FACT SHEET 60

Alcan Smelters and Chemicals Ltd, Shawinigan Works

1100 Saint-Sacrement Blvd.
Shawinigan, Quebec
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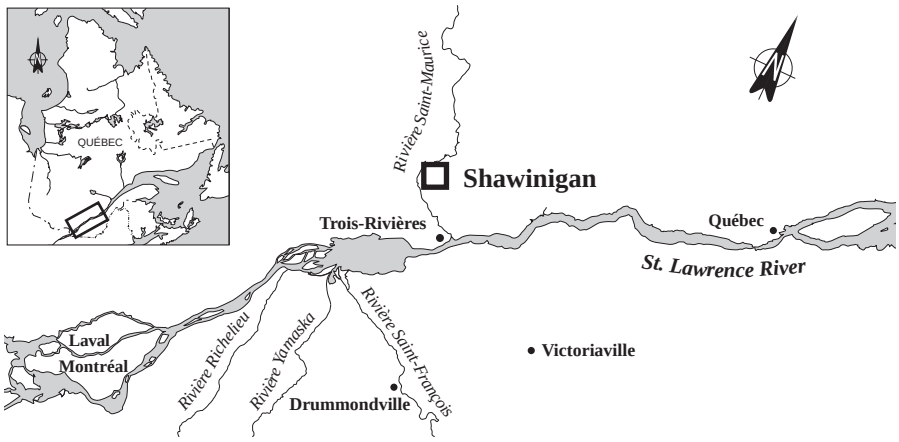
A list of 106 industrial plants has been established under St. Lawrence Vision 2000 (SLV 2000), the second phase of the St. Lawrence Action Plan, launched in 1988. The overall objective is to reduce toxic effluent and virtually eliminate discharges of persistent toxic substances.

The 106 industrial plants designated under SLV 2000 are divided into four groups, each with a specific objective. The ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS, in Shawinigan is in Group 1.

The objective for Group 1 is to reduce toxic effluent discharges in targeted plants by 90%.



INDUSTRIAL PLANT

Aluminum smelter

The ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS plant uses an electrolysis process that reduces alumina to aluminum using Söderberg-type anodes with horizontal studs; the annual production capacity of the process is 84 000 t. Gases emitted are recovered using wet scrubbers. The four-stage aluminum casting line includes a retention furnace, alloy furnace, and facilities for oxidation of impurities and ingot casting. The plant also has an annual production capacity of 42 800 t of liquid alum. The alum process used is a chemical reaction of aluminum hydrate with water and sulphuric acid. The plant produces anode paste briquettes, which contain a mixture of pitch and coke. The annual briquette production capacity is 120 000 t. In 1997, the plant operated at 100% capacity and employed a work force of 571.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Alumina
- Coke
- Pitch
- Sulphuric acid
- Hydrates
- Metals for alloys (chromium, copper, iron, magnesium, manganese)

FINISHED PRODUCTS

- Söderberg paste briquettes
- Aluminum ingots
- Liquid alum

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

Fluorides and aluminum

Based on company data, in 1993 the plant discharged an average of 6694 m^3/d of effluent, containing notably:

- 125.5 kg/d of suspended solids (SS)
- 10 kg/d of oil and grease (O&G)
- 5.5 kg/d of fluorides
- 3 kg/d of aluminum

RESOURCES AND USES TO PRESERVE

Resort areas

Effluents from the ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS plant is discharged into the Saint-Maurice River. A marina, a federal government wharf and resort and recreation areas are located not far from the discharge point. The area is used for sport fishing and pleasure boating. The region includes the Parc des Chutes, providing a panoramic view of the Shawinigan Falls and the Saint-Maurice River. The city of Shawinigan has built an urban park and walkway along the river, a little over a kilometre from the effluent discharge point. Some twenty species of fish live in the Saint-Maurice River, including yellow walleye, northern pike and small-mouth bass. The river is also used by waterfowl and swimmers, and contains many spawning areas. Trois-Rivières draws its drinking water from the Saint-Maurice River, about 7 km from where it meets the St. Lawrence River.

ENVIRONMENTAL DISCHARGE OBJECTIVES

Environmental protection

Environmental discharge 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. Environmental discharge objectives for ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS have been calculated and are available on request.

EFFLUENT TREATMENT

Water recirculation

Wastewater from the wet scrubbers is treated by the addition of lime, allowed to settle and then recycled, while the sludge is dried. Direct cooling water from the casting process is discharged untreated into the municipal sewer system. Indirect cooling water from electrical rectifiers is air-cooled in a pond and then recycled. Rainwater is separated and discharged into the Saint-Maurice River. Domestic sewage is separated then discharged into the municipal sewer system.

PREVENTION AND CLEANUP MEASURES IMPLEMENTED

Restoration of sedimentation basin site

Wastewater from the alum and anode paste plants has been recirculated in a closed circuit since September 1992. In the fall of 1995, the plant completed a comprehensive site restoration program. The project involved covering the old wet scrubber settling pond with an impermeable membrane and plant cover, and installing a soil-bentonite barrier to prevent groundwater intake.

Since January 1998, the company has been using synthetic vegetable oil on its casting line. This has decreased the consumption of oil by half, thereby reducing the effluent load.

The city of Shawinigan's wastewater treatment plant is scheduled to open in 1999. Domestic sewage and industrial wastewater will be separated and the domestic sewage will be treated at the Shawinigan wastewater treatment plant (aerated ponds).

REGULATORY COMPLIANCE - WATER COMPONENT

No specific regulations

The ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS plant is not subject to any specific wastewater regulations.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Mainly total oil and grease

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

Table 1 gives SLV 2000 characterization-data collected in March 1995 along with the Chimiotox values estimated from them, assuming an effluent flowrate of 5610 m^3/d. Eight substances were selected in testing for more than 120. Based on these data, total oil and grease account for 54% of the Chimiotox index.

Figure 1 is plotted from the SLV 2000 characterization data collected in 1995. The Chimiotox index calculated from these data was reported unchanged for 1993 to 1997. The reduction in 1998 is due to the use of synthetic vegetable oil on the casting line, which reduces the effluent load.

Table 1 ***Chimiotox Index (1995) - Alcan Smelters and Chemicals Ltd, Shawinigan Works****

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Total oil and grease	16.143	100	1 614
Benzo(*b+k*)fluoranthene	0.014	32 154	434
Dibenzo(*a,h*)anthracene	0.004	100 000	377
Benzo(a)pyrene	0.003	100 000	297
1,2,3-Indeno(*cd*)pyrene	0.003	32 154	103
Benzo(*a*)anthracene	0.003	32 154	91
Total aluminum	6.963	11	77
Anthracene	0.0005	32 154	15
CHIMIOTOX INDEX			**3 008**

* For an effluent flowrate of 5610 m^3/d (8 substances selected in testing for more than 120).

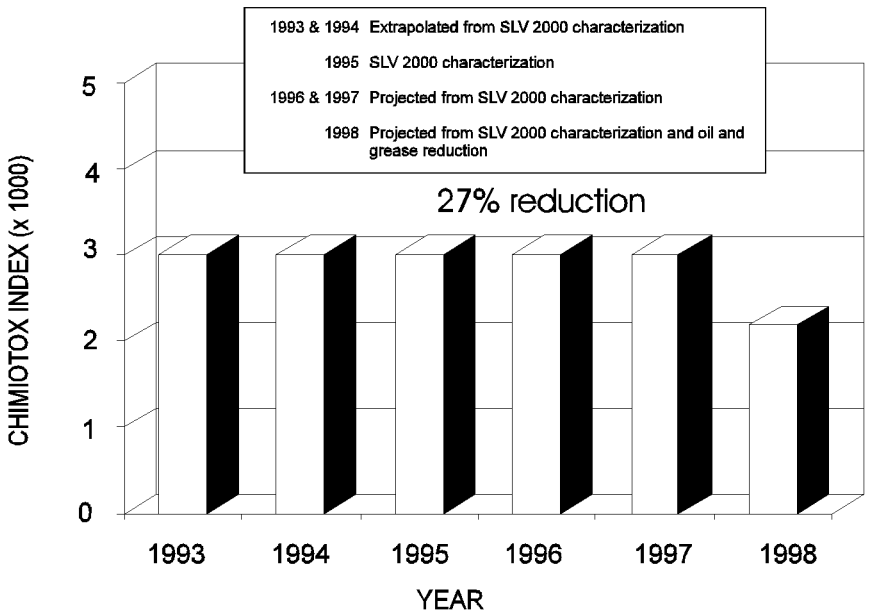


Figure 1 ***Chimiotox Index Trends (1993-1998) Alcan Smelters and Chemicals Ltd, Shawinigan Works***

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

One long-range objective of SLV 2000 is the virtual elimination of eleven persistent and bioaccumulative toxic substances from the effluent of the 106 priority plants along 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 alkyls, benzo(*a*)pyrene and hexachlorobenzene. To reach this objective, Protection has fixed the environmental discharge objectives set for applicable substances as its target by the end of SLV 2000 in 1998, thereby ensuring that all uses of the receiving environment are protected.

During the 1995 SLV 2000 characterization, one persistent toxic substance was found in effluent from the ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS plant: the benzo(*a*)pyrene concentration was 2.81 µg/L. This value meets the environmental discharge objective for polycyclic aromatic hydrocarbons (including benzo(*a*)pyrene), which is 3.1 µg/L.

PEEP TOXICITY REDUCTION

Low toxicity

The Potential Ecotoxic Effects Probe (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, SHAWINIGAN WORKS, a series of bioassays was conducted in 1995, resulting in a PEEP of 2.8, and showing low toxicity for the organisms tested.

REDUCTION IN SUBSTANCES MONITORED

Decrease in ss and oil and grease

Based on company data, in 1995 the plant discharged an average of 5610 m^3/d of effluent, containing notably:

- 15.4 kg/d of oil and grease (O&G)
- 13.5 kg/d of suspended solids (SS)
- 8.8 kg/d of fluorides
- 4.7 kg/d of aluminum

From 1993 to 1995, the concentration of suspended solids decreased by 89%. This decrease was due to a reduction in atmospheric discharges of particles from the potroom lines and plant maintenance.

The oil and grease load has also decreased since January 1998 with the use of synthetic vegetable oil on the casting line.

KEY POINTS

- **Recirculation of alum plant water since September 1992**
- **Sedimentation basin site restoration in 1995**
- **27% reduction in Chimiotox index**

Information updated January 1998

ADDITIONAL INFORMATION

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