FACT SHEET No. 8

Canadian Electrolytic Zinc Limited

860 Cadieux Boulevard
Salaberry-de-Valleyfield, Quebec
J6S 4W2

***A** list of 106 industrial plants has been established under St. Lawrence Vision 2000 (SLV 2000), the second phase of the St. Lawrence Action Plan, launched in 1988. The overall objective is to reduce liquid toxic waste and virtually eliminate discharges of persistent toxic substances.*

The 106 industrial plants designated under SLV 2000 are divided into four groups, each of which has been given a specific objective. The CANADIAN ELECTROLYTIC ZINC LIMITED refinery, located in Salaberry-de-Valleyfield, is part of Group 4, comprising the 50 plants targeted under the St. Lawrence Action Plan.

The objective set for Group 4 is to pursue cleanup efforts and perform environmental monitoring to achieve a 90% reduction in liquid toxic waste. Between 1988 and 1995, the 50 plants reduced their toxic effluent discharges by 96%.

INDUSTRIAL PLANT

A large metallurgical facility

The CANADIAN ELECTROLYTIC ZINC LIMITED refinery, located in Salaberry-de-Valleyfield, comprises four production units carrying out four primary processes: roasting of concentrated zinc ore; leaching, purification, cadmium and copper recovery and gypsum removal; electrolysis (zinc recovery); casting of zinc slabs and shot and zinc dust production. In 1990, the company built a new cell house and shut down the two existing ones. In 1995, the plant had an annual production capacity of 250 000 t of zinc metal and 426 000 t of sulphuric acid. In 1995, it operated at 90% of capacity and employed a work force of 750.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Zinc ore concentrate

FINISHED PRODUCTS

- Zinc metal
- Sulphuric acid
- Copper cake
- Cadmium metal

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

Heavy metals

According to company data, discharge of both types of effluent combined amounted in 1988 to 150 900 m^3/d, containing:

- 215 kg/d of ammonia nitrogen
- 134 kg/d of zinc
- 12 kg/d of selenium
- 3 kg/d of cadmium

RESOURCES AND USES TO PRESERVE

Nearby conservation area

The CANADIAN ELECTROLYTIC ZINC LIMITED refinery discharges its effluent into the Beauharnois Canal, a major staging area for migratory birds. A no-hunting zone 14.5 km long established under the Wildlife Conservation and Management Act lies along the south canal bank, near Beauharnois. Large plant communities frequented by waterfowl and a major Brown bullhead spawning ground are found on the north canal bank, about 7 km below the plant. Recreational fishing (perch, pike) is common along the canal. The Beauharnois municipal water intake is 19 km downriver from the refinery.

WATER QUALITY BASED OBJECTIVES

Environmental protection

Water quality based objectives are established to preserve local resources and uses. These guidelines, expressed as maximum permissible loads and concentrations for effluent released into the environment, are used in choosing treatment methods which best promote environmental protection. CANADIAN ELECTROLYTIC ZINC LIMITED'S water quality based objectives are available on request.

EFFLUENT TREATMENT

Two types of effluent

CANADIAN ELECTROLYTIC ZINC LIMITED uses two separate systems to treat its two types of wastewater. Largely uncontaminated cooling water, the main effluent at 165 800 m^3/d, is discharged untreated into the Beauharnois Canal.

Runoff, process wastewater and wash water are neutralized with lime. The neutralizing unit also takes in sanitary sewage that has undergone activated-sludge pretreatment and weak acid bleed that has been treated with sodium sulphide (Na_2S) and filtered. The sodium sulphide treatment precipitates mercury out of solution. The two types of effluent make for a combined discharge of 6700 m^3/d. They are circulated to ponds for the removal of gypsum and metal hydroxides, then pumped into the Beauharnois Canal.

In 1990, the company installed mist eliminators which cut zinc contamination of wastewater from the four vacuum evaporators. The new equipment is intended to prevent the contamination of direct-contact cooling water.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

Selenium elimination tests in progress

CANADIAN ELECTROLYTIC ZINC LIMITED is conducting pilot-tests for the elimination of selenium from weak acid bleed from acid production units #1, 2 and 3. The tests will produce the design criteria for a new treatment system. Concurrently, wastewater separation work is continuing.

REGULATORY COMPLIANCE - WATER COMPONENT

A $30 million, 10-year plan

In June 1993, the company committed to a wastewater treatment program (PAE) and undertook work scheduled for completion in 1998. The two main program objectives are to regulate neutralizing unit pH and eliminate selenium. A ten-year environment plan (1993-2003) has also been instituted for water management and to prevent spills at the refinery. It comprises 50 projects totalling $30 million.

The projects under the ten-year plan fall outside of the wastewater treatment program, which is proceeding on schedule.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Mostly selenium

The Chimiotox index gauges the load of all toxic substances present in industrial effluent, using the toxicity factor assigned to each one. It is used, among other things, to monitor discharge trends over the years (see Figure 1) and determine the proportion of each pollutant (see Table 1).

Table 1 gives the characterization data gathered in 1991, as well as the Chimiotox values estimated from those figures, for an effluent flow of 181 584 m^3/d. In testing for more than 120 substances, 8 were found. The figures show a predominance of selenium in the treated wastewater. Selenium makes up 64% of the Chimiotox index, followed by copper (14%), cadmium (12%) and zinc (8%).

Figure 1 is plotted from the 1991 characterization data. Since output and processes remained unchanged from 1990 to 1992, the Chimiotox indices for that period were extrapolated from the 1991 characterization results. The 1991 figures adjusted for monthly company data were used to build indices for 1988, 1989, 1993, 1994 and 1995. The drop in the index since 1988 results chiefly from the reduction in zinc discharges. In 1990, effluent zinc was cut by 59% after the plant added mist eliminators to the vacuum evaporators. In 1993, monthly company data showed an additional 73% drop in zinc content as compared with the 1991 characterization figures. The planned introduction of selenium elimination systems (now being tested) will further lower the Chimiotox index.

Table 1 ***Chimiotox Index (1991) - Canadian Electrolytic Zinc Limited****

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Selenium	18.750	200	3750
Copper	1.880	424	797
Cadmium	0.770	909	700
Zinc	51.980	9	490
Iron	11.530	3	38
Manganese	3.220	10	32
Total Phosphorus	0.450	50	23
Ammonia Nitrogen	12.310	0.8	10
CHIMIOTOX INDEX			**5840**

* For effluent discharge of 181 584 m^3/d (8 substances detected in testing for more than 120).

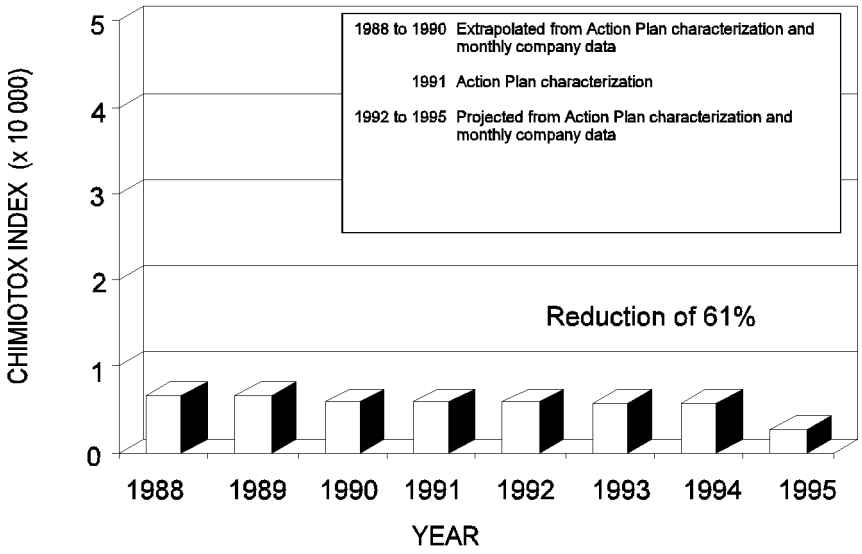

Figure1 ***Changes in toxic effluent discharges, 1988 -1995 - Canada Electrolytic Zinc Limited***

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

Virtual elimination achieved

One long-range objective of SLV 2000 is the virtual elimination of 11 persistent bioaccumulative toxic substances from the St. Lawrence and its tributaries. The targeted substances are those designated by the International Joint Commission in August 1993: PCBs, DDT, dieldrin, toxaphene, dioxins, furans, Mirex, mercury, lead alkyl, benzo(*a*)pyrene and hexachlorobenzene.

None of the targeted substances was detected in the refinery effluent.

PEEP TOXICITY REDUCTION

Average toxicity

The Potential Ecotoxic Effects Probe, or PEEP, combines results from six standardized bioassays measuring the toxic effects of effluent. The results are expressed on a logarithmic scale of increasing toxicity ranging from 1 to 10 and are used to monitor discharge trends over the years. One series of bioassays was conducted for the CANADIAN ELECTROLYTIC ZINC LIMITED refinery in Salaberry-de-Valleyfield. The 1991 PEEP index was established at 4.6, in the average range of the PEEP indices found for the 50 plants.

REDUCTION IN SUBSTANCES MONITORED

Significant cuts

According to company data for 1995, the two types of effluent combined for an average discharge of 172 650 m^3/d, containing:

- 68 kg/d of ammonia nitrogen
- 8.9 kg/d of zinc
- 6.9 kg/d of selenium
- 0.35 kg/d of cadmium

Although effluent flow increased 14% from 1988 to 1995, daily loads of ammonia nitrogen dropped by 68% and cadmium and zinc loads by 88% and 93%, respectively.

TECHNOLOGICAL DEVELOPMENT

In 1992 and 1993, CANADIAN ELECTROLYTIC LIMITED tested a mobile prototype of the rotary filter press made by Fournier Industries Inc. The filter, developed under the St. Lawrence Action Plan Technology Development and Demonstration Program, treats industrial sludge. The sludge used for the trials contained finegrained, abrasive and corrosive matter. The prototype is highly versatile and incorporates sophisticated instrumentation. The test parameters included extract dryness ratio, extraction efficiency (ratio of extract to input) and extraction flow rate. The company has not adopted this technology, preferring to use pressbelt filters for washing refinery sludge.

KEY POINTS

- **61% reduction in the Chimiotox index**
- **Commitment to a wastewater treatment program in 1993**
- **93% reduction in zinc discharges since 1988**
- **Selenium removal tests**

Based on December 1995 inventory.
Information reviewed by Gilles Legault, SLV 2000.

ADDITIONAL INFORMATION

Chimiotox index and PEEP: Gilles Legault, Environment Canada (514) 283-3452.

Water quality based objectives: Francine Richard, MEF (418) 644-3574.

Records officer at the Ministère de l'Environnement et de la Faune du Québec (MEF): Diane Lafortune (514) 370-3085.

Environment officer at CANADIAN ELECTROLYTIC ZINC LIMITED: Daniel Daoust (514) 373-9144, ext. 2569.

Published by authority of the Minister of the Environment

Catalogue No. En 153-6/8-1996F
ISBN 0-662-23358-1

(Aussi disponible en français sous le titre *Établisssements industriels - faits saillants)*.