Chapter 2: Case Study Relating to Effluent Treatment

Companies should of course take measures to prevent pollution to mitigate environmental problems. Japanese companies are taking countermeasures against waste water, which is a key factor in pollution prevention in the Philippines. The case studies introduced in Chapter 2, 3, 4 and 5 illustrated companies facing environmental problems, selected mainly from those companies which answered questionnaires in 1995. After interviewing them in detail about their environmental measure by visiting these companies, we asked them to freely write reports about the measures they had taken. The following case studies are drawn from those reports after editing by our survey team.

Case 1: Appropriate Effluent Treatment of Waste Water Containing Chromium, Taking Advantage of Lack of Treatment Operators

1) Profile of the company

Company A	
Business activities:	Manufacture and sale of advanced precision electronic components
Number of employees:	Approximately 1,100
Start of operation:	1989
Location:	Export processing zone in a suburb of Manila
Ownership ratio of headquarters in Japan: 100 percent	

2) Background

Company A's top management policy with regard to environmental control standards is basically that of "clearing Japanese emission standards," as instructed by its head office in Japan.

Company A conducts chromate surface processing on magnetic products used in personal computers by creating corrosion-resisting chromate film by immersing galvanized substances in anhydrous chromic acid solution. The problem was how to treat waste water containing hexavalent chromium after chromate processing. In Japan, waste water is stored in a drainage tank and a specialist treatment operator is paid to remove it. In the Philippines no such operator with the specialist technology and equipment could be found, so Company A was obliged to deal with the effluent problem with its own in-house facility. Company A intended to carry out waste water treatment suitable to the situation in the Philippines in order to create an efficient system.

3) Contents

A Japanese waste water treatment plant manufacturer was commissioned to make the treatment equipment. Equipment capable of processing a maximum of 400 liters of chromate effluent per day was installed at an expense of 15 million Japanese yen. Figure 2-1 outlines the system of treatment equipment. Figure 2-2 shows the flow of chromate effluent treatment.

Figure 2-1　Waste Water Treatment Equipment

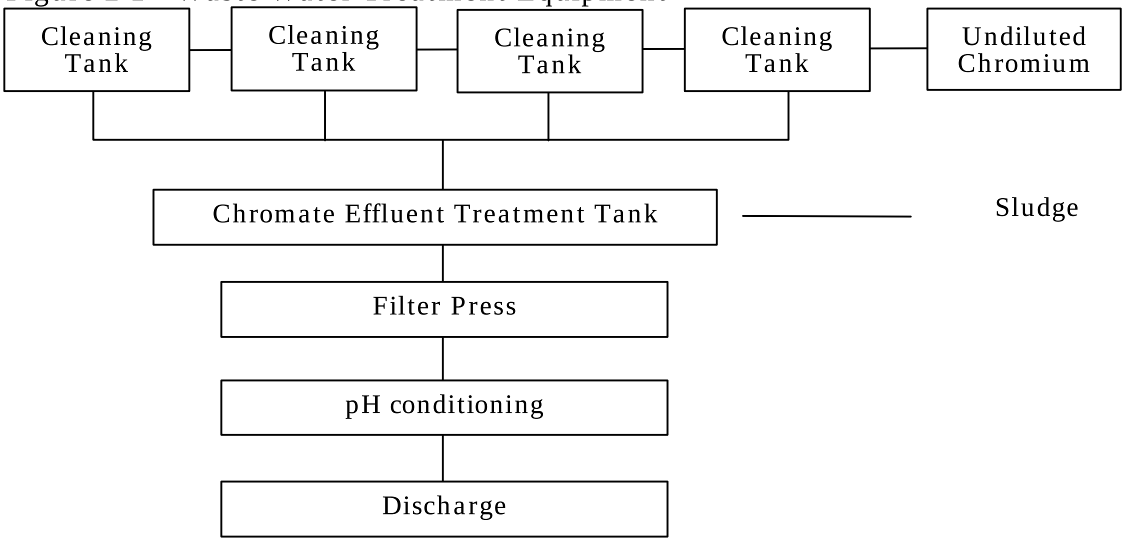
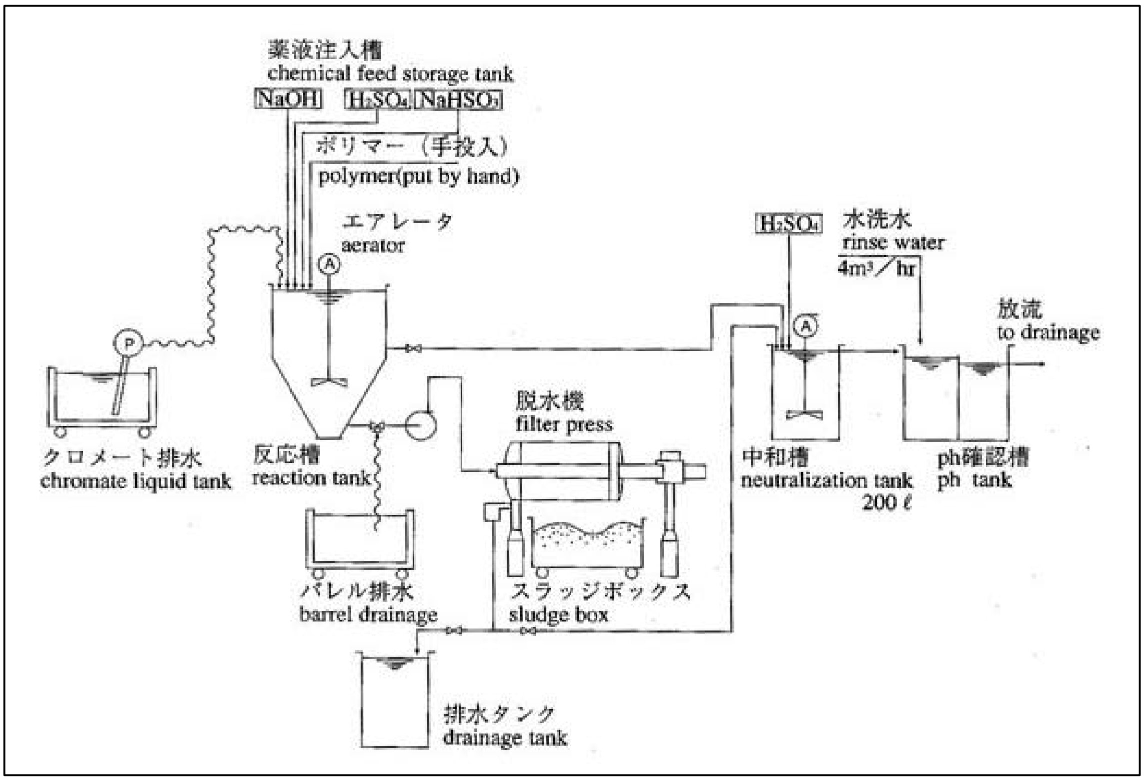


Figure 2-2　Flow of Chromate Effluent Treatment

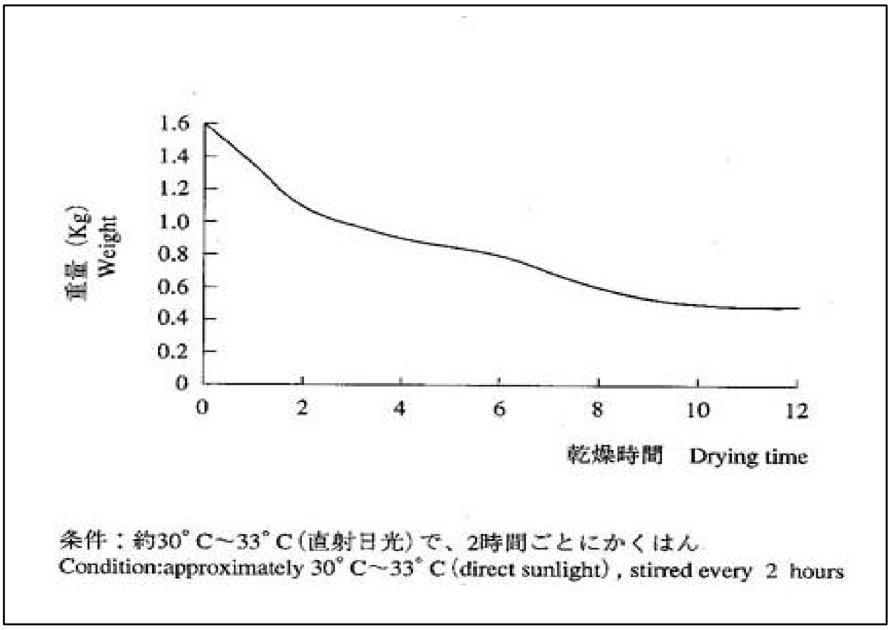


For the surface processing of magnetic products, a chromium solution of 1200 mg/l (maximum concentration) is used.　The treatment method is as follows: sulfuric acid is added to chromate effluent containing hexavalent chromium after surface processing, in order to reduce the pH level to 3 or below; using sodium bisulfate as reducing agent, hexavalent chromium ion is reduced to the harmless trivalent chromium ion; then caustic soda is added to raise the pH level to about 8 and sediment chromium hydroxide sludge; this sludge is then dehydrated; after sedimentation, the waste water is neutralized; the pH is checked and the water is discharged.　Due to this treatment, the effluent fully clears the current 0.1ppm regulation standard.

It must be noted that because a large expenditure had not been made on the waste water treatment equipment, the equipment could not be fitted with expensive electromagnetic valves, and therefore, the adjustment and operation of the system is carried out manually.

The chromium sludge is sun dried in order to reduce it in weight by taking advantage of the sunny climate in the Philippines. 1.6kg of sludge could be reduced to 0.5kg in 12 hours (see Figure 2-3). The remaining sludge is stored within the plant.

Figure 2-3 Result of Chromium Sludge Sun-dry Reduction Test



4) Issues for the future

Company A intends to carry out local treatment of the chromium sludge, using a local contractor with the specialist technology and facilities. Also, it is considering the reduction of the chromium intake itself by controlling the chromating equipment operation. In the near future, action is to be stepped up: for example, through closed treatment and recycling by ion exchange resin process, Company A hopes to make voluntary regulation of total effluent emission, making maximum effort to restrain the discharge of effluent into the environment.

Currently, chromium levels are measured once a week. Instrumentation will be switched to absorptiometer to improve analytical precision. The measurement of BOD and COD is also thought to be necessary.

It is important to inform and educate employees as to why effluent treatment is being conducted. Training is at present being given to leader class personnel, but in future, training is to be extended to all members of staff.

Case 2: Establishment of Waste Water Treatment Facilities to Prevent Water Quality Accidents in Advance

1) Profile of the company

Company B	
Business activities:	Manufacture and sale of electronic components and products for floppy disc drives and video cassette recorders
Number of employees:	Approximately 1,900
Start of operation:	1987
Location:	In a suburb of Manila
Ownership ratio of headquarters in Japan: 51 percent	

2) Background

At the design stage of a new plant, the pending problem for Company B was treatment of the waste water discharged from the Memory System Department's base-board cleaning process. However, it was discovered that the synthetic detergent used by the spray cleaning system to clean the base boards was no different from that used by domestic households, and disposing of this into the waste water system was not deemed to be a problem. Consequently, waste water treatment facilities were not installed, and the waste water was discharged directly from the factory into a sewerage system that emptied into a river when the plant started operation.

However, a certain amount of discoloring was noticed in the river about one year later, and the discharge of waste water was suspended. A new waste water treatment facility was decided to be installed, and until it became fully operational, the waste water was stored in steel drums in a warehouse on the plant site. Once the treatment facility was up and running, the waste water was subjected to the necessary processing.

3) Cost

The total cost of constructing the waste water treatment facility (with a processing capacity of 2 cubic meters per day) was approximately 1.8 million Philippine pesos.

4) Contents

The waste water discharged from the base boards cleaning process is chemically treated (see Figure 2-4). The treated waste water is analyzed by an independent third-party organization once a month. Figure 2-5 shows average figures of the waste water for the last 12 months.

Since the treatment facility was installed, the figures have satisfied the waste water criteria established by the DENR.

5) Issues for the future

From now and into the future, every time new processes discharging waste water are established, Company B will always consider setting up a waste water treatment facility from these new stages in development.

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

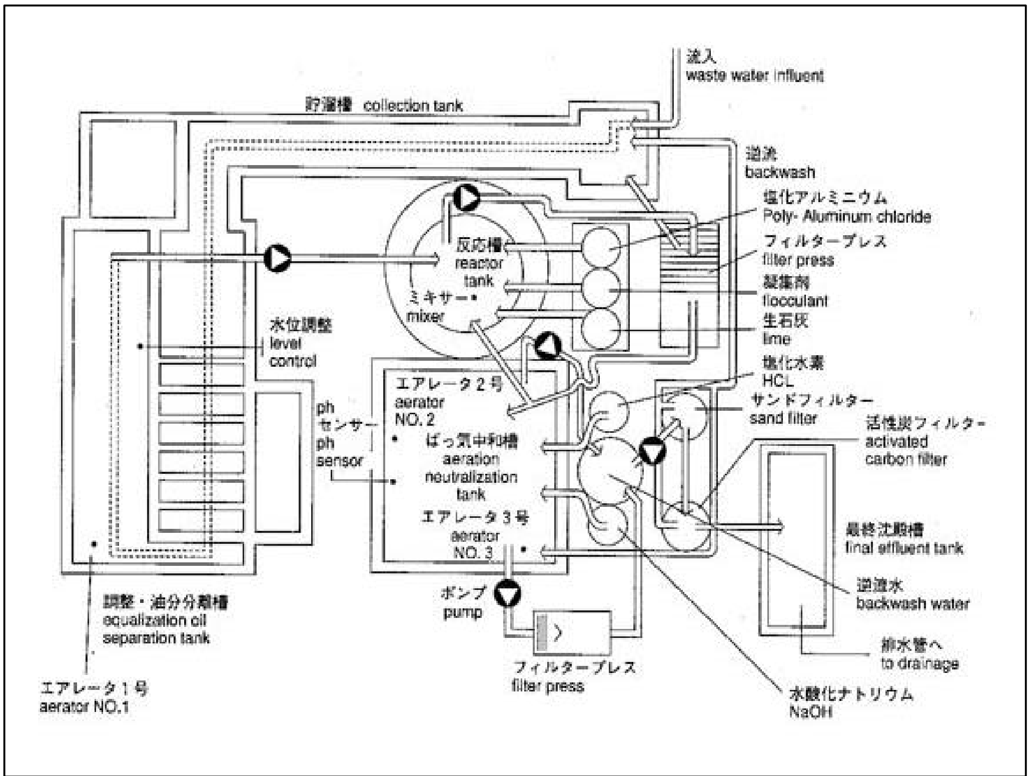


Figure 2-5 Average Value of the Waste Water in Company B for the Last 12 Months

Parameters	Influent (ppm)	Effluent (ppm)
COD		58.12
BOD (5 days, 20°C)	36,480	24.91
COLOR		12.25
TOTAL DISSOLVED SOLIDS		398.92
TOTAL SUSPENDED SOLIDS	15,050	8.13
SETTLEABLE SOLIDS		ND
OIL & GREASE	183,296	4.77
SURFACTANTS as MBAS		8.6
PHENOL		ND
PH	7.45	7.61
CADMIUM (Cd)		<0.003
MERCURY (Hg)		<0.01
CHROMIUM (Cr)		0.080
LEAD (Pb)	0.51	<0.02
ARSENIC (As)	ND	ND
COLIFORMS	<2.2	<2.2

Note: ND is none detected. Minimum Detection Limits are (in ppm): As=0.001, SS=0.1

Case 3: Plating Waste Water Treatment to Prevent Efflux of Poisonous Cyanide from Factory

1) Profile of the company

Company C	
Business activities:	Manufacture and sale of zippers
Number of employees:	Approximately 220
Start of operation:	1978
Location:	An industrial park in a suburb of Manila
Ownership ratio of headquarters in Japan: 50 percent	

2) Background

Plating processes are partially used in zipper manufacturing. The plating processes use soda cyanide solution containing copper cyanide, which generates a sludge containing cyanide after treatment. Company C has expanded its facilities every year since it set up in 1978, according to the company's policy that no poisonous cyanide be discharged from its factory. The number of dyeing machines has increased from the initial 3 to 17 at present. The number of waste water tanks also has increased accordingly. Company C believes it necessary to tackle environmental management and to take action to prevent pollution and the discharge of cyanide from its factory.

Its headquarters in Japan is constructing an environment management system; the local factory will then implement and continuously improve upon the system. The headquarters established an environmental charter in October 1992 and group companies, including overseas factories, established such a charter in September 1994. The charter states that "Company C aims to be an 'earth-friendly company' and promotes 'harmony with the environment' as one of its top business priorities" (excerpt) and has eight action guides. Company C also has 11 items for "Action Programs Based on the Environmental Charter" and has set numerical targets to be achieved.

The 11 items in the Charter concern the following: protecting the ozone layer, countermeasures to prevent global warming, reducing industrial waste, recycling old paper, reducing packing materials, transportation measures, social activities, environment preservation activities, preventing disasters, environment inspections and environment businesses.

3) Organization

Employees who have other responsibilities are in charge of environmental issues. Several employees are involved because of the need to communicate with government bodies and to understand the detailed implications of changes in standards. Local staff in charge of environmental issues participate in meetings and seminars about amendments to environmental standards that are held periodically by government bodies.

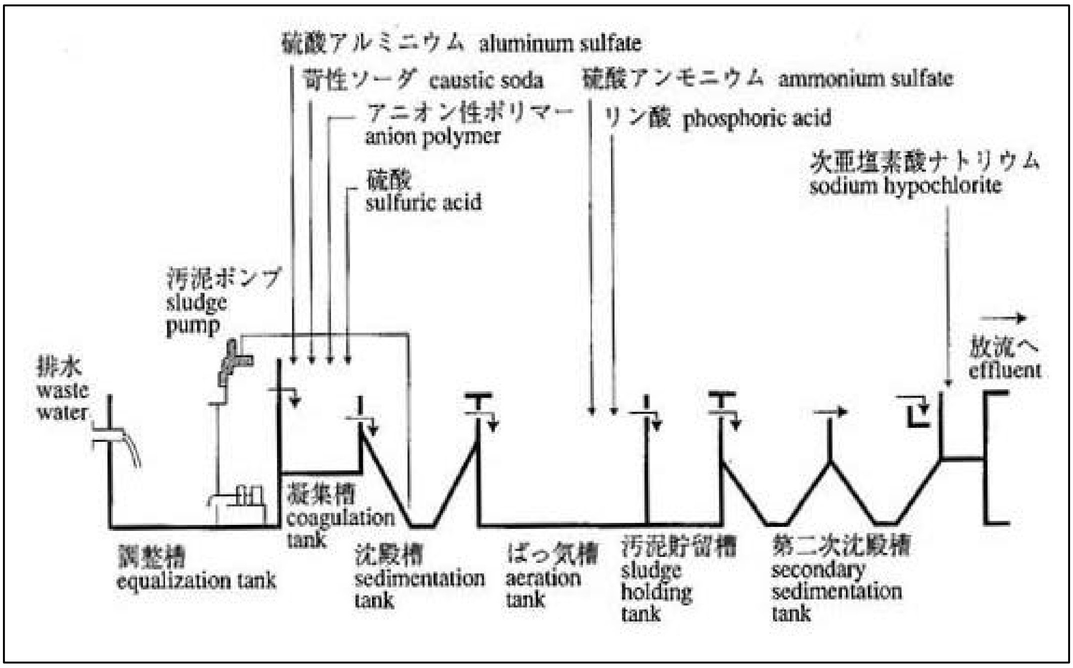
4) Contents

Company C clearly defines seven typical kinds of pollution, decides their priorities, and then tackles them. Water quality is voluntarily measured in waste water treatment facilities every day. Samples of waste water are sent to a government research center once a month, and analysis reports are kept. The government makes a 24-hour on-the-spot inspection of the facilities annually. The facilities are considered to be acceptable because the results of all tests have satisfied the waste water criteria.

As shown in Figure 2-6, the actual flow of a waste water facility consists of a physicochemical process using sulfuric acid and a biological process. The former physicochemical process removes poisonous cyanide compounds completely from the waste water, and the latter biological process purifies the waste water to a level which satisfies the waste water criteria.

This method has no problems concerning the quality of waste water. In the physicochemical process involving sulfuric acid that is used by Company C, cyanide compounds in waste water are precipitated and removed by a chemical reaction. Therefore, a sludge containing the precipitated cyanide compounds remains, and processing of this sludge causes the following problem.

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



5) Issues for the future

At the request of the Philippine University, Company C accepted two intern students worked at the facilities to learn about the waste water system in 1996. As a result, Company C receives many visitors not only from universities but also local companies who wish to improve their own facilities, thus requiring a little effort to be made to accommodate these visitors every day. Company C intends to serve the local community by keeping its criteria and, if possible, voluntarily tightening the criteria.

The gilding process generates sludge containing cyanide compounds and there is no processing contractor. Therefore Company C is now considering the following options: 1) To ask mining and manufacturing contractors about burning treatments; or 2) To utilize the sludge by turning it into cement for concrete blocks at its site. Currently, sludge is put into storage and measures are taken to prevent scattering or percolation down into the soil.

As stated above, Company C has an outside body analyze its waste water once a month, and is planning to establish in-house measurements and analysis systems in order to carry out analyses on a daily or weekly basis.

Case 4: Establishment of an In-House Laboratory for Analysis of Waste Water Quality

1) Profile of the company

Company D	
Business activities:	Manufacture and sale of automobile parts (transmissions, uniform-speed joints, etc.)
Number of employees:	Approximately 430
Start of operation:	1992
Location:	An industrial park in the Laguna area
Ownership ratio of headquarters in Japan: 95 percent	

2) Background

Situated in the Laguna area, Company D discharged all effluent from its waste water treatment plant straight into the adjoining Laguna Lake. Supplying about 90 percent of the fish consumed in the surrounding area, Laguna Lake is applied Class C standards of water quality in order to preserve marine life.

Company D began to use treated waste water for watering plants on its site, and thus successfully reduced the amount of waste water discharged into Laguna Lake by 80 percent in 1997.

It is part of the company's basic policy to cause absolutely no pollution. In keeping with this policy, it decided to construct a waste water treatment plant and consigned analysis of waste water to a private organization. However, it took the step of establishing its own waste water analysis laboratory in 1992 because of the high consignment fees and to ensure better compliance with the legislative controls.

3) Contents

Company D began mass production of automobile transmissions in 1992 when it consigned analysis of waste water quality to a private organization and submitted self-monitoring reports monthly to the Laguna Lake Development Authority (LLDA). It established its own laboratory for waste water analysis in early 1992. In late 1993, it purchased and installed equipment capable of analyzing all the items required under the Class C standards of the DENR.

The waste water laboratory of Company D is capable of analyzing almost all important parameters listed under the Class C standards.

The waste water analyses are performed by local personnel who have received training in laboratory work and related fields. Chemical solutions and reagents are also available in this laboratory.