

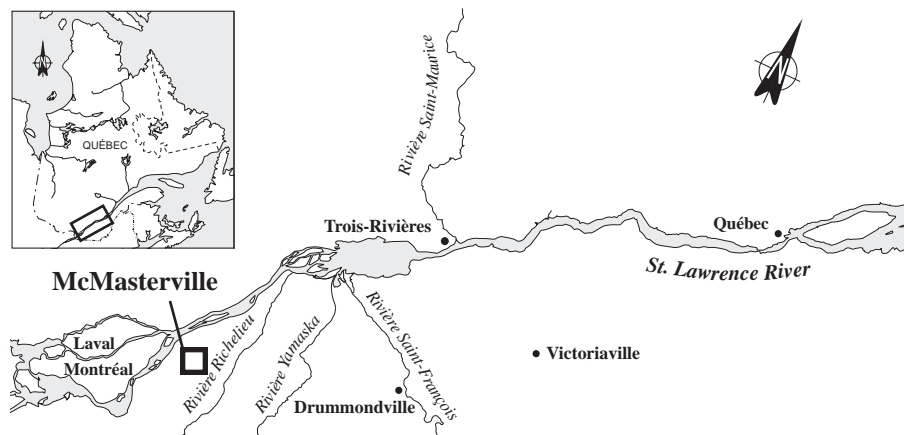
FACT SHEET 55

ICI Explosives Inc.

801 Richelieu Blvd.

McMasterville, Quebec

J3G 1T9



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 ICI EXPLOSIVES INC. plant in McMasterville is in Group 1, comprising industrial plants whose effluent may contain toxic substances even though it is treated.

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

INDUSTRIAL PLANT

Explosives

The ICI EXPLOSIVES INC. plant produces trinitrotoluene (TNT)*, pentaerythritol tetranitrate (PETN), sodium nitrate, ammonium nitrate, nitric acid and explosive emulsions. The TNT is produced in a continuous reaction between toluene and a mixture of nitric acid and oleum, then washed, neutralized and transported in molten form to the finishing unit where it is solidified and packaged. The PETN is obtained through a batch reaction between pentaerythritol and nitric acid, then recrystallized in acetone. In the sodium azide manufacturing process, ammonia reacts with molten sodium and is converted into sodium azide in a reaction with nitrous oxide and then purified. The ammonium nitrate in solution is obtained through a reaction between ammonia and nitric acid. In the production of nitric acid, the ammonia reacts with air at a high temperature. Explosive emulsions are the result of a mixture of oil, nitrate solution and various other solids and liquids. Annual production capacity of the plant is 350 t of PETN, 3000 t of TNT, 1000 t of ammonium azide and 7800 t of ammonium nitrate. The plant operates at a rate of 70% capacity for PETN, 40% for TNT, 60% for sodium azide and 100% for ammonium nitrate. In 1995, the plant employs a work force of 250.

* Production of this product ceased in December 1995

PRODUCTION

PRINCIPAL RAW MATERIALS

- Toluene*
- Nitric acid
- Oleum*
- Ammonia
- Nitrous oxides
- Pentaerythritol
- Sodium
- Oil (emulsion)

FINISHED PRODUCTS

- Trinitrotoluene (TNT)**
- Pentaerythritol tetranitrate (PETN)
- Explosive emulsions
- Ammonium nitrate
- Sodium azide

* These products have not been used since December 1995

** Production ceased in December 1995

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

Nitrates and sulphates

Based on company data for 1993, the plant discharged an average of 26 784 m³/d of effluents, containing notably:

- 690 kg/d of nitrates
- 410 kg/d of sulphates
- 250 kg/d of acetone
- 3 kg/d of TNT

RESOURCES AND USES TO PRESERVE

Vacation area

Effluent from the ICI EXPLOSIVES INC. plant in McMasterville flows from the left bank of the Richelieu River. The Richelieu Valley is a major residential area, while the river is used for pleasure boating. Marinas and wharves, along with a campground, are located near McMasterville, downstream from the plant. The river is bordered by vacation areas and rest areas. Fishing enthusiasts make use of a number of locations in the area. The water intake for the Richelieu Valley intermunicipal water board (RIEVR) is located at Otterburn Park, upstream from the plant. The water supply system serves seven municipalities, including McMasterville. This water intake cannot be influenced by effluent from the plant, since it is on the opposite shore and upstream. The first water intake downstream from the plant is at Saint-Denis, about 28 km away; this structure belongs to the Lower Richelieu intermunicipal water supply committee (CAIBR), which serves eight municipalities.

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 ICI EXPLOSIVES INC. have been calculated.

EFFLUENT TREATMENT

Treatment suited to processes

In the TNT manufacturing process, the neutralization solution is burned, the waste acid is recycled and the solidification water is treated with ozone and UV rays and then released into the river. PETN wash water is neutralized with limestone, then discharged into the river; the acid used in the reaction is also recycled in the process, and acetone is recovered from the acetone-water mixture before discharge into the river. In the sodium azide and nitric acid processes, cooling water is the only material discharged into the environment. Wash water from the production of explosive emulsions is burned. The acidity of some discharge is reduced by treatment with sodium hydroxide. Domestic sewage is discharged into a septic field.

PREVENTION AND CLEANUP MEASURES IMPLEMENTED

Reduction in pollutant discharge

A cleanup agreement was signed in 1989. Since the research and contaminant reduction program began, work has been undertaken to reduce concentrations of TNT (1989 to 1991), acetone (since 1993) and ammonium nitrate in the effluent. All TNT production ceased in December 1995.

REGULATORY COMPLIANCE - WATER COMPONENT

Compliance with cleanup agreement standards

The ICI EXPLOSIVES INC. McMasterville plant is subject to no special regulations on industrial wastewater. The company complies with the 1989 cleanup agreement standards.

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 targeted plants along 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.

According to SLV 2000 characterization data for September 1995, none of the eleven persistent and bioaccumulative toxic substances were detected in the company's effluents.

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. In the case of ICI EXPLOSIVES INC., a series of bioassays was carried out in 1995, yielding a PEEP of 3, and showing a low toxicity for the organisms tested.

REDUCTION IN SUBSTANCES MONITORED

Reduced loads

Based on company data for 1995, the plant discharged an average of 23 756 m³/d of effluents, containing notably:

- 150 kg/d of nitrates
- 100 kg/d of sulphates
- 100 kg/d of acetone
- 0.8 kg/d of TNT

Between 1993 and 1995, nitrate and sulphate loads decreased by 78% and 76% respectively, while the acetone loads dropped by 60%. Before closure of the TNT unit, the TNT discharge was down 73%. The plant has discharged no further TNT since December 1995.

KEY POINTS

- Cleanup measures ongoing since 1989 under a cleanup agreement
- Closure of TNT production unit in December 1995

Based on December 1995 inventory

ADDITIONAL INFORMATION

Chimiotox Index and PEEP:

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POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Mainly total oil and grease

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 characterization carried out in September 1995 under SLV 2000 along with Chimiotox values estimated from them, assuming an effluent flowrate of 34 116 m³/d. Seven substances were selected in testing for over 120 parameters. According to these data, total oil and grease represents 56% of the Chimiotox index, followed by nitrites-nitrates with 23%.

Figure 1 is plotted from 1995 SLV 2000 characterization data. The Chimiotox index estimated from the 1995 data was applied for the entire period between 1993 and 1998. Without appropriate information, it was impossible to determine the influence of cleanup measures and the closure of one production unit on the Chimiotox index.

Table 1 *Chimiotox Index (1995) - ICI Explosives Inc.**

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Total oil and grease	19.343	100	1934
Nitrites-nitrates	159.505	5	798
Total sulphides	0.958	500	479
Ammoniacal nitrogen	159.661	0.8	128
Total phosphorus	1.905	50	95
Total aluminum	0.042	11	<1
Total manganese	0.031	10	<1

CHIMIOTOX INDEX

3435

* Assuming an effluent flowrate of 34 116 m³/d (7 substances selected in testing for more than 120)

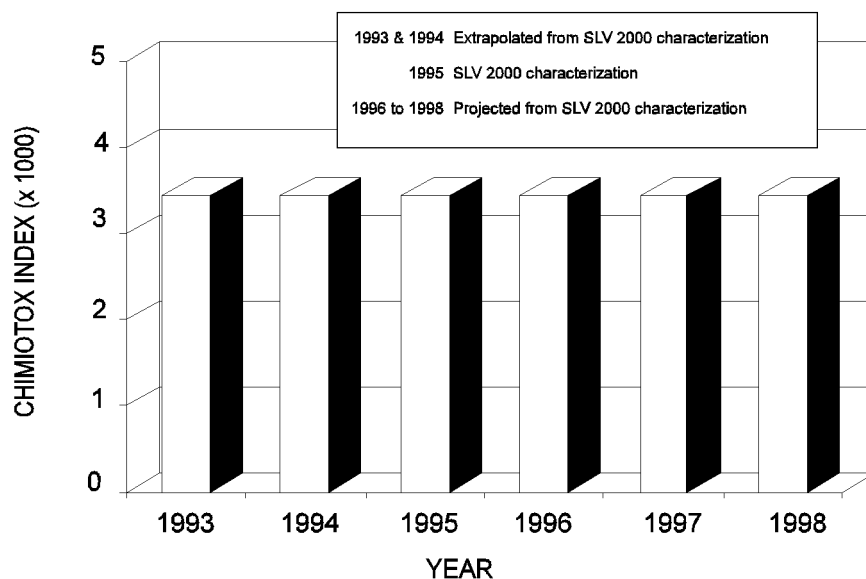


Figure 1 *Chimiotox Index Trends (1993 to 1998)*
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