FACT SHEET No. 9

Alcan Smelters and Chemicals Ltd., Beauharnois Works

40 Industrie Boulevard

Melocheville, Quebec

J6N 1W5

***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. ALCAN SMELTERS AND CHEMICALS LTD., BEAUCHARNOIS WORKS, located in Melocheville, 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 industrial plants reduced their toxic effluent discharges by 96%.

INDUSTRIAL WORKS

Aluminum made with the Söderberg process

The ALCAN SMELTERS AND CHEMICALS LTD., BEAUHARNOIS WORKS in Melocheville produces ingots and pig aluminum. The Works has an area for electrolysis and one for casting. In the electrolysis area, where aluminum oxide is broken down into aluminum by the Söderberg process, there are two series of pots with horizontal studs. The casting area is where the 700 kg ingots and the 14.8 kg alloy ingots are cast. In 1995, the Works' annual production capacity was 50 000 t of primary aluminum. The Works operated at 95% of rated capacity and employed a work force of 248.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Aluminum oxide (alumina)
- Söderberg-type anode paste briquettes
- Carbon blocks
- Compounds from the electrolytic bath
- Additives for alloys

FINISHED PRODUCTS

- 700 kg pig aluminum ingots
- 14.8 kg aluminum alloy ingots

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

COD and SS

Based on company data for 1988 and the characterization study carried out in 1991 pursuant to Action Plan requirements, the Works had an effluent discharge of 5544 m^3/d, containing:

- 124 kg/d of chemical oxygen demand (COD)
- 64 kg/d of suspended solids (SS)
- 8.4 kg/d of fluorides
- 0.75 kg/d of polycyclic aromatic hydrocarbons (PAHs)

RESOURCES AND USES TO PRESERVE

A wildlife reserve in need of protection

The effluent from the ALCAN SMELTERS AND CHEMICALS LTD., BEAUHARNOIS WORKS in Melocheville empties into the Saint-Louis River. This river comprises a fish spawning ground upstream from the bridge on highway 132, as well as a wildlife reserve. The Iles de la Paix National Wildlife Area is on the south shore of Lake Saint-Louis, less than 2 km downstream from Beauharnois. The marshes that cover the islands serve as a refuge for waterfowl, while the weed beds that surround them are an important spawning area for Largemouth bass and Northern pike. The south shore of Lake Saint-Louis and the banks of the Saint-Louis River attract muskrats and beavers. The lake appeals to both recreational and commercial fishermen. There is a private marina at the mouth of the river, and there are public wharfs and boat-launching ramps, particularly between Beauharnois and Châteauguay. The water supply for Châteauguay is drawn from the south shore of the lake, 11 km downstream from Beauhaarnois.

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. ALCAN SMELTERS AND CHEMICALS LTD.'S water quality based objectives are available on request.

EFFLUENT TREATMENT

A successful water treatment program

In 1980, ALCAN SMELTERS AND CHEMICALS LTD. implemented a water treatment program (PAE) aimed at separating domestic water and treating industrial water. This program, which was completed in January 1989, made it possible to connect the domestic wastewater conduit to the municipal sewage system in 1988.

The treatment system for atmospheric emissions from the electrolytic cells creates a residual liquor that is reused after physical and chemical treatment. The treatment includes neutralization with precipitation, followed by decantation. The blow-down from the purifiers is returned to the process. Run-off and cooling water (with a flow of 2577 m^3/d in 1995) are emptied directly into the Saint-Louis River.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

Recycling of water containing PAHs

The characterization study carried out for Action Plan in 1991 showed that the Works was discharging 0.751 kg/d of PAHs. After checking the procedures, it was discovered that the waters from occasional (once a year) floor washing of the Söderberg paste briquette warehouse was the source of the PAHs in the final effluent. It was then decided to recycle this water. A follow-up characterization study in 1992 showed that the recycling was successful, since the PAH load dropped to 0.003 kg/d.

REGULATORY COMPLIANCE - WATER COMPONENT

Commendation

In 1993, Environment Canada and the Ministère de l'Environnement et de la Faune du Québec commended ALCAN SMELTERS AND CHEMICALS LTD. for the industrial wastewater treatment measures introduced in its Beauharnois Works since 1988.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Virtually non-existent toxic substances

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 1992 pursuant to Action Plan requirements, as well as the Chimiotox values calculated from them for a discharge flow of 2880 m^3/d. The data show that benzo(*b*)fluoranthene is preponderant in the treated water, representing 56% of the Chimiotox index. Benzo(*a*)pyrene follows with 40%. In 1991, the characterization showed that PAHs such as benzo(*a*)pyrene and benzo(*b*)fluoranthene were responsible for 98% of the Chimiotox index. Since then, to all intents and purposes, these substances have been eliminated.

Figure 1 is plotted from the data of the first characterization study carried out for Action Plan in June 1991 and from the follow-up characterization study done in September 1992. The 1991 values were attributed to the preceding years, while the 1992 ones were attributed to the following years. The 99.8% reduction in the Chimiotox index between 1988 and 1992 is especially due to the pollution control measures taken to eliminate PAHs from the wash water in the Sõderberg paste briquette warehouse.

Table 1 ***Chimiotox Index (1992) - Alcan Smelters and Chemicals Ltd., Beauharnois Works****

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Benzo(*b*)fluoranthene	0.001	32 154	27
Benzo(*a*)pyrene	1.9×10^{-04}	100 000	19
Aluminum	0.180	11	2
Fluoranthene	4.6×10^{-04}	63	<1
Naphthalene	0.001	34	<1
CHIMIOTOX INDEX			**48**

* For effluent discharge of 2880 m^3/d.

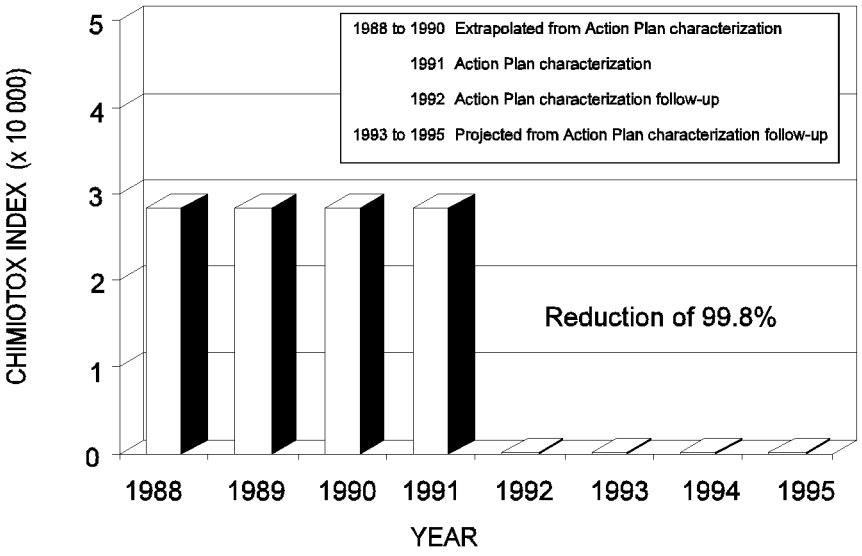

Figure 1 ***Changes in toxic effluent discharges, 1988-1995 - Alcan Smelters and Chemicals Ltd., Beauharnois Works***

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

Virtual elimination of PAHs

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.

The 1992 characterization study showed that benzo(*a*)pyrene, which was present in 1991, had dropped from 189 g/d to 0.19 g/d; this was a reduction of over 99.5%

PEEP TOXICITY REDUCTION

Relatively low toxicity

The Potential Ecotoxic Effects Probe, or PEEP, combines the 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. In the case of the ALCAN SMELTERS AND CHEMICALS LTD. BEAUHARNOIS WORKS in Melocheville, one series of bioassays was carried out. The 1991 PEEP value was 2.0. This was one of the lowest PEEP values found among the 50 plants.

REDUCTION IN SUBSTANCES MONITORED

A significant reduction

Based on company data for 1995, the average effluent discharge was 2577 m^3/d, containing:

- 59.2 kg/d of chlorides
- 16.2 kg/d of chemical oxygen demand (COD)
- 6.7 kg/d of suspended solids (SS)
- 4.4 kg/d of oil and grease
- 2.1 kg/d of fluorides

Between 1988 and 1995, the daily ss load in the effluent fell by 89%. During the same period, the COD load dropped 87%, the fluoride load fell 75% and the PAH load almost 100%.

KEY POINTS

- **99.8% reduction in the Chimiotox index**
- **Pollution prevention achieved by recycling water polluted with PAHs**
- **In 1993, Environment Canada and the Ministère de l'Environnement du Québec commended ALCAN SMELTERS AND CHEMICALS LTD. for the cleanup measures implemented in its Beauharnois Works since 1988**

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): Yvon Goulet (514) 370-3088.

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