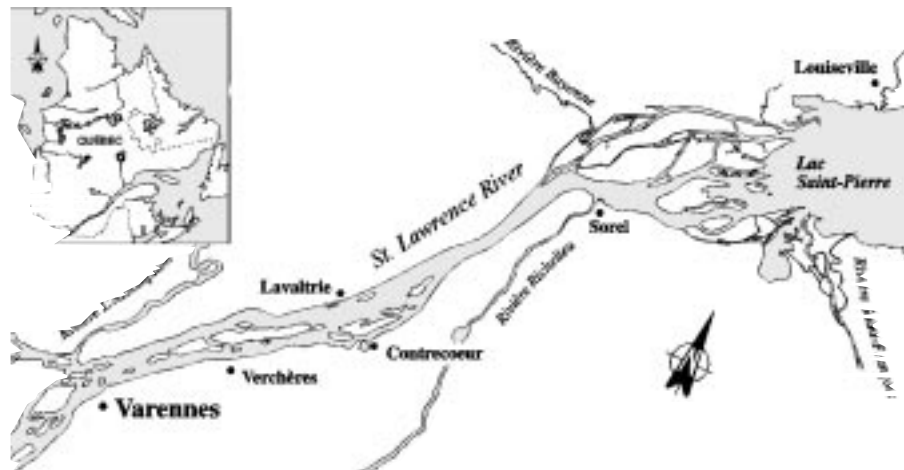


FACT SHEET No. 22

KRONOS Canada, Inc.

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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 KRONOS CANADA, INC. plant, located in Varennes, 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

Two production processes

KRONOS CANADA, INC. makes titanium dioxide pigments through two processes, one using sulphate and the other using chloride. The sulphate process, introduced in 1957, is the chief source of liquid waste. The annual sulphate-process production capacity was cut in half in 1994, from 38 000 to 19 000 t. The chloride process is more recent (1987) and provides for a nominal annual production capacity of 40 000 t. In 1995, the sulphate and chloride units together operated at 110% of capacity, and the Varennes plant had a work force of about 420.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Titanium ore and slag
- Sulphuric acid
- Chlorine
- Coke

FINISHED PRODUCTS

- Titanium dioxide pigment
- Gypsum

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

Acidic effluent

According to company data, in 1988 the plant had an effluent discharge of 47 320 m³/d, containing:

- 261 833 kg/d of sulphates
- 17 940 kg/d of suspended solids (ss)
- 12 551 kg/d of chlorides
- 13 100 kg/d of iron
- 191 kg/d of chromium

The pH was 1.3.

RESOURCES AND USES TO PRESERVE

A commercial fishing area

KRONOS CANADA, INC. discharges its effluent into the St. Lawrence at Cap Saint-Michel. The river section between Montreal and Lake Saint-Pierre is a choice habitat for Lake sturgeon, a valuable species for the commercial fishery in the river. The Verchères islands are about 5 km downstream of the plant outfall, on the north side of the shipping channel. The island marshes and aquatic plant communities are used as waterfowl staging areas and contain large spawning grounds for several fish species. The islands are also a cottaging area. Waterfowl nesting and staging areas extend along the south shore of the St. Lawrence, between Varennes and Verchères. The municipality of Verchères draws its water from the river, about 10 km downstream from Varennes' industrial park.

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 KRONOS CANADA, INC. are available on request.

EFFLUENT TREATMENT

Recent acid neutralization process

The outfall of the KRONOS CANADA, INC. plant handles 50 000 m³/d of effluent consisting of cooling water and wastewater from the chloride and sulphate processes. According to 1994 data, uncontaminated cooling water is released (untreated) at the rate of 47 200 m³/d. Wastewater from the chloride-based production unit flows at 1200 m³/d and is neutralized, clarified and filtered before being routed to the outfall. Since June 1994, the acidic effluent from the sulphate-based production unit (1600 m³/d) has been neutralized and the dewatered sludge transformed into gypsum. A company report (June 1994) notes that this system is 99.4% effective. White waters are coagulated and clarified; sanitary sewage is treated in septic tanks.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

A \$35 million investment

In September 1986, the Ministère de l'Environnement et de la Faune du Québec (MEF) approved the wastewater treatment program (PAE) proposed by KRONOS CANADA, INC. When the company could not meet the program conditions, the MEF took legal action and ordered two measures aimed at the sulphate-based production unit in order to reduce the environmental impact of plant discharges. In compliance with that order, the company halved production of the sulphate unit as of January 1, 1994. It also began neutralizing its acidic wastewater, a measure which required construction of a gypsum production unit at a cost of \$35 million. Work began in January 1993; that unit has been on stream since June 1994. The gypsum produced (70 000 t) is used in the manufacture of wallboard panels.

REGULATORY COMPLIANCE - WATER COMPONENT

Compliance with order

In May 1992, the company complied with a MEF order to carry out the cleanup measures described above. Discharges from the chloride unit are subject to a 1987 certificate of authorization.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Mostly metals

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 November 1991, as well as the Chimiotox values estimated from those figures, for an effluent flow of 50 950 m³/d. In testing for more than 120 substances, 15 were found. The figures show a predominance of chromium in the treated wastewater. Chromium makes up 39% of the Chimiotox index, followed by iron (22%), vanadium (19%) and aluminum (12%).

Figure 1 is plotted from the November 1991 characterization data, which were used to extrapolate Chimiotox indices for 1988, 1989 and 1990. Dioxins and furans were characterized in 1992, and the Chimiotox index was adjusted accordingly. The 1994 index was adjusted to account for 1994 company figures for chromium and iron. The lower index for that year results from the 50% reduction in sulphate-based production capacity and the June 1994 commissioning of the unit to neutralize acidic effluent. The 1995 index is based on the 1991 characterization data and company figures. Overall, the Chimiotox index fell by 94% between 1988 and 1995.

Table 1 *Chimiotox Index (1991) - KRONOS Canada, Inc.**

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Chromium	153.947	500	76 974
Iron	13 038.339	3	43 461
Vanadium	520.955	71	37 211
Aluminium	2 014.825	11	23 159
2,3,7,8T ₄ CDD- equivalent	5.3x10 ⁻⁰⁸	7.143x10 ¹⁰	3 786
Dichloromethane	40.523	64	2 581
Total Oil and Grease	23.861	100	2 386
Manganese	213.147	10	2 131
Lead	4.901	314	1 541
Cadmium	1.478	909	1 344
Copper	2.889	424	1 224
Nickel	5.419	10	54
Antimony	14.135	2	23
Zinc	1.581	9	15
Ammonia Nitrogen	10.190	0.8	8
CHIMIOTOX INDEX			195 898

* For effluent discharge of 50 950 m³/d (15 substances detected in testing for more than 120).

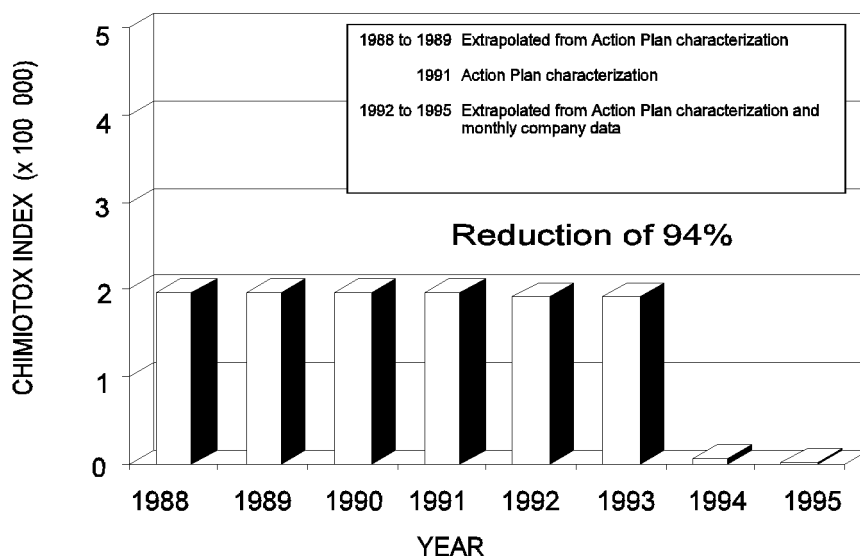


Figure 1 *Changes in toxic effluent discharges, 1988-1995 - KRONOS Canada, Inc.*

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

Dioxins and furans detected

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.

Trace amounts of dioxins and furans (53 µg/d) were detected during the Action Plan characterization of November 1991. The 1992 characterization for these two substances showed a load of 0.92 µg/d. A new characterization study planned under SLV 2000 will determine whether the treatment measures implemented since 1994 have eliminated dioxins and furans from the effluent.

PEEP TOXICITY REDUCTION

The Potential Ecotoxic Effects Probe, or PEEP, combines 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. One series of bioassays was conducted for the KRONOS CANADA, INC. plant, at the time of the 1991 Action Plan characterization study. The results yield a value of 6.9, which is among the highest of the PEEP indices for the 50 plants.

However the index is expected to have been reduced significantly as of June 1994, when the company began operating the gypsum unit.

REDUCTION IN SUBSTANCES MONITORED

Sizeable reductions

According to company data, the average pH of the effluent since June 1994 has ranged from 6.0 to 9.5. The average effluent discharge was 51 230 m³/d, containing:

- 27 950 kg/d of chlorides
- 27 629 kg/d of sulphates
- 7027 kg/d of suspended solids (ss)
- 1232 kg/d of iron
- <5 kg/d of chromium

Wastewater acidity has decreased since start-up of the gypsum unit, which neutralizes the acidic effluent. Average discharges were reduced by 99% for chromium, 93% for sulphates and 66% for iron relative to 1988 levels.

KEY POINTS

- Sulphate-based production capacity cut by 50% since January 1, 1994
- Start-up of an acidic effluent neutralization plant in June 1994 (\$35 million investment)
- 94% reduction in the Chimiotox index

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

ADDITIONAL INFORMATION

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