

FACT SHEET No. 34

Reynolds Aluminum Company of Canada

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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 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 REYNOLDS ALUMINUM COMPANY OF CANADA plant, located in Cap-de-la-Madeleine, 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

Aluminum recycling

The REYNOLDS ALUMINUM COMPANY OF CANADA plant in Cap-de-la-Madeleine makes aluminum sheet from sheet ingot and aluminum scrap. The raw material is remelted in furnaces and transferred to vertical and level casting units to produce aluminum sheet. The cast pieces are hot or cold rolled to obtain thinner sheet. The plant has an annual production capacity of 52 000 t. In 1995, it operated at 90% of capacity and employed a work force of 700.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Sheet ingot
- Aluminum scrap

FINISHED PRODUCTS

- Aluminum sheet

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

Oil and grease

According to company data and the 1986 characterization figures, in 1988 the plant had an effluent discharge of 1400 m³/d containing:

- 80 kg/d of oil and grease (o&g)

RESOURCES AND USES TO PRESERVE

A cottaging area

The REYNOLDS ALUMINUM COMPANY OF CANADA plant in Cap-de-la-Madeleine is located on the north shore of the St. Lawrence, near its confluence with the Saint-Maurice River. The plant discharges its industrial wastewater into the municipal sewer age system, which channels it to the treatment station of the Greater Trois-Rivières intermunicipal waste management board in Saint-Marthe-du-Cap-de-la-Madeleine. That facility discharges its effluent into the St. Lawrence. Cottaging stands out among local uses tied to the proximity of water, with many cottages and motels lining the river as far as Champlain. The appeal of the local waters is obvious with the presence of riverside parks, notably the park of Notre-Dame-du-Cap-Shrine, which is visited by 700 000 to 800 000 pilgrims a year.

The river section near Trois-Rivières contains no extensive wildlife habitats, but a few hundred geese and ducks do stop along the banks in spring and fall. The mouth of the Saint-Maurice opens onto a system of rivers and lakes containing spawning grounds for several fish species (northern pike, yellow pike, burbot). There are also a few spawning grounds (Saint-Quentin Island) and a commercial fishery (shad, catfish, tomcod) around the islands at the mouth of the Saint-Maurice. Northern pike, perch, yellow pike and catfish are regularly harvested in the study area.

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. The water quality based objectives for REYNOLDS ALUMINUM COMPANY OF CANADA are available on request.

EFFLUENT TREATMENT

Recovery of spent oil

Wastewater from the cold mill is settled to recover the oils, then treated by ultrafiltration and emptied into the public sewer age system. The hot mill wastewater is treated by ultrafiltration to remove emulsified oil. The oils are reused as furnace fuel.

Sanitary sewage, rainwater, cooling water and process wastewater are discharged to the Cap-de-la-Madeleine public sewer age system. They are then treated in the aeration lagoons of the Greater Trois-Rivières waste management board and released into the river.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

Recirculation of cooling water

Following completion in 1990 of the recirculation system for direct and indirect cooling water, the flow dropped from 1400 to about 900 m³/d. At present, 99% of the cooling water is returned to the process stream.

In February 1994, the floor drains were blocked and the wash water was directed to the existing settling system. In addition, an oil separator was installed for the roof drainage.

REGULATORY COMPLIANCE - ATER COMPONENT

A successful remedial program

In 1992, REYNOLDS ALUMINUM COMPANY OF CANADA of Cap-de-la-Madeleine submitted a remedial program to reduce the oil and grease content of its effluent. The projects under that program were completed in the fall of 1993.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Mostly oil and grease

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 Action Plan characterization data gathered in 1990, as well as the Chimiotox values estimated from those figures, for an effluent flow of 866 m³/d. In testing for more than 120 substances, 17 were found. The figures show a predominance of oil and grease in the treated wastewater. Oil and grease make up 90% of the Chimiotox index.

Figure 1 is plotted from the 1990 characterization data. The Chimiotox indices for 1988 to 1995 were extrapolated from the Action Plan characterization data adjusted on the basis of monthly company figures for oil and grease. The 89% drop in the index from 1988 to 1995 results mainly from cooling water recirculation and oil recovery.

Table 1 *Chimiotox Index (1990) - Reynolds Aluminum Company of Canada**

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Total Oil and Grease	9.343	100	934
Total Phosphorus	0.745	50	37
Copper	0.056	424	24
Bis-(2-ethylhexyl)phtalate	0.007	1667	11
Nitrites-Nitrates	2.020	5	10
Lead	0.024	314	7
Aluminium	0.446	11	5
Iron	0.691	3	2
1,3-Dichlorobenzene	0.006	400	2
Ammonia Nitrogen	1.419	0.8	1
Total Phenols	0.005	200	1
Zinc	0.070	9	1
Manganese	0.019	10	<1
1,1,1-Trichloroethane	0.011	9	<1
Cyanides	4.3x10 ⁻⁰⁴	200	<1
1,2-Dichlorobenzene	6x10 ⁻⁰⁴	143	<1
Nickel	0.005	10	<1

CHIMIOTOX INDEX

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* For effluent discharge of 866 m³/d (17 substances detected in testing for more than 120).

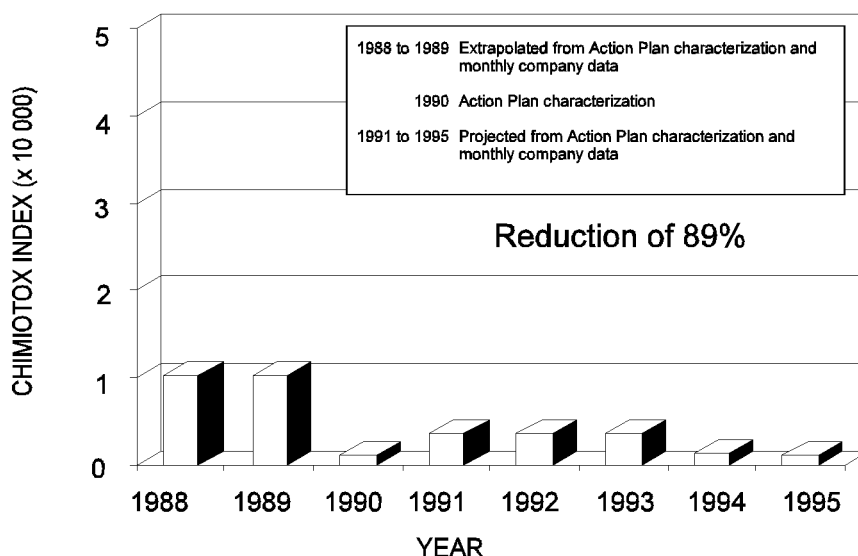


Figure 1 *Changes in toxic effluent discharges, 1988-1995 - Reynolds Aluminum Company of Canada*

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

No persistent toxic discharge

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 during the 1990 Action Plan characterization study.

PEEP TOXICITY REDUCTION

Comparatively 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.

KEY POINTS

- 89% reduction in the Chimiotox index
- Treatment measures: reduction at source and improved management of O&G
- 50% reduction in the effluent flow

ADDITIONAL INFORMATION

Chimiotox index and PEEP:

Gilles Legault, Environment Canada (514) 283-3452.

Water quality based objectives:

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One series of bioassays was conducted for the REYNOLDS ALUMINUM COMPANY OF CANADA plant in Cap-de-la-Madeleine. At 2.2, the 1990 PEEP index was among the lowest indices found for the 50 Action Plan plants.

REDUCTION IN SUBSTANCES MONITORED

Significant reduction in O&G

According to company data for the first ten months, in 1995 the plant had a total effluent discharge of 700 m³/d, containing:

- 10.0 kg/d of oil and grease (O&G)

The changes introduced by REYNOLDS ALUMINUM COMPANY OF CANADA between 1988 and 1995 cut oil and grease discharges by 90% and effluent flow by 50%. The O&G load and effluent flow have remained unchanged for the most part since then.

TECHNOLOGICAL DEVELOPMENT

Membrane bioreactors

A novel technology for handling concentrated, hard to treat industrial effluent was evaluated by Zenon Environment Inc., together with REYNOLDS ALUMINUM COMPANY OF CANADA and Environment Canada. That project was conducted at several locations, including the Cap-de-la-Madeleine plant. The technology in question combines biological treatment with polymer filtering membranes. According to the results, the technique can eliminate biochemical oxygen demand, suspended solids and mineral O&G as prescribed in the standards for discharges to municipal sewers. In addition, it significantly reduces acute toxicity. The project began in May 1991 and was completed in June 1993.

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

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