FACT SHEET 75

Norsk Hydro Canada Inc.

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Bécancour, Quebec

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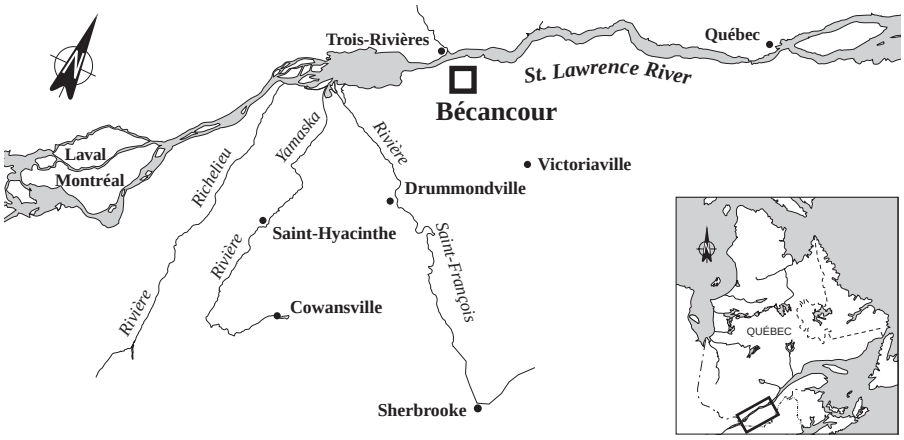

***A** list of 106 industrial plants has been established under St. Lawrence Vision 2000 (SLV 2000), the second phase of the St. Lawrence Action Plan, launched in 1988. The overall objective is to reduce toxic effluent and virtually eliminate discharges of persistent toxic substances.*

The 106 industrial plants designated under SLV 2000 are divided into four groups, each with a specific objective. The NORSK HYDRO CANADA INC. plant in Bécancour is in Group 2, comprising plants that have already implemented treatment programs but whose effluent may contain toxic substances.

The objective for Group 2 is maximum reduction of toxic effluent of targeted plants.

NDUSTRIAL PLANT

Magnesium and alloy production

The NORSK HYDRO CANADA INC. plant in Bécancour produces pure magnesium and alloys in ingots, T-bars and round bars. Production of primary magnesium includes the following stages:

- Magnesite ($MgCO_3$) is dissolved in hydrochloric acid (HCl) to produce magnesium chloride brine ($MgCl_2$).
- The brine is dried to produce magnesium chloride granules ($MgCl_2$ particles).
- The $MgCl_2$ is decomposed by electrolysis to produce metallic magnesium and chlorine gas.
- The magnesium is refined and alloyed.
- Chlorine gas from electrolysis is burned with hydrogen to produce hydrochloric acid, which is recycled to the beginning of the process.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Magnesite
- Hydrochloric acid
- Hydrogen
- Natural gas
- Soda
- Hypochlorite
- Magnesium alloy scraps
- Alloy metals

FINISHED PRODUCTS

- Pure magnesium
- Magnesium alloys

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

Low loads

Based on company data, in 1993 the plant discharged 18 120 m^3/d of effluent, containing notably:

- 278 kg/d of suspended solids (SS)
- 4 kg/d of aluminum

RESOURCES AND USES TO PRESERVE

Wide variety of habitats

The NORSK HYDRO CANADA INC. plant is located in the Bécancour industrial park along the banks of the St. Lawrence. The complex natural shape of the river in the area results in a wide variety of wildlife habitats. The infralittoral area facing the park contains water plant communities. A large mud flat rises in the middle of the St. Lawrence immediately downstream from the Bécancour wharf. The water plant communities in the area are considered attractive spawning and nursery areas for northern pike, perch, brown bullhead and smallmouth bass. Over 70 fish species and at least 26 species of water birds may be found in the vicinity. Hunting and fishing enthusiasts visit the Bécancour area, and sport fishing and muskrat trapping are particularly popular around the mouth of the Gentilly River. The nuclear power plant draws drinking and industrial water a short distance downstream from the Bécancour wharf.

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 NORSK HYDRO CANADA INC. have been calculated and are available on request.

EFFLUENT TREATMENT

Neutralization and sedimentation

Effluent treatment equipment has been installed to recycle and re-use liquid and gaseous waste inside the plant. A water neutralization facility and sedimentation tank are the only equipment required before discharging effluent into the river. The sedimentation tank keeps suspended solids under 30 g/m^3, while the neutralization facility keeps pH between 5.5 and 9.5. Domestic sewage is discharged into the domestic sewer system of the Bécancour industrial park. Indirect cooling water flows into the river through a diversion ditch around the plant following monitoring for pH, conductivity and oxidation-reduction potential.

PREVENTION AND CLEANUP MEASURES IMPLEMENTED

Several measures

A number of measures have been adopted to make better use of resources and limit losses. In 1988, a dike was built to recycle off-spec brine, along with a heat exchanger to re-use HCl; in 1992, a system to dissolve off-spec $MgCl_2$ granules and a furnace to melt magnesium scraps was installed, and in February 1994, a flocculation/sedimentation system was introduced to remove chlorinated aromatic hydrocarbons.

These measures required an investment of over $11 million. In addition, every year NORSK HYDRO CANADA INC. produces a detailed environmental status report that gives an update on the quality of the water, air, soil and environment around the plant. To prepare this report, up to 6000 facts and figures are collected every year; the report is available on request.

REGULATORY COMPLIANCE - WATER COMPONENT

Standards met

Effluent from the NORSK HYDRO CANADA INC. plant meets the discharge standards specified in the certificate of authorization issued in 1988 and updated in October 1993 and January 1997. It defines, among other things, discharge standards for the company.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

8 substances selected

The Chimiotox index gauges the load of all toxic substances in industrial effluent using 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 data from the October 1995 SLV 2000 characterization along with the Chimiotox values calculated from them, assuming an effluent flowrate of 25 337 m^3/d. Eight substances were selected in testing for more than 120. The Chimiotox index is below the average for the 106 SLAP and SLV 2000 plants.

Figure 1 is plotted from 1995 SLV 2000 characterization data, and company data for 1997 and 1998. The Chimiotox index calculated from the 1995 data was reported unchanged for 1993-1996. Reductions in 1997 and 1998 are the result of measures introduced by the company to reduce water consumption and toxic loads.

Table 1 ***Chimiotox Index (1995) - Norsk Hydro Canada Inc.****

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Total arsenic	0.034 **	57 143	1 934
Total copper	0.591 **	451	266
Total aluminum	11.065	11	122
Total iron	23.064	3.3	76
Total phosphorus	1.432	50	72
Nitrites-nitrates	5.900	5	30
Total manganese	1.740	10	17
Ammonia nitrogen	1.855	0.8	1
CHIMIOTOX INDEX			**2 518**

* Assuming an effluent flowrate of 25 337 m^3/d (8 substances selected in testing for more than 120).

** Load calculation based on analytical data which are near methodological detection limits.

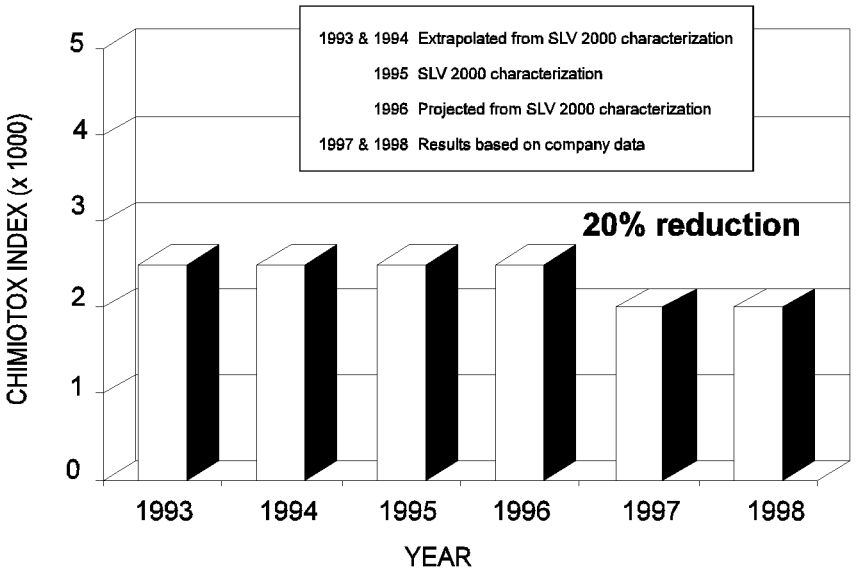

Figure 1 ***Chimiotox Index Trends (1993 to 1998) Norsk Hydro Canada Inc.***

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.

Based on 1995 SLV 2000 characterization data, none of these eleven persistent and bioaccumulative toxic substances was detected in the company's effluent.

PEEP TOXICITY REDUCTION

Non toxic effluent

The Potential Ecotoxic Effects Probe (PEEP) combines the results of six standardized bioassays measuring the toxic effects of effluent. 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 NORSK HYDRO CANADA INC. plant, a series of bioassays was carried out in 1995 yielding a PEEP of less than 0.7, and showing no toxicity in the company's effluent.

REDUCTION IN SUBSTANCES MONITORED

Increased production

According to company data, in 1997 the plant discharged 25 170 m^3/d of effluent, containing notably:

- 317 kg/d of suspended solids (SS)
- 9 kg/d of aluminum

Between 1993 and 1997, effluent flowrate increased 39% and the suspended solids 14%. These increases were due to a 120% increase in production between 1993 and 1997. However, water consumption per tonne of magnesium produced decreased by 33% over the same period.

KEY POINTS

- **A number of source reduction and resource enhancement measures implemented between 1988 and 1994, for an investment of over $11 million**
- **20% reduction in the Chimiotox index**
- **Non-toxic effluent**

Information revised January 1998

ADDITIONAL INFORMATION

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