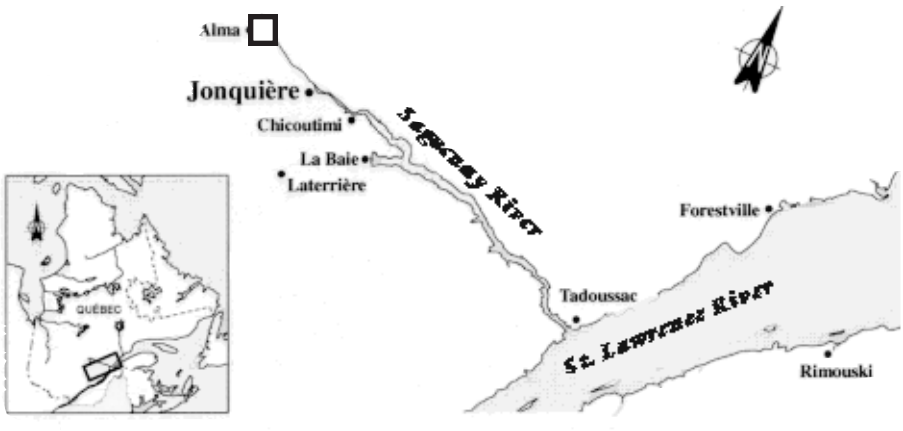
FACT SHEET No. 47

Alcan Smelters and Chemicals Ltd., Île-Maligne Works

1025 Pine Street West

Alma, Quebec

G8B 5W2



***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 4 groups, each of which has been given a specific objective. The ALCAN SMELTERS AND CHEMICALS LTD., ILE-MALIGNE PLANT in Alma 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

Production of aluminum and an aluminum alloy

The ALCAN SMELTERS AND CHEMICALS LTD. plant in Alma mainly produces aluminum ingots, although it makes aluminum-magnesium alloys on occasion. Alumina electrolysis is carried out by the Hall-Héroult process. The aluminum is produced in electrolysis cells equipped with a Söderberg-type anode with horizontal studs. The alumina is dissolved in a bath of cryolite and aluminum fluoride. The aluminum is recovered on the cathode and the oxygen is given off from the anode. The gases emitted during the reaction are purified by the wet method. The purification liquor is treated and then recirculated. The Jonquière plant treats the sludge from the purification liquor. The water used for cooling the ingots (direct contact) and the cathodic protection rectifiers (indirect contact), as well as the water used in the gas purifiers for the wet method, comes from the Grande Décharge river. The plant has an annual production capacity of 76 058 t. In 1995, the plant operated at 95% rated capacity and employed a work force of 425.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Alumina
- Cryolite
- Aluminum fluoride
- Lithium fluoride
- Calcium fluoride
- Söderberg paste

FINISHED PRODUCTS

- Aluminum
- Aluminum-magnesium alloy

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

ss and fluorides

According to company data, in 1988 the effluent discharge was 7800 m^3/d, containing:

- 87 kg/d of suspended solids (SS)
- 21 kg/d of fluorides
- 8 kg/d of oil and grease (O&G)
- 7.8 kg/d of aluminum

At the time the data was gathered, the stud conditioning centre (closed in 1990) and the No. 2 machine shop (closed in 1991) were still in operation.

RESOURCES AND USES TO PRESERVE

An area for water sports

The ALCAN SMELTERS AND CHEMICALS LTD. plant in Alma is located on the north shore of Alma island, approximately 12 km from Pointe des Américains. The four effluents from the plant are emptied into an area of calm waters in the southern arm of the Grande Décharge, less than 2 km upstream from the Île-Maligne dam. Canoeing and windsurfing are mostly done in the northern arm of the Grande Décharge. The calm, deep stretch of river upstream from the confluence of the Petite Décharge and the Grande Décharge, between Alma and Shipshaw, is also a good spot for water sports. In general, sport is done all along the Saguenay. There used to be ouananiche habitats in the area, but they have disappeared because of dams and the floating of logs down the river.

WATER QUALITY BASED OBJECTIVES

Environmental protection

In order to protect resources and uses, environmental objectives for toxic effluent are calculated in terms of concentrations and loads that must not be exceeded. These values are guidelines in seeking the most appropriate treatment solutions for protecting the environment. The water quality based objectives for ALCAN SMELTERS AND CHEMICALS LTD. are available on request.

EFFLUENT TREATMENT

Treatment by sedimentation

The wash water in the purifiers circulates in a closed system. This water is regularly sent to a sedimentation treatment system to eliminate the fluorides. Water from direct and indirect cooling is emptied, untreated, in the southern arm of the Grande Décharge. Domestic wastewater is separated from industrial wastewater and discharged into the Alma municipal sewerage system. The treatment station in Alma is made up of aeration lagoons.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

Separation of domestic wastewater

In 1988 and 1989, the company installed a system to separate domestic wastewater and built a sewer conduit to discharge this water directly into the Alma municipal sewerage system. Between 1988 and 1992, cleanup measures, as well as the closure of certain sections of the plant, resulted in a reduction of ss, fluorides and aluminum in the effluent.

REGULATORY COMPLIANCE - WATER COMPONENT

Commendation

The ALCAN SMELTERS AND CHEMICLAS LTD. plant in Alma is subject to the sanitary effluent discharge standards stipuled in the certificate of autorization issued by the Ministère de l'Environnement et de la Faune du Québec (MEF) in 1988. The company complies with these standards. In 1993, Environment Canada and the MEF officially commended the plant for its cleanup measures.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

The Chimiotox index gauges the load of all the toxic substances 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 Action Plan characterization data gathered in the summer of 1991 as well as the Chimiotox values calculated from them for an effluent discharge of 13 431 m^3/d. Ten substances were detected in testing for more than 120. The data show that silver and oil and grease were preponderant in the treated wastewater. Silver and oil and grease (O&G) each represented 34% of the Chimiotox index. Cyanides followed with 15%, then nitrites-nitrates (10%) and phthalates (5%).

Figure 1 is plotted from the 1991 Action Plan characterization study. The Chimiotox indices for 1988, 1989, 1990 and 1992 were extrapolated from the 1991 characterization figures. Monthly company data served to adjust the Chimiotox indices for 1993 and 1995. The change in the Chimiotox index from 1993 to 1995 can be attributed to a variation in the O&G concentration, which differs according to the alloy being produced. The 76% reduction in the Chimiotox index between 1988 and 1995 is due to the cleanup measures that were implemented and the closure of certain sections.

Table 1 ***Chimiotox Index (1991) - Alcan Smelters and Chemicals Ltd., Île-Maligne Works****

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Silver	0.140	10 000	1 400
Total Oil and Grease	13.970	100	1 397
Cyanides	3.220	200	644
Nitrites-nnitrates	84.580	5	423
Bis-(2-ethylhexyl)phthalate	0.116	1 667	193
Aluminum	5.100	11	59
Chloroform	0.732	64	47
Total Phosphorus	0.076	50	4
Iron	1.120	3	4
Ammonia Nitrogen	2.880	0.8	2
CHIMIOTOX INDEX			**4 173**

* For effluent discharge of 13 431 m^3/d (10 substances detected in testing for more than 120).

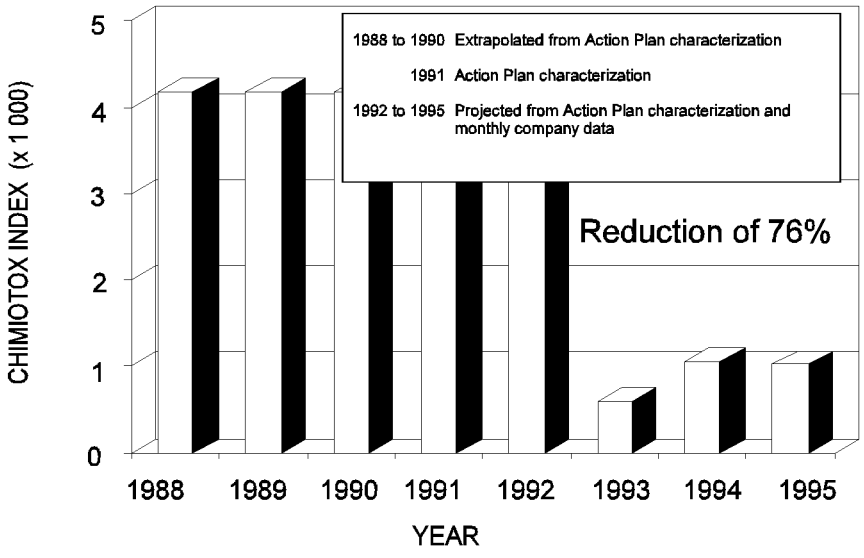


Figure 1 ***Changes in toxic effluent discharges, 1988-1995 - Alcan Smelters and Chemicals Ltd., Île-Maligne Works***

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

Absence of persistent toxic substances

One long-range objective of SLV 2000 is the virtual elimination of 11 persistent and 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.

At the time of the 1991 Action Plan characterization study, no persistent toxic substance was detected.

PEEP TOXICITY REDUCTION

Low toxicity

The Potential Ecotoxic Effects Probe, or PEEP, combines the results of 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. plant in Alma, one series of bioassays was carried out. The 1991 PEEP value was 1.9. This was one of the lowest PEEP values found among the 50 Action Plan plants.

REDUCTION IN SUBSTANCES MONITORED

According to company data, in 1995 the average effluent discharge was 9500 m^3/d, containing:

- 53.2 kg/d of suspended solids (SS)
- 14.6 kg/d of fluorides
- 9.3 kg/d of oil and grease (O&G)
- 6.0 kg/d of aluminum

Company data for 1988 to 1995 showed reductions in SS (39%), fluorides (30%) and aluminum (23%). The O&G concentration varied from one year to another depending on the kind of alloy being produced. Indeed, some alloys are stickier than others and require the addition of castor oil when the ingots are being cast (direct cooling). The decreases are partly due to the installation of a sewer conduit to empty domestic wastewater into the Alma municipal wastewater treatment system in 1989, and to the closure of the stud conditioning centre in 1990 and a machine shop in 1991.

KEY POINTS

- **Separation of domestic wastewater and disposal in the Alma municipal sewerage system**
- **In 1993, Environment Canada and the Ministère de l'Environnement et de la Faune commended the plant for its cleanup measures**
- **76% reduction in the Chimiotox index**

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):
Bernard Crevier, (418) 695-7883.

Environment officer at ALCAN SMELTERS AND CHEMICALS LTD., ISLE-MALIGNE WORKS:
Nicole Tremblay, (418) 662-6461, ext. 829.

Published by authority of the Minister of the Environment

Catalogue No. En153-6/43-1996E
ISBN 0-662-23357-3

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