

Chemical Waste Treatment Centre
Operation Report
Oct 95 – Dec 95

I. INTRODUCTION

This Operation Report is prepared by EPD for the Environment and Planning Committee (EPC) of the Kwai Tsing District Board. It outlines the activities of the Chemical Waste Treatment Centre (CWTC) and provides a summary of environmental performance of the plant.

The environmental performance summary as shown in Section II of this report covers the result of environmental monitoring from October 95 to December 95.

II. ENVIRONMENTAL PERFORMANCE SUMMARY

Enviropace are required to undertake regular checks on environmental performance of the operation of the plant. These include the following:

- Effluent discharge monitoring
- Stack gas monitoring
- Stabilised residue monitoring

Effluent Discharge

Effluent from the CWTC treatment processes has to meet very strict discharge limits on pollutant concentration. Multiple processes are employed inside the CWTC to treat all liquid wastes to ensure a safe waste management system. Automatic monitoring of pH and temperature are conducted to facilitate immediate warning on any significant change detected in the composition of the effluent, such that prompt corrective response can be effected.

Effluent from the plant is discharged in batches. Each batch is sampled and analyzed, and discharges are permitted only if limits are met. Tables 1 to 3 show the summary of effluent quality from October 95 to December 95. No exceedances in effluent discharge limits were observed.

Stack Gas

Air emissions from the incineration system are closely monitored by a comprehensive management and monitoring programme to ensure that the system is operating safely and in an environmentally acceptable manner.

A continuous monitoring system on key parameters is installed in the incinerator stack to ensure combustion and air pollutant removal processes are functionally well. Furthermore, the incinerator is equipped with an automatic waste feed cut-off system. In the event that the continuous monitoring system picks up any potential sign of exceedance of any of the control parameters, waste feed to the incinerator will be stopped automatically. The result for Stack Gas Monitoring from October 95 to December 95 are attached in Tables 4 to 6 and compliance in all stack gas control parameters has been achieved.

Stabilised Residue

All solid wastes and process residues at the CWTC are detoxified, chemically stabilized and physically immobilized to an environmentally benign state. Samples of the stabilized materials have to pass a series of analytical tests, proven to be innocuous before being sent to an off-site landfill for final disposal.

The summaries of result for Stabilized Residue from October 95 to December 95 are attached in Tables 7 to 9. All of the test parameters fell within the control limits and no exceedances occurred.

Table 1

Chemical Waste Treatment Centre
Effluent Discharge Summary (October 1995)

| Parameters | Control Limits | Result | Mean |
|--------------------------------|--------------------|--------------|--------------|
| pH | 6-10 | 6.6 - 9.2 | N/A |
| Total Kjeldahl Nitrogen (mg/l) | 100 | < 20.3 | N/A |
| Total Phosphate (mg/l) | 10 | < 2 | N/A |
| Total Sulphate (mg/l) | 2000 | 302.7 - 1237 | 874.1 |
| Total Sulphides (mg/l) | 10 | < 1.1 | N/A |
| Total Cyanide (mg/l) | 0.1 | < 0.06 | N/A |
| Total Suspended Solids (mg/l) | 100 | < 50.1 | N/A |
| Oil and Grease (mg/l) | 20 | < 15 | N/A |
| Total Phenols (mg/l) | 0.5 | < 0.35 | N/A |
| Total Residual Chlorine (mg/l) | 1 | < 0.6 | N/A |
| Anionic Detergents (mg/l) | 15 | < 3 | N/A |
| Dissolved TOC (mg/l) | 200 | 20 - 134 | 75.3 |
| Temperature (°C) | 43 | 25 - 34 | N/A |
| Floatable Substances (mg/l) | Not to be detected | Not detected | Not detected |
| Toxic Metals : | | | |
| Arsenic (mg/l) | 2 | < 0.1 | N/A |
| Barium (mg/l) | 5 | < 1 | |
| Cadmium (mg/l) | 0.1 | < 0.1 | |
| Chromium (mg/l) | 1 | < 0.3 | |
| Copper (mg/l) | 2 | < 0.7 | |
| Lead (mg/l) | 2 | < 1 | |
| Manganese (mg/l) | 5 | < 0.56 | |
| Mercury (mg/l) | 0.05 | < 0.05 | |
| Nickel (mg/l) | 2 | < 1 | |
| Silver (mg/l) | 2 | < 0.4 | |
| Tin (mg/l) | 5 | < 1 | |
| Zinc (mg/l) | 2 | < 1 | |
| Total Toxic Metals # (mg/l) | 10 | < 7 | |
| Boron (mg/l) | 5 | < 3.08 | |
| Iron (mg/l) | 10 | < 2 | N/A |

| Parameters | Control Limits | Result | Mean |
|------------------------------|----------------|---------|------|
| Pesticides : | | | |
| Aldrin (mg/l) | 0.01 | < 0.01 | N/A |
| BHCS (mg/l) | 0.01 | < 0.01 | |
| DDT (mg/l) | 0.01 | < 0.01 | |
| Semi-volatile Compounds : | | | |
| Benzo (A) Pyrene (mg/l) | 0.1 | < 0.1 | N/A |
| Volatile Compounds : | | | |
| 1,1,1-Trichloroethane (mg/l) | 0.05 | < 0.05 | N/A |
| Polychlorinated Biphenyls : | | | |
| Total PCBs (mg/l) | 0.003 | < 0.003 | N/A |
| Radioactive Substances : | | | |
| Gross (pc/l) | 10000 | < 10000 | N/A |
| Radium-226 (pc/l) | 30 | < 30 | |
| Strontium-90 (pc/l) | 100 | < 100 | |

Total toxic metals include: Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Tin, Zinc.

Remark: The COD results are heavily interfered by the presence of chloride in seawater, a constituent of MARPOL waste. As a result, all COD data in effluent samples are considered to be invalid. In the meantime, control is exercised by analysis of TOC and Oil/Grease.

Table 2

Chemical Waste Treatment Centre
Effluent Discharge Summary (November 1995)

| Parameters | Control Limits | Result | Mean |
|--------------------------------|--------------------|---------------|--------------|
| pH | 6-10 | 7.1 - 9.9 | N/A |
| Total Kjeldahl Nitrogen (mg/l) | 100 | < 40.9 | N/A |
| Total Phosphate (mg/l) | 10 | < 2 | N/A |
| Total Sulphate (mg/l) | 2000 | 56.6 - 1109.5 | 570.8 |
| Total Sulphides (mg/l) | 10 | < 1 | N/A |
| Total Cyanide (mg/l) | 0.1 | < 0.08 | N/A |
| Total Suspended Solids (mg/l) | 100 | < 48.2 | N/A |
| Oil and Grease (mg/l) | 20 | < 15 | N/A |
| Total Phenols (mg/l) | 0.5 | < 0.22 | N/A |
| Total Residual Chlorine (mg/l) | 1 | < 0.63 | N/A |
| Anionic Detergents (mg/l) | 15 | < 3 | N/A |
| Dissolved TOC (mg/l) | 200 | 20 - 185.1 | 81.4 |
| Temperature (°C) | 43 | 25 - 31 | N/A |
| Floatable Substances (mg/l) | Not to be detected | Not detected | Not detected |
| Toxic Metals : | | | |
| Arsenic (mg/l) | 2 | < 0.1 | N/A |
| Barium (mg/l) | 5 | < 1 | |
| Cadmium (mg/l) | 0.1 | < 0.1 | |
| Chromium (mg/l) | 1 | < 0.3 | |
| Copper (mg/l) | 2 | < 1.9 | |
| Lead (mg/l) | 2 | < 1 | |
| Manganese (mg/l) | 5 | < 0.2 | |
| Mercury (mg/l) | 0.05 | < 0.05 | |
| Nickel (mg/l) | 2 | < 1 | |
| Silver (mg/l) | 2 | < 0.4 | |
| Tin (mg/l) | 5 | < 1 | |
| Zinc (mg/l) | 2 | < 1 | |
| Total Toxic Metals # (mg/l) | 10 | < 8 | |
| Boron (mg/l) | 5 | < 3.9 | |
| Iron (mg/l) | 10 | < 2 | N/A |

| Parameters | Control Limits | Result | Mean |
|---------------------------------|----------------|---------|------|
| Pesticides : | | | |
| Aldrin (mg/l) | 0.01 | < 0.01 | N/A |
| BHCS (mg/l) | 0.01 | < 0.01 | |
| DDT (mg/l) | 0.01 | < 0.01 | |
| Semi-volatile Compounds : | | | |
| Benzo (A) Pyrene (mg/l) | 0.1 | < 0.1 | N/A |
| Volatile Compounds : | | | |
| 1,1,1-Trichloroethane (mg/l) | 0.05 | < 0.05 | N/A |
| Polychlorinated Biphenyls : | | | |
| Total PCBs (mg/l) | 0.003 | < 0.003 | N/A |
| Radioactive Substances : | | | |
| Gross (pc/l) | 10000 | < 10000 | N/A |
| Radium-226 (pc/l) | 30 | < 30 | |
| Strontium-90 (pc/l) | 100 | < 100 | |

Total toxic metals include: Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Tin, Zinc.

Table 3

Chemical Waste Treatment Centre
Effluent Discharge Summary (December 1995)

| Parameters | Control Limits | Result | Mean |
|--------------------------------|--------------------|---------------|--------------|
| pH | 6-10 | 7 - 9.5 | N/A |
| Total Kjeldahl Nitrogen (mg/l) | 100 | < 85.9 | N/A |
| Total Phosphate (mg/l) | 10 | < 2 | N/A |
| Total Sulphate (mg/l) | 2000 | 135.6 - 950.6 | 546.7 |
| Total Sulphides (mg/l) | 10 | < 1 | N/A |
| Total Cyanide (mg/l) | 0.1 | < 0.09 | N/A |
| Total Suspended Solids (mg/l) | 100 | < 100 | N/A |
| Oil and Grease (mg/l) | 20 | < 16.6 | N/A |
| Total Phenols (mg/l) | 0.5 | < 0.33 | N/A |
| Total Residual Chlorine (mg/l) | 1 | < 0.8 | N/A |
| Anionic Detergents (mg/l) | 15 | < 7.5 | N/A |
| Dissolved TOC (mg/l) | 200 | 20 - 179 | 78.9 |
| Temperature (°C) | 43 | 24 - 32 | N/A |
| Floatable Substances (mg/l) | Not to be detected | Not detected | Not detected |
| Toxic Metals : | | | |
| Arsenic (mg/l) | 2 | < 0.1 | N/A |
| Barium (mg/l) | 5 | < 1 | |
| Cadmium (mg/l) | 0.1 | < 0.1 | |
| Chromium (mg/l) | 1 | < 0.3 | |
| Copper (mg/l) | 2 | < 1.7 | |
| Lead (mg/l) | 2 | < 1 | |
| Manganese (mg/l) | 5 | < 0.2 | |
| Mercury (mg/l) | 0.05 | < 0.05 | |
| Nickel (mg/l) | 2 | < 1 | |
| Silver (mg/l) | 2 | < 0.4 | |
| Tin (mg/l) | 5 | < 1 | |
| Zinc (mg/l) | 2 | < 1 | |
| Total Toxic Metals # (mg/l) | 10 | < 7.8 | |
| Boron (mg/l) | 5 | < 4.4 | |
| Iron (mg/l) | 10 | < 2 | N/A |

| Parameters | Control Limits | Result | Mean |
|------------------------------|----------------|---------|------|
| Pesticides : | | | |
| Aldrin (mg/l) | 0.01 | < 0.01 | N/A |
| BHCS (mg/l) | 0.01 | < 0.01 | |
| DDT (mg/l) | 0.01 | < 0.01 | |
| Semi-volatile Compounds : | | | |
| Benzo (A) Pyrene (mg/l) | 0.1 | < 0.1 | N/A |
| Volatile Compounds : | | | |
| 1,1,1-Trichloroethane (mg/l) | 0.05 | < 0.05 | N/A |
| Polychlorinated Biphenyls : | | | |
| Total PCBs (mg/l) | 0.003 | < 0.003 | N/A |
| Radioactive Substances : | | | |
| Gross (pc/l) | 10000 | < 10000 | N/A |
| Radium-226 (pc/l) | 30 | < 30 | |
| Strontium-90 (pc/l) | 100 | < 100 | |

Total toxic metals include: Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Tin, Zinc.

Table 4

Chemical Waste Treatment Centre
Stack Gas Monitoring Summary (October 1995)

| Parameters | Control Limits | Result | Mean |
|-------------------------------------------------------------------|----------------|--------------|-------|
| Particulates (mg/m ³) | 75 | 0.6 - 1.5 | 0.93 |
| Chlorine and Compounds (as Cl ₂) (mg/m ³) | 100 | < 4 | N/A |
| Fluorine and Compounds (as HF) (mg/m ³) | 25 | < 0.4 | N/A |
| Hydrogen Sulphide (mg/m ³) | 5 | Not detected | N/A |
| Acidity (as Sulphuric Acid) (mg/m ³) | 100 | 0.4 - 10.8 | 8.1 |
| Sulphur Dioxide (mg/m ³) | 750 | 4.8 - 427.3 | 255.3 |
| Hydrochloric Acid (mg/m ³) | 38 | 4.7 - 17 | 12.8 |
| Total Phosphorus (as P) (mg/m ³) | 7.5 | < 1.7 | N/A |
| Hydrogen Fluoride (mg/m ³) | 7.5 | < 1.1 | N/A |
| Hydrogen Bromide (mg/m ³) | 7.5 | < 1 | N/A |
| Toxic Metals I : | | | |
| Mercury (mg/m ³) | 3 | < 0.002 | N/A |
| Cadmium (mg/m ³) | 3 | < 0.033 | |
| Antimony (mg/m ³) | 3 | < 0.332 | |
| Toxic Metals II : | | | |
| Lead (mg/m ³) | 10 | < 0.332 | N/A |
| Copper (mg/m ³) | 10 | < 0.332 | |
| Arsenic (mg/m ³) | 10 | < 0.002 | |
| Nickel (mg/m ³) | 10 | < 0.332 | |
| Chromium (mg/m ³) | 10 | < 0.033 | |
| Total of Toxic Metals I & II (mg/m ³) | 10 | < 1.396 | N/A |
| Dioxin (ng/m ³) | 0.1 | 0.0087 | N/A |

Table 5

Chemical Waste Treatment Centre
Stack Gas Monitoring Summary (November 1995)

| Parameters | Control Limits | Result | Mean |
|-------------------------------------------------------------------|----------------|--------------|------|
| Particulates (mg/m ³) | 75 | 0.7 | N/A |
| Chlorine and Compounds (as Cl ₂) (mg/m ³) | 100 | < 3.6 | N/A |
| Fluorine and Compounds (as HF) (mg/m ³) | 25 | < 0.4 | N/A |
| Hydrogen Sulphide (mg/m ³) | 5 | Not detected | N/A |
| Acidity (as Sulphuric Acid) (mg/m ³) | 100 | 15.4 | N/A |
| Sulphur Dioxide (mg/m ³) | 750 | 613.6 | N/A |
| Hydrochloric Acid (mg/m ³) | 38 | 9.1 | N/A |
| Total Phosphorus (as P) (mg/m ³) | 7.5 | < 1.4 | N/A |
| Hydrogen Fluoride (mg/m ³) | 7.5 | < 1.1 | N/A |
| Hydrogen Bromide (mg/m ³) | 7.5 | < 1.1 | N/A |
| Toxic Metals I : | | | |
| Mercury (mg/m ³) | 3 | < 0.001 | N/A |
| Cadmium (mg/m ³) | 3 | < 0.028 | |
| Antimony (mg/m ³) | 3 | < 0.275 | |
| Toxic Metals II : | | | |
| Lead (mg/m ³) | 10 | < 0.275 | N/A |
| Copper (mg/m ³) | 10 | < 0.275 | |
| Arsenic (mg/m ³) | 10 | < 0.001 | |
| Nickel (mg/m ³) | 10 | < 0.275 | |
| Chromium (mg/m ³) | 10 | < 0.028 | |
| Total of Toxic Metals I & II (mg/m ³) | 10 | < 1.158 | N/A |
| Dioxin (ng/m ³) | 0.1 | 0.0284 | N/A |

Table 6

Chemical Waste Treatment Centre
Stack Gas Monitoring Summary (December 1995)

| Parameters | Control Limits | Result | Mean |
|-------------------------------------------------------------------|----------------|--------------|------|
| Particulates (mg/m ³) | 75 | 1.1 - 2.1 | 1.7 |
| Chlorine and Compounds (as Cl ₂) (mg/m ³) | 100 | < 5.2 | N/A |
| Fluorine and Compounds (as HF) (mg/m ³) | 25 | < 0.5 | N/A |
| Hydrogen Sulphide (mg/m ³) | 5 | Not detected | N/A |
| Acidity (as Sulphuric Acid) (mg/m ³) | 100 | 0.3 - 6.5 | 3 |
| Sulphur Dioxide (mg/m ³) | 750 | 1.3 - 74.5 | 30.1 |
| Hydrochloric Acid (mg/m ³) | 38 | < 9.8 | N/A |
| Total Phosphorus (as P) (mg/m ³) | 7.5 | < 1.47 | N/A |
| Hydrogen Fluoride (mg/m ³) | 7.5 | < 0.9 | N/A |
| Hydrogen Bromide (mg/m ³) | 7.5 | < 0.9 | N/A |
| Toxic Metals I : | | | |
| Mercury (mg/m ³) | 3 | < 0.002 | N/A |
| Cadmium (mg/m ³) | 3 | < 0.029 | |
| Antimony (mg/m ³) | 3 | < 0.295 | |
| Toxic Metals II : | | | |
| Lead (mg/m ³) | 10 | < 0.295 | N/A |
| Copper (mg/m ³) | 10 | < 0.295 | |
| Arsenic (mg/m ³) | 10 | < 0.001 | |
| Nickel (mg/m ³) | 10 | < 0.295 | |
| Chromium (mg/m ³) | 10 | < 0.029 | |
| Total of Toxic Metals I & II (mg/m ³) | 10 | < 1.241 | N/A |
| Dioxin (ng/m ³) | 0.1 | 0.0098 | N/A |

Table 7

Chemical Waste Treatment Centre
Stabilised Materials Summary (October 1995)

| Parameters | Control Limits | Result | Mean |
|-------------------------------------------|------------------|------------|------|
| Section A | | | |
| pH (water) | 8 (lower limit) | 8.4 - 12.8 | N/A |
| % Solids (%) | 30 (lower limit) | 52.4 - 100 | 83.9 |
| Toxic Metals : | | | |
| Cadmium (ppm) | 0.5 | < 0.08 | N/A |
| Mercury (ppm) | 0.1 | < 0.02 | |
| Total Chromium (ppm) | 10 | < 0.5 | |
| Copper (ppm) | - | < 4 | |
| Nickel (ppm) | - | < 0.5 | |
| Lead (ppm) | - | < 6.7 | |
| Zinc (ppm) | - | < 3.8 | |
| Total of copper, nickel, lead, zinc (ppm) | 25 | < 10.5 | |
| Iron (ppm) | 20 | < 3.5 | N/A |
| Sulphide (ppm) | 10 | < 5 | N/A |
| Ammoniacal Nitrogen (ppm) | 10 | < 1.1 | N/A |
| Cyanide (ppm) | 5 | < 5 | N/A |
| Section B | | | |
| Volatile Organic Contents (ppm) | 5000 | < 15 | N/A |
| Total Organic Halides (ppm) | 10 | < 2.5 | N/A |
| Total Chloro Phenols (ppm) | 2 | < 2 | N/A |
| Polychlorinated Biphenyls (ppm) | 1 | < 1 | N/A |
| TCDD equivalent (ITEF method) (ppb) | 1 | < 1 | N/A |

Table 8

Chemical Waste Treatment Centre
Stabilised Materials Summary (November 1995)

| Parameters | Control Limits | Result | Mean |
|-------------------------------------------|------------------|------------|------|
| Section A | | | |
| pH (water) | 8 (lower limit) | 11.5 - 13 | N/A |
| % Solids (%) | 30 (lower limit) | 52.2 - 100 | 86.4 |
| Toxic Metals : | | | |
| Cadmium (ppm) | 0.5 | < 0.5 | N/A |
| Mercury (ppm) | 0.1 | < 0.02 | |
| Total Chromium (ppm) | 10 | < 0.5 | |
| Copper (ppm) | - | < 10 | |
| Nickel (ppm) | - | < 6.4 | |
| Lead (ppm) | - | < 1.3 | |
| Zinc (ppm) | - | < 11 | |
| Total of copper, nickel, lead, zinc (ppm) | 25 | < 13 | |
| Iron (ppm) | 20 | < 8.4 | N/A |
| Sulphide (ppm) | 10 | < 5 | N/A |
| Ammoniacal Nitrogen (ppm) | 10 | < 2 | N/A |
| Cyanide (ppm) | 5 | < 5 | N/A |
| Section B | | | |
| Volatile Organic Contents (ppm) | 5000 | < 15 | N/A |
| Total Organic Halides (ppm) | 10 | < 9.1 | N/A |
| Total Chloro Phenols (ppm) | 2 | < 2 | N/A |
| Polychlorinated Biphenyls (ppm) | 1 | < 1 | N/A |
| TCDD equivalent (ITEF method) (ppb) | 1 | < 1 | N/A |

Table 9

Chemical Waste Treatment Centre
Stabilised Materials Summary (December 1995)

| Parameters | Control Limits | Result | Mean |
|-------------------------------------------|------------------|------------|------|
| Section A | | | |
| pH (water) | 8 (lower limit) | 11 - 13.2 | N/A |
| % Solids (%) | 30 (lower limit) | 55.3 - 100 | 79.9 |
| Toxic Metals : | | | |
| Cadmium (ppm) | 0.5 | < 0.5 | N/A |
| Mercury (ppm) | 0.1 | < 0.02 | |
| Total Chromium (ppm) | 10 | < 0.5 | |
| Copper (ppm) | - | < 8.8 | |
| Nickel (ppm) | - | < 3.1 | |
| Lead (ppm) | - | < 7.3 | |
| Zinc (ppm) | - | < 5.6 | |
| Total of copper, nickel, lead, zinc (ppm) | 25 | < 11.2 | |
| Iron (ppm) | 20 | < 8.4 | N/A |
| Sulphide (ppm) | 10 | < 5 | N/A |
| Ammoniacal Nitrogen (ppm) | 10 | < 2.4 | N/A |
| Cyanide (ppm) | 5 | < 5 | N/A |
| Section B | | | |
| Volatile Organic Contents (ppm) | 5000 | < 15 | N/A |
| Total Organic Halides (ppm) | 10 | < 4.8 | N/A |
| Total Chloro Phenols (ppm) | 2 | < 2 | N/A |
| Polychlorinated Biphenyls (ppm) | 1 | < 1 | N/A |
| TCDD equivalent (ITEF method) (ppb) | 1 | < 1 | N/A |