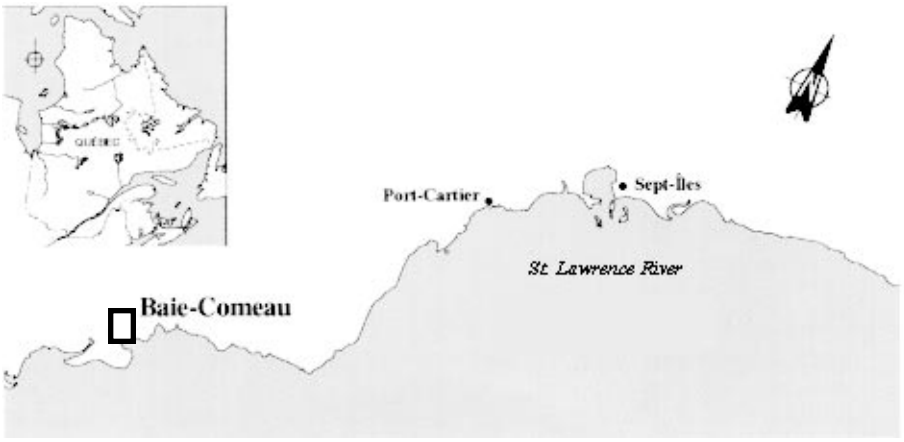
FACT SHEET No. 42

CANADIAN REYNOLDS METALS COMPANY, BAIE COMEAU PLANT

100 Maritime Road

Baie Comeau, Quebec

G4Z 2H7



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 REYNOLDS METALS COMPANY plant, located in Baie Comeau, 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

Many fabrication processes

The CANADIAN REYNOLDS METALS COMPANY plant in Baie Comeau produces molten aluminum that is cast into alloys in various forms for recasting, rolling and extrusion. It comprises an aluminum smelter, a casting centre and an anode plant. Aluminum is smelted from alumina in electrolytic cells; an electrolytic solution containing cryolite and such additives as aluminum fluoride is used for the physico-chemical reaction. One of the two technologies used is vertical-stud Söderberg cells; the other is prebaked anode cells with centre tapholes. The pot rooms contain 542 Söderberg anode cells and 480 prebaked anode cells. After being siphoned from the electrolytic cells, the molten aluminum goes to the casting centre, where various alloys are prepared in holding furnaces. The aluminum alloy is then cast in different shapes using a continuous vertical or horizontal casting process. The anode paste briquettes used as anodes in the Söderberg cells and the cathode paste used to assemble the cells are fabricated in the paste plant. The plant has an annual production capacity of 400 000 t of aluminum. In 1995, it operated at 100% capacity and employed a work force of 2150.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Alumina
- Pitch
- Coke
- Cryolite
- Aluminum fluoride

FINISHED PRODUCTS

- Aluminum alloys in different forms

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

SS, COD, O&G and PAHS

According to company data, in 1988 the refinery had an average effluent discharge of 25 200 m^3/d, containing:

- 330 kg/d of suspended solids (SS)
- 157 kg/d of chemical oxygen demand (COD)
- 125 kg/d of oil and grease (O&G)
- 102 kg/d of polycyclic aromatic hydrocarbons (PAHS)
- 18.7 kg/d of aluminum
- 3.6 g/d of polychlorinated biphenyls (PCBS)

At the time these figures were gathered, the refinery had an annual production capacity of 280 000 t. The annual capacity was boosted to 400 000 t in August 1991.

RESOURCES AND USES TO PRESERVE

Commercial and sport fishing

Effluent from the CANADIAN REYNOLDS METALS COMPANY PLANT in Baie Comeau is discharged into the St. Lawrence. Atlantic salmon and speckled trout migrate annually to the area to spawn in the Anglais river, located 0.5 km below the refinery outfalls. Benthic organisms in Anglais bay include several species of molluscs and crustaceans. Whelk and snow crab are the only species of commercial interest, the others being unsuitable for harvesting owing mostly to contamination by PCBS, coliform bacteria and the toxic alga *Alexandrium excavatum*. The commercial fishery takes place in Anglais bay. Marine mammals (seals, minke whales) frequent the area. The main recreational activities are hiking and boating (marina). The riverbanks provide habitat for sea ducks, diving ducks and geese.

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 the CANADIAN REYNOLDS METALS COPANY are available on request.

EFFLUENT TREATMENT

Reusing water

The cooling water from the casting centre circulates to a water treatment centre comprising four filters, six cooling towers and two buffer tanks to remove SS and O&G from the process wastewater. The treated water is returned to the casting centre and reused. The water treatment centre has a nominal capacity of 28 000 m^3/d and treats an average of 14 400 m^3/d. There are four other treatment lines for wastewater from the paste plant, the section where the Söderberg cell studs are cleaned and the compressor section of the Söderberg plant. Sanitary wastewater is discharged to the Baie Comeau sewerage treatment plant.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

Cutback in wastewater

Extensive measures to reduce wastewater volume and pollution were taken through the wastewater treatment program (PAE) implemented in 1989. Between 1989 and 1992, facilities were built to clean the effluent from the casting centre and other process streams. A pipe was laid to drain sanitary wastewater to the municipal sewerage treatment plant. Although the production capacity increased 43% in August 1991, total water consumption was reduced by 80%.

REGULATORY COMPLIANCE - WATER COMPONENT

Commendation

Through the measures implemented under the 1989 wastewater treatment program, the plant effluent meets the program objectives. In 1993, Environment Canada and the Ministère de l'Environnement et de la Faune du Québec commended CANADIAN REYNOLDS METALS COMPANY for the cleanup measures implemented at the Baie Comeau facility.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

PAHs

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 follow-up data gathered in 1992, as well as the Chimiotox values estimated from those figures, for an effluent flow of 9917 m^3/d. The figures show a predominance of total oil and grease in the treated wastewater. O&G make up 40% of the Chimiotox index.

Figure 1 is plotted from the 1989 and 1992 characterization data. Since the PAH sampling method was unsuitable at the time of the 1989 evaluation, figures from the 1986 characterization study by the Ministère de l'environnement du Québec (MENVIQ) were used to estimate PAH discharges for 1989. The Chimiotox indices for 1988 to 1991 were extrapolated from the 1989 characterization follow-up results. The 1993-1995 indices were projected from the 1992 figures.

From 1988 to 1992, effluent toxicity was virtually eliminated through the treatment measures implemented. Despite a 43% production gain, the Chimiotox index dropped 99.6%.

Table 1 ***Chimiotox index (1989) - Canadian Reynolds Metals Co. ltd., Baie Comeau Plant****

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Total Oil and Grease	6.489	100	649
Benzo(*a*)pyrene	3.28×10^{-03}	100 000	328
Total Aluminium	26.5	11	292
Benzo(*b+j+k*)fluoranthene	5.70×10^{-03}	32 154	183
Benzo(*a*)anthracene	2.00×10^{-03}	32 154	64
Total Cyanures (*CN-tot.*)	0.26	200	52
Indeno(*1,2,3,-cd*)pyrene	1.60×10^{-03}	32 154	51
Dibenzo(*a,h*)anthrancene	1.26×10^{-04}	100 000	13
Acenaphthene	1.00×10^{-03}	333	<1
CHIMIOTOX INDEX			**1 633**

* For effluent discharge of 15 736 m^3/d (15 substances detected in testing for more than 120).

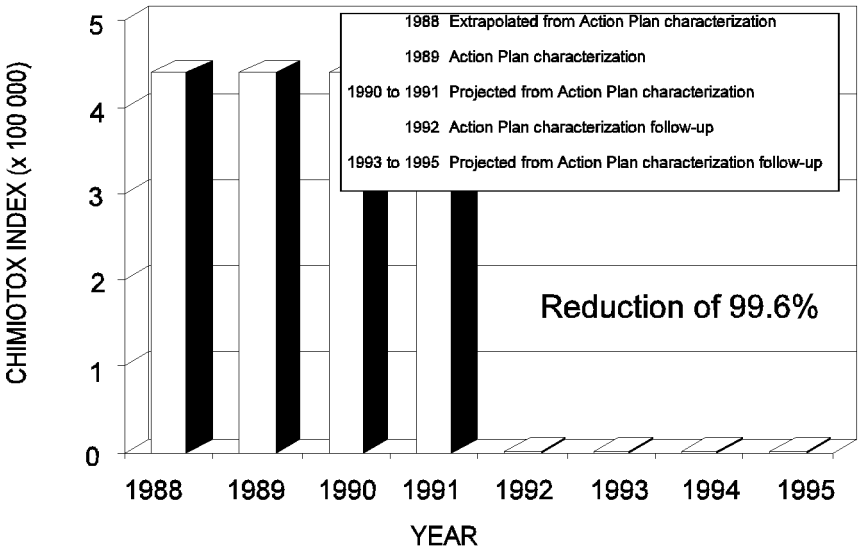


Figure 1 ***Changes in toxic effluent discharges, 1988-1995 - Canadian Reynolds Metals Co. Ltd., Baie Comeau Plant***

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

Virtual elimination of persistent toxic substances

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.

Two of the 11 targeted substances, PCBs and benzo*(a)*pyrene, were detected during the first Action Plan characterization study (1989). Together, they accounted for a load of 1.904 kg/d. The second Action Plan characterization (October 1992) revealed no trace of PCBs and a 99% reduction in benzo(*a*)pyrene. Both substances were eliminated by the treatment measures introduced within the plant.

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. Two series of bioassays were conducted for the CANADIAN REYNOLDS METALS COMPANY plant in Baie Comeau. The PEEP index was established at 3.0 for 1991 and 3.7 for 1992. The 1991 value was among the lowest of the PEEP indices found for the 50 Action Plan plants.

REDUCTION IN SUBSTANCES MONITORED

Significant drop in chief pollutants

According to company data, in 1995 the plant had an average effluent discharge of 3057 m^3/d, containing:

- 78 kg/d of suspended solids (SS)
- 66 kg/d of chemical oxygen demand (COD)
- 34 kg/d of fluorides
- 27.1 kg/d of total organic compounds (TOC)
- 10.8 kg/d of aluminum
- 3.8 kg/d of oil and grease (O&G)
- 0.063 kg/d of cyanides
- 29 g/d of polycyclic aromatic hydrocarbons (PAHs)
- 1.9 g/d of polychlorinated biphenyls (PCBs)

Company data for 1988-1995 show SS reduced by 76%, COD by 58%, O&G by 97%, PAHs by 100%, and aluminum by 42%. Cleanup measures cut the effluent flow by 88%.

KEY POINTS

- **In 1993, Environment Canada and the Ministère de l'Environnement et de la Faune du Québec commended CANADIAN REYNOLDS METALS COMPANY for the cleanup measures at its Baie Comeau plant**
- **Commitment to a wastewater treatment program in 1989**
- **99.6% 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):
Michel Croteau (418) 962-3378.

Environment officer at CANADIAN REYNOLDS METALS COMPANY, BAIE COMEAU PLANT:
Lucien J. Larouche (418) 296-7193.

Published by authority of the Minister of the Environment

Catalogue No. En153-6/42-1996E
ISBN 0-662-23349-2

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