the automatic pH controller did not function well at the time of sampling. Besides, the zinc content was close to the upper limit of the standard. Since then, the plant has had the waste water sampled and analyzed by a private testing company every three months and reported the results to the city. All the analytical results have met the standards. Twice in 1996 and once in 1997, the city officials of the Bureau of Environmental Conservation in charge came for inspection without prior notice only to find nothing odd. The plant routinely checks the operation based on a formatted check list. If there is any problem, the city authority will warn the plant of the problem. It would not be too late to take corrective measures after a warning is received.

The plant takes water from the Mookervaart River and treats it for clarification before using it in the plant. The quality of water is so bad that the water can only be used after being treated by coagulation sedimentation followed by filtration. Last year, water quality was further deteriorated by the drought and the plant had another water clarification unit installed by a Japanese company specializing in this field.

Figure 2-4-3 Flow of the Waste Water Treatment of Company K



Case 12 Example of Consigning Waste Water Treatment to a Sister Company

1. Outline of the Company

Company: L
Business line: Manufacture of lactic acid bacteria beverages
Number of employees: 700
Start of operation: 1997 (L Company was inaugurated in 1991.)
Location of the plant: In the suburbs of Sukabumi, West Jawa Province, 80 km to the south of Jakarta
Japanese equity ratio: 49%

2. Background

This plant is the sole production base of lactic acid bacteria beverages in Indonesia. It produces 800 thousand bottles per day of beverages. Eight years have passed since L Company started its operation in Indonesia and established a plant in Jakarta. During the past years the surroundings of the plant changed to residential areas and the plant site became too small for the operation of producing lactic acid bacteria beverages. The company therefore built a plant on the present site and has operated the new plant since one year ago. This location is on the foot of Mt. Gunung Salak and is gifted with plentiful supply of underground water of good quality. Air is also clean in this area.

In the processes of manufacturing lactic acid bacteria beverages, a large quantity of waste water containing organic compounds at high concentrations is generated associated mainly with washing of tanks. An affiliated dairy product company is situated next to the plant. That is a sister company at Indonesian side of Company L. The plant has asked the sister company to build a waste water treatment unit capable of processing waste water from Company L in addition to its own and has consigned the sister company with the treatment of waste water from Company L.

3. Activities

a. Waste Water Treatment

Washing of tanks and production machines and disposal of off-specification products combined generate 100 m³ per day of waste water. This waste water is sent by a pipeline via a simple aeration tank to the waste water treatment unit of the dairy product plant next to this plant. The pipeline is 25 cm diameter, 750 m long and has a head drop of 9.2 m. The waste water flows by natural gravity. Figure 2-4-4 shows the effluent standards that West Jawa Province

indicated to the dairy product company. Figure 2-4-5 shows the flow scheme of the waste water treatment unit designed to satisfy the standards. The capacity of the unit is 750 m³ per day. The waste water stream from the lactic acid bacteria beverages processes and that from the milk process are mixed in the bar screen tank and homogenized in the equalization tank. The homogenized liquid is rid of fat and subsequently neutralized, followed by biological treatment in the aeration tank. The biologically treated waste water is separated in the clarifier into the supernatant clear water and settled sludge. The supernatant clear water is discharged and the settled sludge is sent to the thickener where the sludge is condensed to be subsequently dehydrated by a filter press. The quality of the water at the inlet and at the outlet of the unit are as shown in Figure 2-4-4.

Figure 2-4-4 Effluent Standards and an Example of Waste Water Treatment of Company L¹⁾

Unit: mg/liter

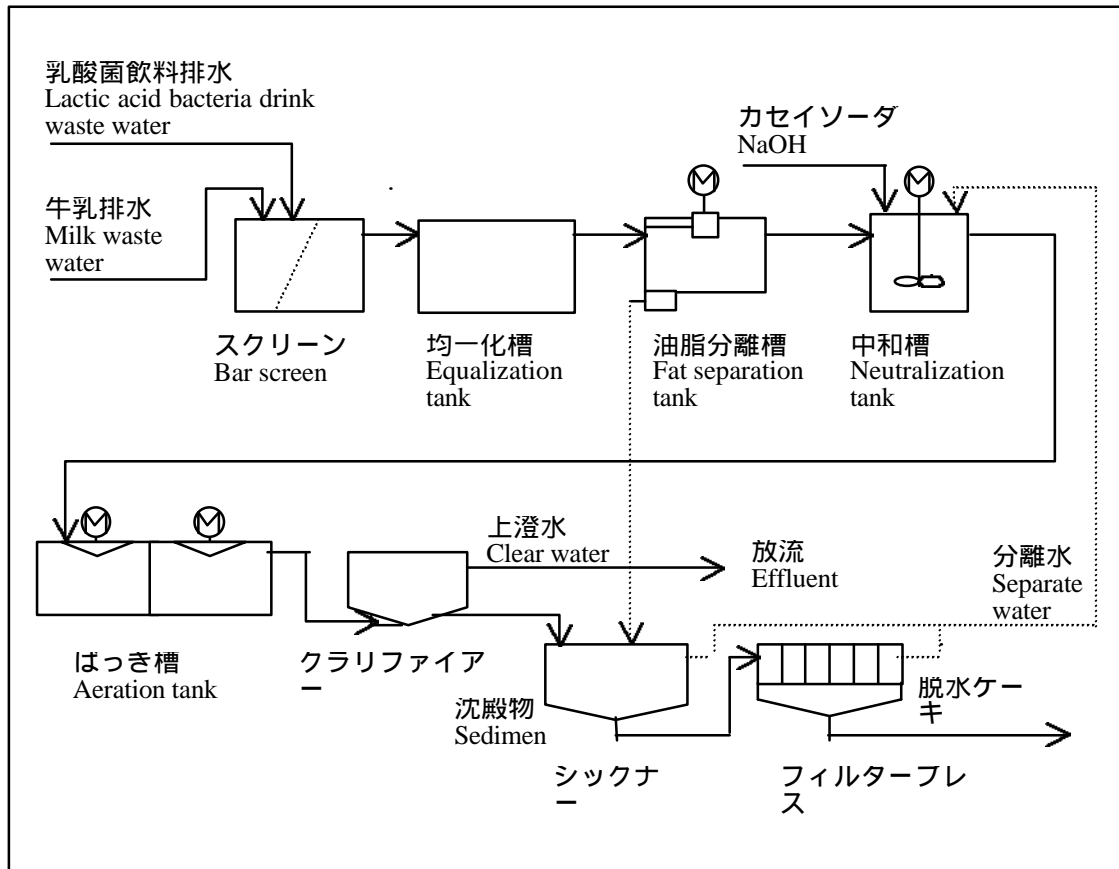
Parameters	Temp.	pH	BOD	COD	TSS
Standards ²⁾	< 38	5 - 9	100	200	200
Inlet	30	5.0	1,065	1,836	750
Outlet	24	6.8	18.4	40.8	39

1) Date of analysis: August 20, 1997

2) Ordinance by the governor of West Jawa Province No. 660.31/SK/694-BKPMD/82

The treated water satisfies all items of the standards. The rates of reduction of BOD and COD are as high as 98%.

Figure 2-4-5 Flow of the Waste Water Treatment of Company L



b. Solid Waste Treatment

The emptied bottles for the lactic acid bacteria beverages and plastic packing films used for the off-specification products end up being wastes. These are handed over to the waste dealers. The empty bottles after the contents have been consumed may be effectively used as packing for the waste water treatment unit after the bottoms are cut. Recovery of the spent bottles would be an expensive endeavor and therefore the company does not collect them now.

c. Others

The processes of manufacturing lactic acid bacteria beverages involve heating and cooling. The plant has replaced flons with ammonia as cooling medium for the refrigerators. The plant has boilers to provide heat to the processes and a power generator. They burn diesel fuel, and do not cause air pollution.

Case 13 Example of Thorough Control of Effluent Water Quality

1. Outline of the Company

Company: M
Business line: Manufacture of household electric appliances (refrigerator, fan, air-conditioner, washing machine, television set, various audio-players)
Number of employees: 2,500
Start of operation: 1970
Location of the plant: An industrial area situated on a border between Jakarta and Bogor
Japanese equity ratio: 60%

2. Background

The plant is situated on a border between Jakarta and Bogor 20 km to the south of the center of Jakarta. The plant has an area of 18 hectares and produces a variety of household electric appliances. This area used to be an industrial area in the suburbs but has become a congested residential area with medium- and small-sized stores. The authority of Jakarta City has been becoming increasingly severe on the control of effluent water, in response to the changes of the circumstances. The plant, on its part, has installed a multi-functional waste water treatment unit to cope with the severe controls of the city.

3. Activities

a. Waste Water Treatment

A large quantity of waste water is produced at the painting process of the production line, one for each product group, from the acid washing operation and surface preparation operation of the steel surface to be painted. The painting processes, other processes and the dining room combined produce a 30 m³ a day of waste water. Figure 2-4-6 shows the effluent standards indicated by the Jakarta City Authority. The plant built in 1991 a waste water treatment unit to collectively treat all streams of waste water in the plant. A company of the same capital group in Malaysia was consigned with the design and construction of the unit. The treated water is discharged to the Kalibaru Timur River running nearby. The plant used to discharge as much as from 40 to 60 m³ per day; however, the discharge has recently decreased because of the production of the plant decreasing as a result of the sharp decline of rupiah. Figure 2-4-7 shows the flow scheme of the waste water treatment unit.

Figure 2-4-6 Effluent Standards and an Example of Analysis for Company M

Parameters	pH	Temp.	SS mg/l	Org.** mg/liter	COD _{Cr} mg/liter
Standards*	6.0 ~ 9.0		100	80.0	100
Results of analysis	8.1	29.5	12.3	39.5	80.3

Note: Standards* Standards indicated by the Jakarta City Authority

Org.** Consumption of permanganic acid

Each production line neutralizes its own waste water as a primary treatment at its place of origin and sends its waste water to the central waste water treatment unit. These streams are collected in the reaction tank where ferric chloride is added to water to effect sedimentation by coagulation. The supernatant clear water is discharged after pH adjustment. The settled sediments are separated into water and dehydrated filter cake by the filter press. The separated water is recycled back to the reaction tank and the dehydrated filter cake, 15 tons per month, is handed over to disposal company. The pH of the treated water is adjusted in two stages and discharged. Measurement is done of pH again before discharge for confirmation. The waste water contains 600 to 1,000 mg/liter of COD in the reaction tank, then COD is reduced to 35 to 60 mg/liter in the effluent water when it is discharged.

A laboratory was set up in the plant in 1993 to intensify the control of discharge water quality. The laboratory conducts analysis of the waste water for all the items listed in the standards and shows them in graphical forms. The changes in the trends of these analytical data are observed. When an abnormality is noted in the trends, appropriate measures are immediately taken. Thus, measures were taken to prevent the effluent water from exceeding any item of the standards; as a result, the plant has never caused any problem with the effluent water.

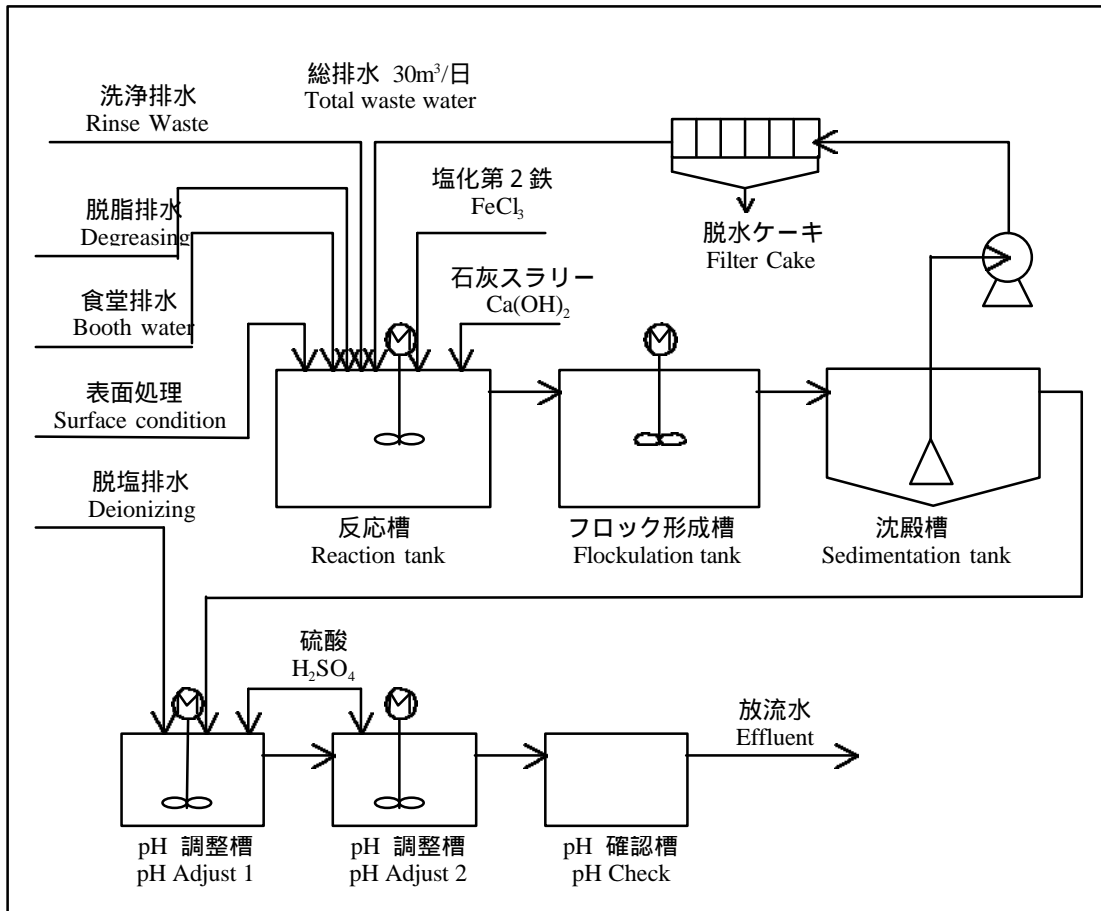
Presently, the plant clears all the items of the effluent standards. An agency designated by the city authority takes samples and analyzes them and reports the analytical results to the city once in three months. Their analyses and plant laboratory's analyses have never deviated from each other.

The sanitary waste water from toilets and others is treated in a septic tank and discharged to the river. The sludge accumulated in the septic tank is regularly drawn up by vacuum cars and taken away by disposal company at a fee of 60,000 rupiah per cubic meter.

Indonesian employees are in charge both of operation of the waste water treatment unit and analysis in the laboratory. Technology transfer to the Indonesian staff and workers has been

well organized.

Figure 2-4-7 Flow of the Waste Water Treatment of Company M



b. Solid Waste Treatment

The plant generates the following wastes:

- Dehydrated filter cake at the waste water treatment unit: 15 tons/month
- Sands stained with dropping paints, /year: 200 liters x 600 cans
- Waste oil

These wastes are handed over to the disposal company in Bogor authorized by the government at a price of US Dollars 164/ton. The plant paid a total of 120 million Rupiah to them in 1997. Wastes like empty cans are sold to recycling company. Sets of three cans are placed at main places of the plant to throw wastes in, one for plastics, one for metals, and one for combustibles and others. The plant thus promotes recovery of wastes by kind and their recycling, to decrease the amount of waste that must be eventually taken out of the plant. The plant intends to reduce the amount of waste to 75% on the present production by 2000.

Case 14 Example of Installing Waste Water Treatment Facility Underground

1. Outline of the Company

Company: N
Business line: Manufacture and sales of cosmetics
Number of employees: 2,425
Start of operation: 1971
Location of the plant: An industrial area to the north of Jakarta
Japanese equity ratio: 52%

2. Background

The Japanese parent company has set up a corporate policy as shown in the frame below to exemplify the images of cosmetics. The plant of Company N also follows to this policy. If the plant of a cosmetics company does not appear fine or discharges foul water, it would give the general public a bad impression of the company and company's products. The plant positively pursues realization of this policy in the context of environmental conservation. The plant manufactures more than 400 kinds of various cosmetics. Waste water containing such organic compounds as fatty acids, surface active agents and castor oil is generated from the manufacturing processes. When the plant first started, this area was an industrial area. Afterwards, with rapid urbanization of Jakarta, an overhead expressway has been constructed passing just next to the plant and office buildings and high-rise apartment houses have been built in the neighborhood. Under such a circumstance the plant had to have a waster water treatment unit that did not look ugly and also had to take appropriate measures to odors.

This area is nearly at sea level and water tends to stagnate and stays at the same place. If foul water should be discharged to a sewer by the plant, it should stay there and would be seen by people there. With the intensification of effluent standards of the City of Jakarta on top of such a circumstance, the plant was obliged to install an advanced waste water treatment unit.

Corporate Policy of Company N's Parent Company To contribute to beautiful, pure and healthy lifestyles.
--

3. Activities

a. Waste Water Treatment

The company started reconstructing the plant in 1993 to increase the production capacity and improve the working environment. The company, taking this opportunity, installed the waste

water treatment unit underground to make it invisible and to make it easier to take appropriate measures if the unit emits a disagreeable odor. A small park with a pond was built on the ground above the underground waste water treatment unit. Carps are kept in the pond which is filled with the treated water from the waste water treatment unit. This provides a pleasant scene if it is seen from the highway and the buildings nearby. The exhaust gas from the waste water treatment unit is emitted from a vent installed in the small park. There proved to be no problem of odor. Figure 2-4-8 shows the effluent standards indicated by the authority of Jakarta City. Since the waste water contains organic substances at high contents, the inflow to the waste water treatment unit has high values of BOD and COD, about 3,000 mg/liter and 4,000 mg/liters respectively. The waste water like this must have been treated to meet the standards for BOD, COD, and organic matter, namely, 75 mg/liter, 100 mg/liter and 85 mg/liter, respectively. To achieve these difficult objectives, a waste water treatment unit, of which the flow scheme is as indicated in Figure 2-4-9, was built. The capacity of the unit was set at 80 m³ a day. The unit was installed nine meters underground.

Figure 2-4-8 Effluent Standards Set for Company N by Jakarta City Authority

Parameters	DSS	SS	pH	BOD	COD	T-Hg	Pb	Cr ⁶⁺	T-Cr
Standards mg/liter	1,000	100	6-9	75	100	0.002	0.1	0.1	0.5
Parameters	Cd	Zn	Fe	Mn	Cu	As	Ni	CN	F
Standards mg/liter	0.05	2.0	5.0	2.0	1.0	0.1	0.1	0.05	2.0
Parameters	Cl ₂	NH ₃ -N	NO ₃ -N	NO ₂ -N	S	phenol	Act. Methyl Blue	Org.	Oil & Fat
Standards mg/liter	1.0	5.0	10.0	1.0	0.05	0.5	1.0	85	5.0

The effluent waste water streams from various processes are gathered in the equalization tank and homogenized by agitation by air blowing. Then the homogenized waste water is neutralized by addition of either an acid or an alkali followed by addition of coagulants to effect sedimentation of suspended materials by coagulation sedimentation. Subsequently, the waste water is subjected to activated sludge treatment in the aeration tanks in which organic substances are decomposed by the action of microorganisms. The activated sludge and treated water are separated in the sedimentation tank from which the activated sludge is partly recycled back to the aeration tanks. The treated water is passed to the biological contact tank packed

with gravel on which microorganisms are cultivated. The two-step biological treatment consisting of activated sludge treatment and biological contact achieves near complete decomposition of organic substances. Suspended solids, SS, dissolved oxygen, DO, pH and temperature, all important process variables of the biological treatment, are measured several times a day and recorded in the operation log. If there is anything odd in these data, corrective measures are taken immediately. The finishing touch to the treated waste water is the passing of the treated waste water through the activated carbon filter to remove traces of organic substances that have escaped the preceding processes. If the biological treatment does not function well, the content of suspended solids increases. As a result, clogging of the activated carbon filter occurs. The plant has had no experience of such a problem and has operated well. The activated carbon is imported from Australia. The finished treated water is pumped up to the pond on the ground and the overflow from the pond is discharged to the ditch beside the plant. The effluent water used to contain surface active agents and therefore generated bubbles after being discharged to the river. This problem has been solved since the waste water treatment unit came on stream. Plant has the treated water analyzed by a testing company once or twice a month. The results of the tests show that the treated water satisfies all the requirements of the standards.

This waste water treatment unit represents a rare case in which such a unit is installed underground. The underground unit does not give off an odor characteristics of activated sludge treatment, presumably because the high temperatures under which activated carbon treatment is done activates bio-chemical reactions, consequently decomposing substances which would otherwise remain intact and would cause odors. The temperature of the cellar where the unit is placed seems to be higher than 30 and the temperature of the contents of the aeration tanks is probably close to this temperature. Another reason for not causing odor is that the operation is well managed and the ventilation is good.

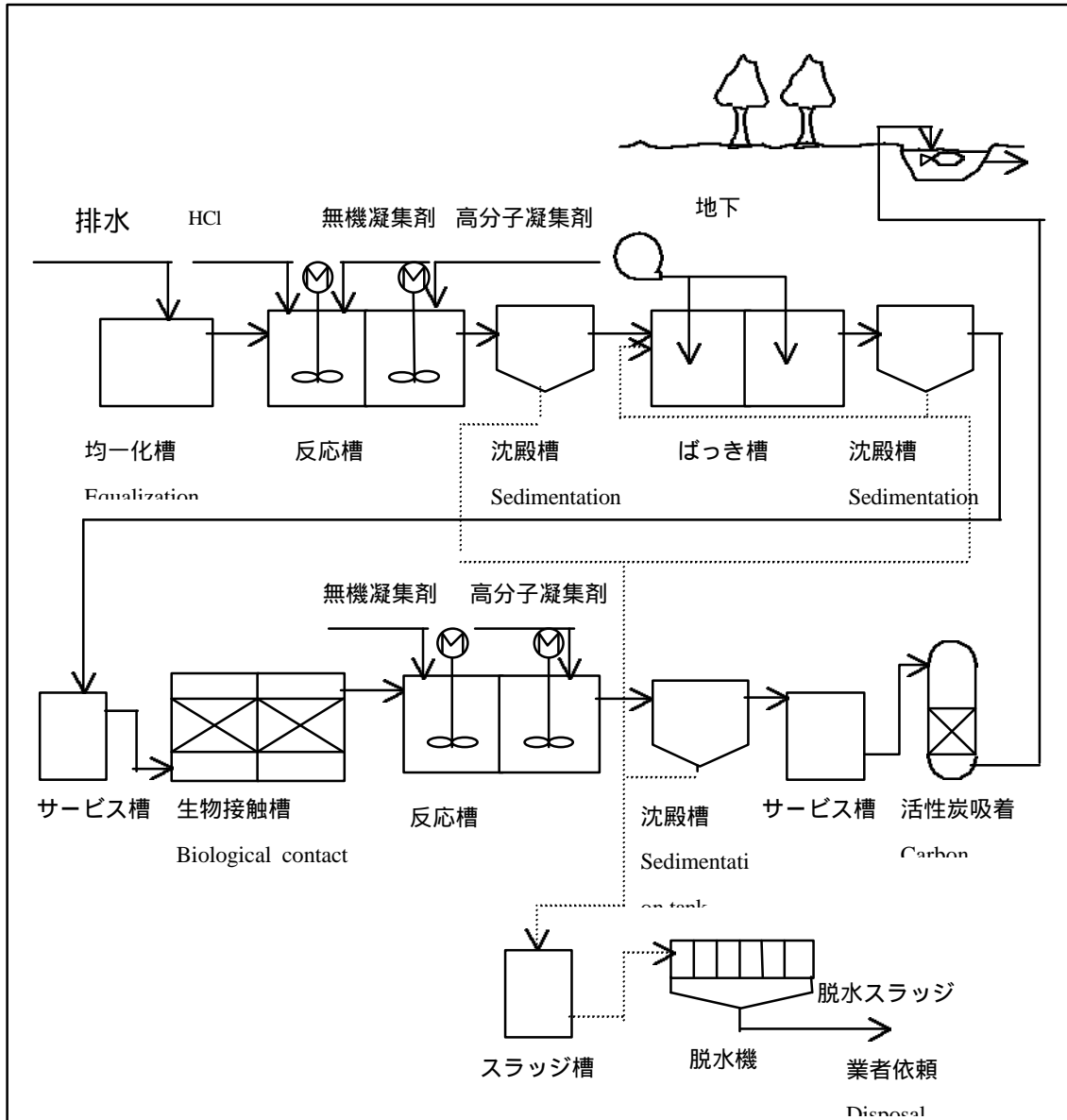
The tap water and well water in this area is too bad in quality to be used for the plant. The plant brings water from Bogor about 30 km away by tank trucks and uses it after water is treated by filtration, activated carbon percolation, de-ionization and sterilization by ultraviolet rays.

b. Others

The propellant for spray containers for cosmetics used to be flons but they have been replaced by LPG. The purchased LPG contains odorants. The odorants are removed from LPG in the plant before LPG is used as propellant.

The plant has been decorated by Jakarta City for good performance of the waste water treatment and for good working environment for the female workers.

Figure 2-4-9 Flow of the Waste Water Treatment of Company N



Section 5 Cases of Establishing Environmental Management System

This section extends the subject beyond the traditional concept of environmental conservation measures, by presenting cases in which companies are establishing environmental management systems commensurate with ISO14001, an international specification of environmental management, including endeavors for acquisition of the ISO14001 certification.

Case 15 Example of Acquisition of Certification of ISO14001

1. Outline of the Company

Company: O (the same as Company M, Case 13)
 Business line: Manufacture of household electric appliances (refrigerator, fan, air-conditioner, washing machine, television set, various audio-players)
 Number of employees: 2,500
 Start of operation: 1970
 Location of the plant: An industrial area situated on a border between Jakarta and Bogor
 Japanese equity ratio: 60%

2. Background

This company's parent company in Japan has manifested its "Environmental Conservation Code" as shown in the frame below to underline its principle that its business activities consider conservation and improvement of environment. In accordance with this principle the parent company requires that its all overseas affiliates' plants acquire certification of ISO14001. This plant established its EMS (Environmental Management System) in October 4, 1996 with a view to acquiring the ISO14001 certification and successfully acquired the certification on January 26, 1998. The five companies in Indonesia in the same capital group have altogether initiated endeavors to acquire the certification of ISO14001. Another two of the five, in addition to O Company, has acquired the certification. The rest of the five are scheduled to acquire the certification by the end of this year.

"Environmental Conservation Code" of Company O's Parent Company

We, human beings, live in harmony with everything in the Universe, and are under a noble mission to realize on earth a harmonious prosperity. Our company fulfils its social responsibilities, while keeping in mind this holy mission given to us, human beings, and at the same time gives full consideration and make continual effort to the conservation and improvement of the environment so that the earth may be maintained in a balanced and ideal conditions.

3. Activities

a. Establishment of Environmental Policy

Formation and operation of organizations relative to environmental management are based on

the specifications of ISO14001. The parent company of Company O has its own environmental policies which conform to the “Environmental Conservation Code” of the parent company and are adapted specifically to the local circumstances in which the company is placed. The Company’s environmental policies have the following objectives in addition to that spelled out in the “Environmental Conservation Code.”

1. Thorough implementation of the specifications of ISO14001 through effective management of EMS,
2. Full compliance with the rules and regulations of the government of Indonesia on effluent water from the plant, emission of gas, working environment and handling of poisonous substance, and resolution of the problems that may arise through cooperation and coordination within the company, companies of the same capital group and people in the concerned areas,
3. Full cooperation to the programs of the government of Indonesia on cleanup of rivers and atmosphere,
4. Promotion of optimization of raw material consumption and recycling so that the resources may be effectively utilized,
5. Education of the employees on environmental conservation to enhance employees’ environmental consciousness

Cards on which these items are printed have been distributed to all employees to enable them to practice these items in their daily works.

b. Organizations for Environmental Management

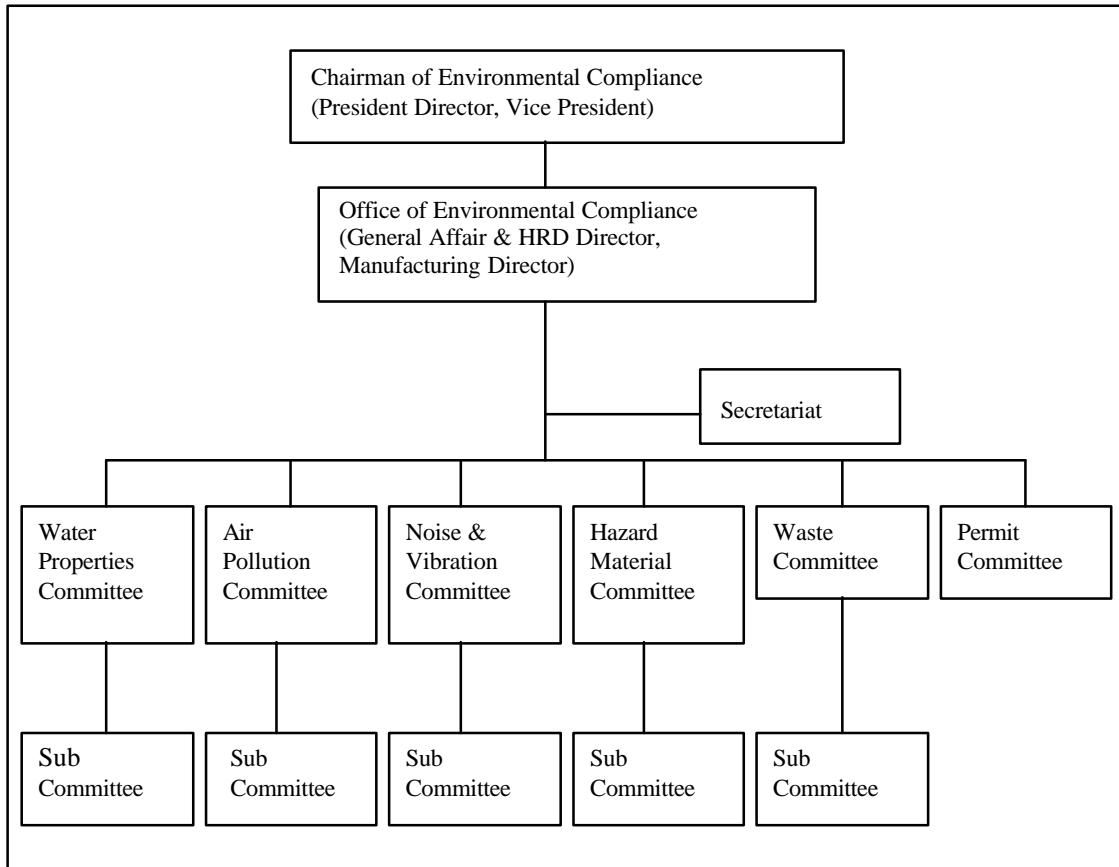
Environmental Protection Promotion Office, EPPO, reporting directly to the board of directors, was established in 1993. Since 1995 EPPO has played instrumental roles in environmental management in compliance with the specifications of ISO14001. Figure 2-5-1 shows the organization of EPPO.

The sub committees at the bottom of Figure 2-5-1 have representatives of all workplaces. Each sub committee studies issues concerning improvement of environmental conditions, disseminates such information as alteration of rules and regulations, and conducts education on environmental conservation.

General Affair & HRD Director and Manufacturing Director address such important environmental problems as requiring engagement of the entire company. Each director solves

problems in his own division with the cooperation of the managers of the concerned workplaces.

Figure 2-5-1 Organization of Environmental Management in Company O



c. Sampling and Analysis of Effluents and Emissions

Sampling, analysis and measurements are routinely done for quality of effluent water and discharged gas, noise, vibration and toxic substances in accordance with the environmental assessment plan, the environmental management plan (RKL) and the environmental monitoring plan (RPL) agreed upon between the Jakarta City Authority and Company O. The locations of sampling, items for measurement, frequency of sampling, measuring organizations, divisions or departments which analyze the data and identities of the persons responsible are all made public.

d. Channels of Reporting Irregularities

Anyone who finds irregularities reports to EPPO through the committee to which he belongs and must take measures to correct the irregularities. The office of EPPO reports the

irregularities to the directors and to the concerned outside organizations as necessary.

e. Environmental Audit

The voluntary audit and internal audit are integrally done twice a year to ensure that environmental management is effectively and thoroughly implemented. In the audit the General Affair & HRD Director and Manufacturing Director audit all the workplaces under their supervision and reports the results of audits to EPPO. EPPO is audited once in two years by the Japanese parent company.

f. Education on Environmental Conservation

To enhance the employee's understanding on the importance of the environmental management and to develop experts in technologies for environmental conservation, the company let the employees attend seminars, courses and training. The seminars are lectures by professionals within and outside the company. The courses comprise practices and lectures extending for some days. The training means sending employees to comprehensive and longer training courses done at home or abroad. In 1994 the company sent some people to a training in Japan. The company intends to develop experts in this way within the company so that these experts may perform all the works required for the environmental management.

g. Communication with Other Organizations

BAPEDAL(Environmental Impact Management Agency) expects that 80 companies will acquire certification of ISO14001 this year. To assist in realization of this objective, the company sometimes makes its experts available as speakers to the seminars for local Indonesian companies to present experiences of the companies or to give lectures. This attests to the fact that the company has been successful in developing human resources within the company in the field of the environmental management.

h. Collection of Information about Environment-related Rules and Restrictions

The company has requested in writing BAPEDAL, PPIPL, KPPL of Jakarta City and the Ministry of Labor and Safety to provide the company with the recent information about environment-related rules and restrictions. The company was able to obtain the full documents one month after the law was promulgated when the law concerning environmental conservation was instituted last year.

Case 16 Example of Preparing for Acquiring the ISO14001 Certification (No. 1)

1. Outline of the Company

Company: P (F Company of Case 6)
 Business line: Manufacture of automobiles
 Number of employees: 600(New Plant), 5,300(Old one)
 Start of operation: 1998(New Plant), 1972(Old one),
 Location of the plant: An industrial park in West Jawa Province 50 km to the east of Jakarta(New Plant), an industrial area near the center of Jakarta (Old one),
 Japanese equity ratio: 49%

2. Background

The parent company in Japan has established its global environmental charter as shown in the frame below. As part of its endeavors to actualize this global environmental charter, the parent company has instructed its all affiliated plants to obtain the ISO14001 certification. Company P is to obtain the certification by the end of 1998. Company P abides by the effluent standards of waste water, reduces emissions, and actively contributes to public welfare in the cause of the global environmental charter. The environmental policy of Company P calls for forestalling environmental problems rather than take remedial measures after the problems emerge. Company P considers that environmental measures comparable to those taken in Japan would generally suffice.

The plant occupies an area of 45 hectares near the center of Jakarta. The surroundings of the plant used to be an industrial area but recently office buildings and high-class apartment houses have been built close to the plant as this area is developed. Under such a circumstance the city authority is becoming increasingly strict about the quality of effluent water. The company was obliged to install a waste water treatment unit capable of meeting the requirements by the city authority and to practice right operation control of the unit.

Global Environmental Charter of Company P's Parent Company

Basic Policy

1. Positive approach

We positively develop environmentally friendly technologies and promote environmental conservation measures in recognition of the fact that the manufacturing of automobiles has important bearings on the global environment. For this purpose we unite the forces and capabilities of the providers of supplies within and without the group, dealers and related

companies, and all the divisions and departments of the company.

2. Prevention rather than correction

We forecast and evaluate the impacts on the environment of all the steps throughout the entire life of automobile; namely, development, design, production, marketing, and disposal of products. We positively take environmental conservation measures effectively making use of the information obtained through the forecasting and evaluation.

3. Contribution to social welfare

We positively support and participate in environmental conservation measures of the society and communities, for the purpose of realizing better global environment not only through business activities but also through contribution to the society as a good corporate citizen.

3. Activities

a. Preparation for Acquisition of Certification of ISO14001

The plant is in the process of preparing its environmental policy. To promote environmental management and safety management a committee was installed in General Affairs Department of the plant five years ago. A sub committee consisting of 22 members including one representative each of all workplaces was set up in the committee. The sub committee members are studying the ways to achieve the standards of ISO14001.

b. Waste Water Treatment

Waste water is generated at the assembly plants, painting plants, and kitchens and toilets. The waste water from the painting plants constitutes about half the total waste water. The streams of waste water are given primary treatment at the places of their origins and channeled to the central waste water treatment unit where waste water is given terminal treatment and discharged. The central waste water treatment unit was constructed in 1992 by an engineering company of Japanese capital at a cost of about 300 million yen. The capacity of the unit is 2,500 m³ per day. Affected by the economic crisis of Indonesia, the production rate has decreased to 2,500 cars per month as of January 1998 from the peak production rate of 9,000 cars per month. As a result, the amount of waste water charged to the waste water treatment unit has decreased to 500 m³ per day. The assembly plants produce waste water containing zinc, Zn, lead, Pb, and phosphorus, P, from the chemical surface pretreatment of steel sheets ahead of the painting process. These streams of waste water undergo neutralization and sedimentation by coagulation as primary treatment. The waste water from the kitchens and toilets undergoes activated sludge treatment. Figure 2-5-2 shows items of effluent water quality and their effluent standards set by the Jakarta City Authority.

Figure 2-5-2 Effluent Standards Set for Company P

Parameters	pH	COD	TSS	Hg	Zn	Pb	Cu	Cr	Cr ⁺⁶	Cd	Phenol	Oil	PO ₄	Org.
Standards mg/Liter	6.0 -9.0	100.0	100.0	0.015	2.0	0.1	1.0	2.0	0.3	0.05	0.4	5.0	4.0	80.0

Figure 2-5-3 Flow of the Total Waste Water Treatment of Company P

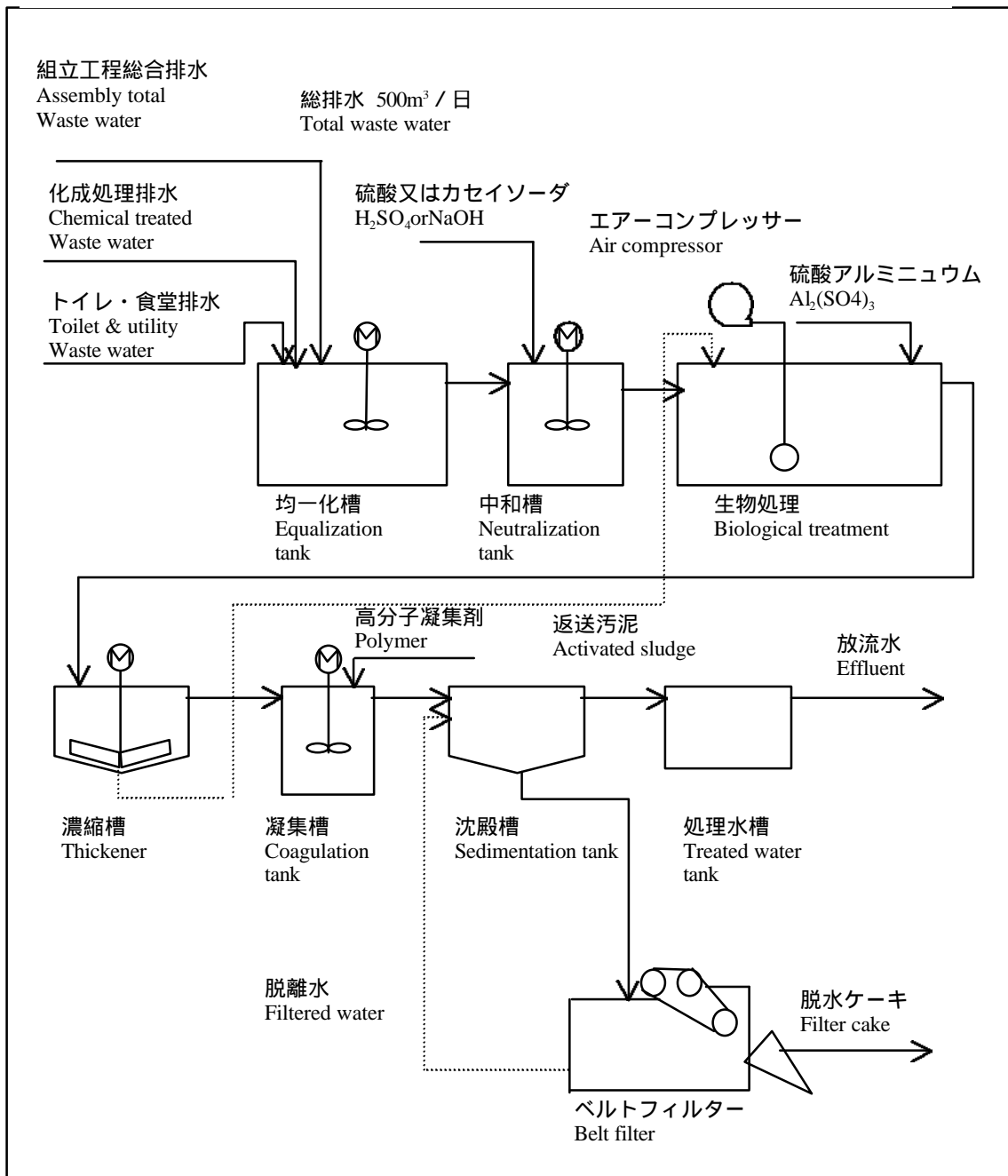


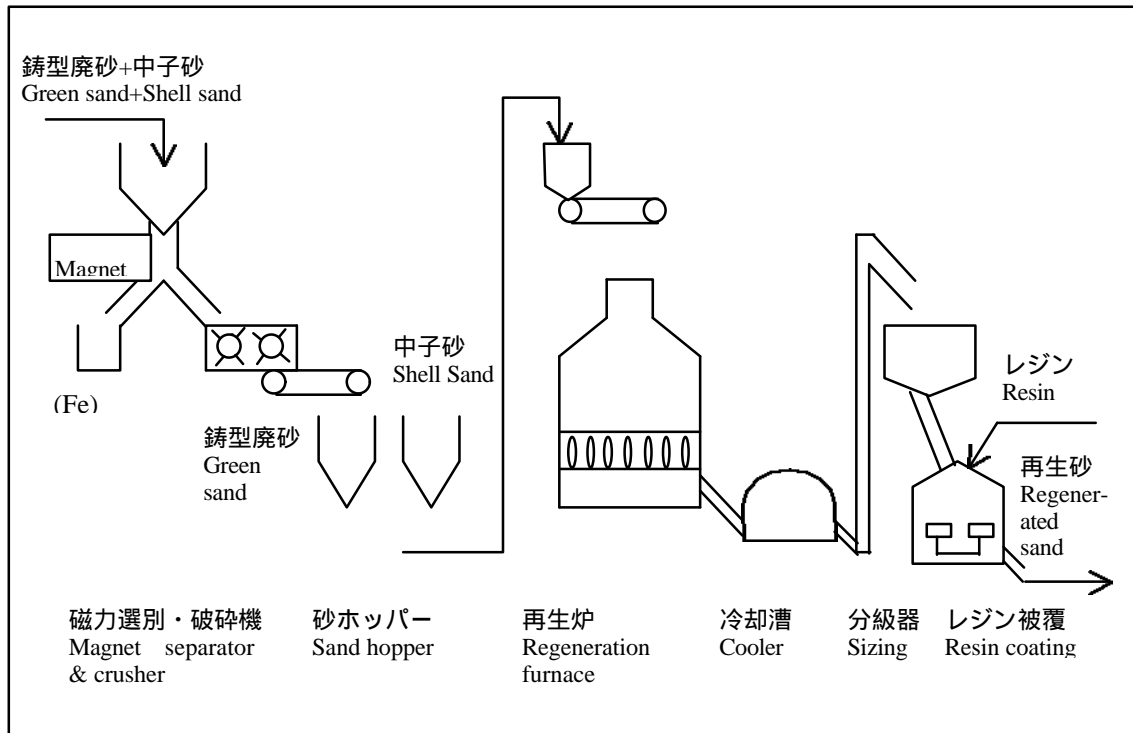
Figure 2-5-3 shows the flow scheme of the central waste water treatment unit installed to meet these effluent standards. The primarily treated waste water streams are sent to this central waste water treatment unit. On reaching the unit the waste water streams are mixed in the equalization tank. The pooled waste water is neutralized in the neutralization tank and aerated in the aeration tank. To the water is added aluminum sulfate, $Al_2(SO_4)_3$, to reduce the phosphorus content at the point where water leaves the aeration tank for the sedimentation tank. The waste water is separated into the supernatant clear water and sediments in the sedimentation tank. The supernatant clear water is discharged after its pH value is confirmed. The sediment is dehydrated by a belt filter. The separated water is recycled back to the sedimentation tank.

The COD content of the waste water at the equalization tank is 100 mg/liter which is reduced to 20 to 30 mg/liter at the point of discharge. The discharged water is analyzed at the laboratory of the plant every day. Once in every three months a private testing company designated by Jakarta City authority comes to take samples and analyze them. The company reports the results of analysis to the city authority. To date the results of analyses have satisfied the effluent standards.

c. Solid Waste Treatment

The paint debris, used green sand from the foundry, dust and dehydrated filter cake from the primary and terminal treatments of the waste water constitute solid waste. Of these the paint debris is predominant representing about half the total waste by weight. The green sand of used molds from the foundry is recycled and used. The recycling plant was built in 1997, of which the flow scheme is shown in Figure 2-5-4. The used molds are crushed and iron is removed by magnetic separation. The roughly crushed molds are further ground and sieved to remove foreign materials and then calcined in the regeneration furnace to burn resinous materials coating grains of sand. The burned sand is cooled and the grains of sand are classified according to grain size. The regenerated sand is coated again with resins to be used again. With the completion of the molding sand recycling plant, generation of spent sand to be disposed of was reduced to about one-sixth. The plant has only to replenish the loss of sand; therefore, the consumption of sand was also reduced from four tons a day to 0.6 to one tons a day at a 7,000 cars per month production rate.

Figure 2-5-4 Flow of the Molding Sand Recycling Plant of Company P



The paint debris, spent sand and the dehydrated filter cake from the waste water treatment, the latter produced at a rate of about five tons a month, are all handed over to a waste treating company is Bogor. The plant plans to reduce the amount of wastes at a rate of 5% per unit per year.

d. Atmospheric Diffusion of Volatile Organic Carbon Compounds, VOC, and Reduction of Paint Consumption

There is no restriction in Indonesia on the atmospheric diffusion of VOC generated as a result of vaporization of the solvents for paints. The plant works on the reduction of VOC in anticipation of possible restrictions in the future. To reduce the consumption of paints and atmospheric diffusion of VOC the plant adopted in 1996 the Minibel sprays. In 1997 the Minibel sprays were adopted throughout. This spray enables the spraying of paint to be maintained at right angle to the steel sheet to be painted by automatic control on one hand, and helps the paint adhere to the sheet by means of static electricity, thereby increasing effective yields of paints and decreasing the consumption of paints. Figure 2-5-5 compares the consumption of paints and atmospheric diffusion of VOC between the operations of August 1995 and January 1998, or before Minibel sprays were introduced and after their effects became

distinct, respectively.

Figure 2-5-5 Comparison of Paint Consumption and Atmospheric Diffusion of VOC before and after Introduction of Minibel Sprays

	August 1995	January 1998
Consumption of paints, kg/unit	5 to 6	3.0 to 3.5
Atmospheric diffusion of VOC, grams/m ²	150 to 160	105

Formerly, operators used spray guns. With the spray guns, only about 30 to 40 percent of the paints sprayed were effectively used, with the rest ending up being paint debris, or a waste. Adoption of the Minibel sprays reduced the consumption of paints, reduced the generation of wastes, reduced atmospheric diffusion of VOC, and reduced manpower.

e. Contribution to the welfare of local society and community

In 1974 the company contributed US Dollars 4.4 million to found the Research and Education Support Fund incorporated in Indonesia. The funds spend 739 million rupiah a year to support various activities including 13 research programs, scholarships to 855 university or college, high school and junior high school students, donation of textbooks and education facilities.

In addition, the company earmarks a budget of 498 million rupiah a year for contributions to the society. This budget is used, among other things, to install public bathhouses, maintain roads, donate police cars, give concerts, train car mechanics.

Case 17 Example of Preparation for Acquiring the ISO14001 Certification
(No. 2)

1. Outline of the Company

Company: Q
 Business line: Manufacturing and sales of linear IC's and signal transistors
 Number of employees: 480
 Start of operation: 1997
 Location of the plant: An industrial estate in Bekasi in West Jawa Province to the west of Jakarta
 Japanese equity ratio: 75%

2. Background

Company Q manufactures IC's and transistors for general-purpose personal computers and audiovisual equipment, and exports its entire production to the Southeast Asian countries through Japan, Singapore and Hong Kong. The company is integrated in the global strategy of the parent company in Japan as a part supplier. The company is under the supervision and control of the Japanese parent company in its environmental conservation measures as well as in its product specifications. The parent company has an Environmental Conservation Charter as shown in the frame below which also constitutes a guideline to the promotion of environmental conservation measures for its overseas plants. The parent company's 28 group plants in Japan obtained the certification of ISO14001 in 1997. The rest of its group plants in Japan are scheduled to obtain the certification by the end of 1998. Company Q is in the process of acquiring the certification scheduled by the end of 1999.

Environmental Conservation Charter of Company Q's Parent Company

Principle for Environmental Conservation

We, at this company, pursue environmentally compatible technologies and adopt environmentally friendly manufacturing processes. As doing so we appreciate the grand processes of Mother Nature and contribute to the realization of a affluent world society and environment on earth in which all human beings may be able to find satisfaction and to express themselves in human ways.

3. Activities

a. Organization for Environmental Management

The plant of Company Q has an organization for maintaining hygiene and safety as shown in

Figure 2-5-6. This organization is also in charge of studying problems associated with environment. The Steering Committee at the top of the organization is chaired by the president of the company and is the supreme function of the organization. Reporting to the Steering Committee is the Organizing Committee having four sections under its umbrella. One of the four sections is in charge of environmental problems. With this section as the center of the function, the company tackles environmental problems, channels information and, and promotes education and enlightenment of the employees.

The organization for maintenance for safety of the plant shown in Figure 2-5-7 is now responsible for operation of the waste water treatment unit and control of the quality of effluent water. A group exclusively responsible for the facilities for environmental conservation will be established by the end of 1998. An environmental engineer will be recruited to head the group. An experienced Malaysian has been invited to manage this organization from a sister company's Malaysian plant. Since Indonesians and Malaysians speak almost the same language, the invited manager can educate the company's employees.

Figure 2-5-6 Organization for Maintenance of Hygiene and Safety in Company Q

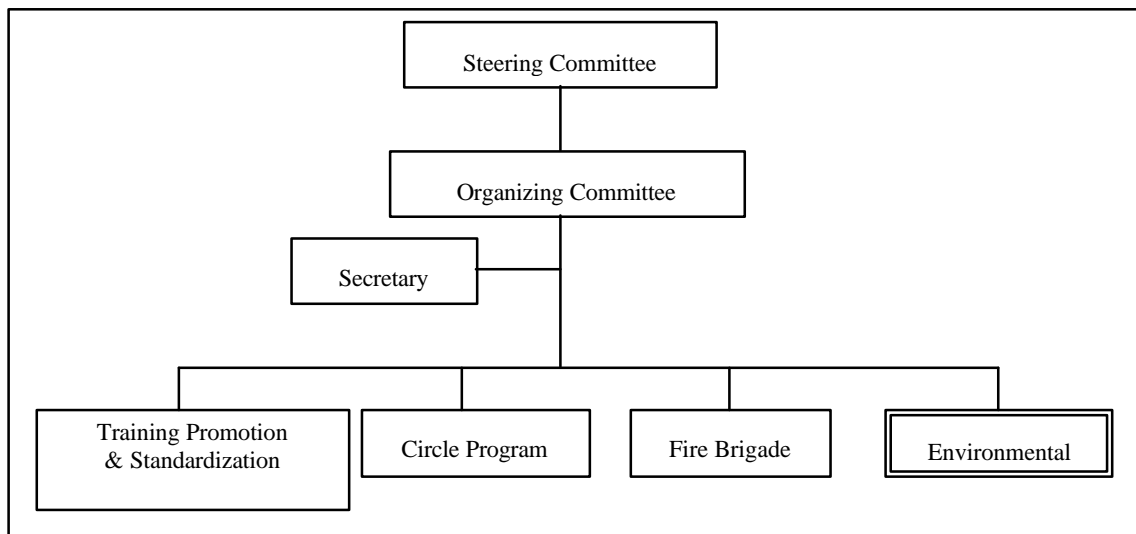
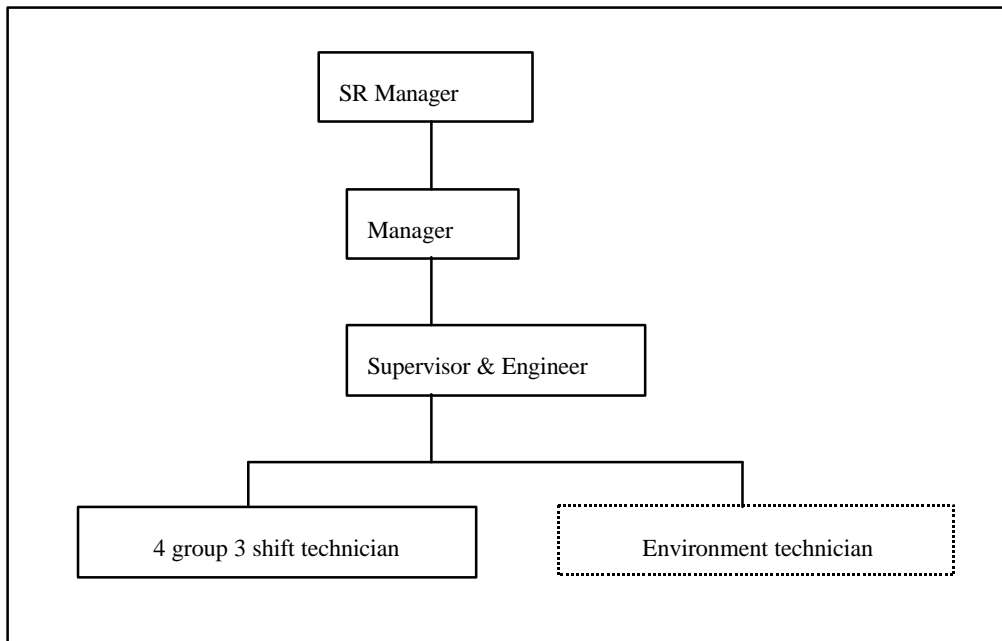


Figure 2-5-7 Organization for Maintenance fo Safety in Company Q**b. Waste Water Treatment**

The plant receives 60,000 m³ per year of industrial water from the industrial estate. The plant gives advanced treatment as required, to produce highly purified water before it is used in the washing processes. The steams of waste water produced at these washing processes are sent to the waste water treatment unit of the plant where it is treated to the quality level satisfying the standards indicated by the office of the industrial estate and the treated waste water is sent to the central waste water treatment unit of the industrial estate. Figure 2-5-8 shows the effluent standards indicated by the office of the industrial estate. Of the items specified, the standards for fluorine, F, 1.5 mg/liter, and phenols, 0.002 mg/liter, are very stringent, even more stringent than those specified by the Water Pollution Control Law of Japan which are 15 mg/liter for fluorine and 5 mg/liter for phenols. The standard for phenols is close to the effective lower limit of the method of quantitative analysis and therefore it is difficult to obtain accurate analytical data. These standards have been set by the government of West Jawa Province on the industrial estate.

Figure 2-5-8 Effluent Standards Set for Company Q by the Industrial Estate

Parameters	Temp. °C	DSS	SS	Color Pt.co ¹⁾	pH	BOD	COD	T-Hg	Pb	Cr ⁺⁶	Cd
Standards mg/l	35	1000	300	300	6-9	500	800	0.005	0.1	0.1	0.01
Parameters	Zn	Fe	Mn	Cu	As	Se	Ni	CN	H ₂ S	F	Cl ₂
Standards mg/l	5	5	0.5	0.5	0.05	0.01	0.1	0.02	0.01	1.5	1
Parameters	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	NO ₃ -N	NO ₂ -N	Blue Methyl ²⁾	Phe- nol	Vege.oil	Mine. oil		
Standards mg/l	600	400	0.5	10	1	0.5	0.002	10	10		

1) Requirement Department of Health No. 416/MENKES/IX/1990(Unit: Pt.Co)

2) Blue Methyl Active Compound

To satisfy these standards the plant installed a waste water treatment unit of 4 m³ per hour capacity. Figure 2-5-9 shows the flow scheme of the waste water treatment unit. The acid and alkaline waste water streams are held up in a tank and homogenized and then transferred to the reaction tanks where the water is neutralized and heavy metals are coagulated. The flocs are separated in the clarifier and the supernatant water is passed through a sand filter to remove a trace of suspended matters to produce the treated water. The streams of waste water containing fluorine compounds, F, are charged to another tank where slaked lime, Ca(OH)₂, and other necessary agents are added to water to make them react with the fluorine compounds to form water-insoluble calcium fluoride, CaF₂. The calcium fluoride is subjected to sedimentation by coagulation. This process is done batchwise and sufficient time is allowed for fluorine level to become less than the standard. The sediments from the heavy metal removal process and those from the fluorine removal process are combined to be stored a while and dehydrated by the filter press to produce dehydrated filter sludge and separated water. The separated water is recycled back to the equalization tank to be subjected to neutralization and sedimentation by coagulation. The treated water is sent to the central waste water treatment unit of the industrial estate. The dehydrated filter sludge is handed over to a waste treating company.

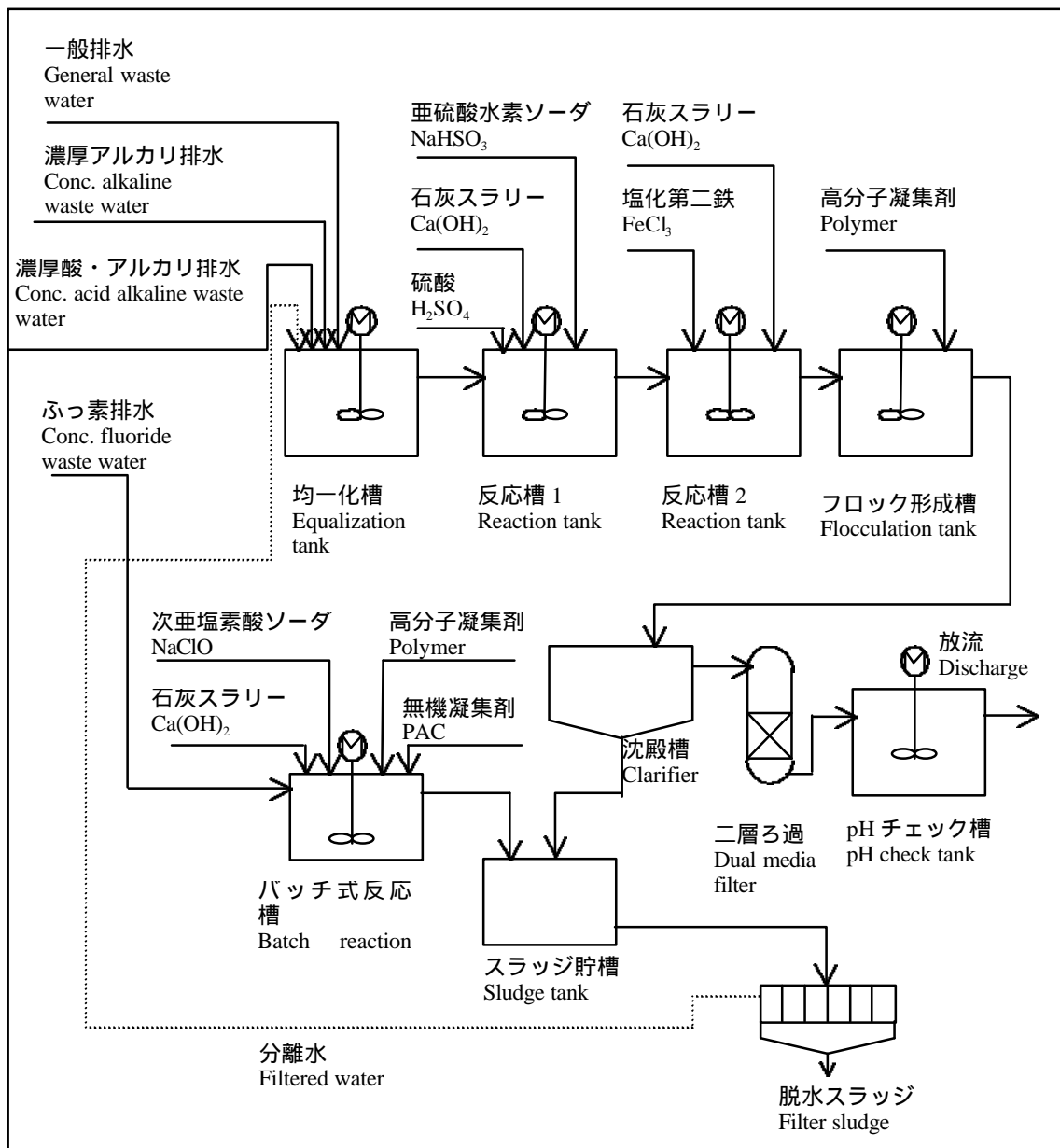
The treated effluent water from the plant is sampled and analyzed at the central treating unit of the industrial estate once a month. The effluent water has passed all the items of the standards.

c. Solid Waste Treatment

Waste plastics amounting to 12,000 kg a year, notably epoxy resins, from the plant represent the largest of all kinds of wastes. Next comes the dehydrated filter sludge amounting to 2,800 kg a year, followed by waste oil amounting to 2,000 liters a year. The spent flucs amount to 140 liters a year. In addition to them, office paper, cardboards and rugs together amount to 4,000 kg a month. All these are handed over to waste treating companies.

Used plated metal frames, amounting to 2,000 kg a month, are generated. These are valuable as resources and Japanese recycling companies take them by way of Hong Kong.

Figure 2-5-9 Flow of the Waste Water Treatment of Company Q



Case 18 Example of Comprehensive Approach to Environmental Management with Cooperation of the Parent Company in Japan

1. Outline of the Company

Company: R Business line: Manufacture of synthetic fibers Number of employees: 952 Start of operation: 1973 Location of the plant: An industrial area in Tangerang 30 km to the west of the center of Jakarta Japanese equity ratio: 100%
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2. Background

Company R's parent company in Japan has declared its basic principle for environmental conservation. Its affiliated overseas plants comply with this basic principle in formulating their environmental conservation measures. The parent company has Global Environmental Conservation Committee which issues to its overseas plants instructions and information concerning environmental management. The overseas plants are required to implement environmental assessment, to establish and run organizations for environmental management, to treat their wastes and to hold affairs on environment, all in effect to the levels equal to those of the parent company.

The parent company in Japan promotes "responsible care activities". In that the company handling chemical substances voluntarily takes necessary measures to maintain safety, health of the people concerned and conserves the environment over the entire range from development of chemical substances down to their disposal. The endeavor to acquire the certification of ISO14001 forms a part of the responsible care activities. The parent company for the time being intends to let the Japanese plants that have already acquired the ISO9001 certification obtain the ISO14001 certification.

Basic Principle for Environmental Conservation of Company R

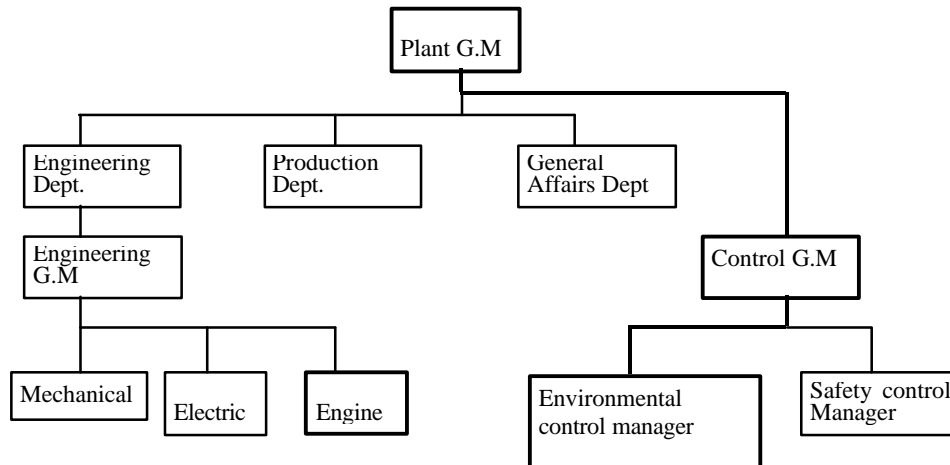
We, at Company R, regard maintenance of safety, prevention of hazards and conservation of environment as top priority management objectives. In line with this principle, we declare, as our code of conduct, that we always care for the safety and health of the society and our employees, and we also contribute to the betterment of society by providing products and technologies compatible with environment and ecological conditions.

3. Activities

a. Organization for Environmental Management

The organization for environmental management of the plant is as shown in Figure 2-5-10.

Figure 2-5-10 Organization of Environmental Management in Company R



The line of the organization connected by the bold lines plays the leading roles in promoting environmental management. The environmental control manager is responsible for testing of water quality, participation in the tests done by outside organizations, reporting to authorities and relevant organizations, managing the Environmental Conservation Committee of the plant, and coping with the environmental problems that may arise. The Utility Section maintains, manages and operates the waste water treatment unit. The positions of managers of the Executive Department and Construction Department, key positions for environmental conservation, are held by Indonesians.

b. Major Activities for Environmental Conservation

- (1) Environmental Conservation Committee (Presided over by the Plant General Manager): every month
The committee consists of managers including and above section managers and discusses mainly waste water related issues.
- (2) Environmental Assessment Committee of the group companies in Indonesia: once or twice times a year
- (3) Exchange of environmental related information (among group companies in Indonesia)
The information includes that on laws and regulations on environment.
- (4) Audit by directors of the parent company of Japan on environmental conservation, prevention of hazards and maintenance of safety: every year

Three or four of them come to examine management of the above subjects and related facilities.

(5) Planting of trees

Scheduled planting of 200 to 300 trees is done every year in the vacant lots of the plant.

(6) Cooperation to the communal environmental conservation measures in the forms of donation of scavenger cars, refuse containers to the City of Tangerang and contribution of funds and land for construction and maintenance of city roads

(7) Promotion of energy conservation with a target of 3% per year reduction for every year

Energy conservation leads to reduction of cost, savings of resources which in turn contributes to conservation of environment. Employees are invited to present posters on energy conservation and thus this endeavor is activated.

(8) Measurements on environmental conservation

Water-related measurements

The received water, treated water, combined effluent water: own measurement, once a day

The treated water and combined effluent water: measurement by official organizations, once or twice a month

Discharged gas

Discharged gas from the boiler and others: measurement by outside testing organizations, once a year

Others

Noise: measurement by an outside commissioned organization: once a year

Others

c. Waste Water Treatment

Water is taken from the Cisadane River. Almost all the processes reduce consumption of water by recycling used water. The contaminated water is treated by the waste water treatment unit and is discharged to the Cisadane River. The uncontaminated water like cooling water is discharged untreated. Figure 2-5-11 shows the effluent standards indicated to Company R by the Tangerang City Authority. The company installed a waste water treatment unit to meet these standards. Figure 2-5-12 shows the flow scheme of the waste water treatment unit. The relatively highly contaminated waste water is first received in the emergency tank from which water is sent to the equalization tank by a controlled flow. Other kinds of waste water is directly received by the equalization tank. The pooled waste water is subjected to pH adjustment and consecutive two-stage activated sludge treatment in the surface agitated aeration tank and the air injected aeration tank. The air injected aeration tank was added last year associated with the increase of production. The treated water is separated in the sedimentation

tank into clear water and sludge. The clear treated water is discharged to the river and the sludge is dehydrated and buried in the plant premises. A portion of the sludge is recycled back to the aeration tanks. The BOD content, from 1,000 to 1,5000 mg/liter in the incoming water, is reduced to 85 mg/liter in the treated water. The waste water also satisfies all other items of the standards.

Figure 2-5-11 Effluent Standards Set for Company R

Parameters	pH	SS	BOD	COD	Phenol	T-Cr	Oil & grease	Waste Water m ³ /t-product
Standards mg/l	6 - 9	60	85	250	1.0	2.0	5.0	150

d. Solid Waste Treatment

The sludge produced by the waste water treatment unit does not contain poisonous substances and therefore is safely buried in the premises of the plant. One to two drumfuls a month of the refuses are produced from the processes of synthetic fibers. These are consigned to the solid waste disposal company. Such general wastes as paper, wood chips are either reused or incinerated by a 300-kg-per-hour incinerator depending upon their conditions. A portion of spent oil is burned in the boiler and the rest is handed over to a waste treating agent.

e. Others

Selected fuels are used for the boiler not to emit pollutants. Use of flons was abandoned in 1993.

Figure 2-5-12 Flow of the Waste Water Treatment of Company R

