

FACT SHEET No. 15

Monsanto Canada Inc.

6800 St. Patrick Street
LaSalle, Quebec
H8N 2H3



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 MONSANTO CANADA INC. plant in LaSalle 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

A complex petrochemical plant

The MONSANTO CANADA INC. industrial plant in LaSalle produces an ABS-type polymer (acrylonitrile-butadiene-styrene), aminoplastic resins, plasticizing esters, styrene polymer salts, maleic acid salts, and herbicides. The industrial wastewater comes from washing the synthesis reactors, from purification of the products and from cooling the machines

PRODUCTION

PRINCIPAL RAW MATERIALS

- Plasticizer: adipic acid, 2-ethyl-hexanol or C7-C9 alcohol
- Polymerization: acrylonitrile, polybutadiene, styrene
- Resin: melamine, urea, formaldehyde, butanol, methanol, ethanol, butyl acetate
- Herbicide: amine salt, surfactant
- Scripset: maleic anhydride, styrene, xylene, ammonia or sodium hydroxide

FINISHED PRODUCTS

- Plasticizing esters
- ABS-type polymers
- Aminoplastic resins
- Round-up herbicide
- Salts from styrene polymers and maleic anhydride (scripset)
- Triax (a mixture of ABS and polycarbonate or nylon)

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

COD and formaldehyde

In 1988, according to company data, the total effluent had an average discharge of 1820 m³/d, containing:

- 6927 kg/d of chemical oxygen demand (COD)
- 1141 kg/d of formaldehyde
- 912 kg/d of suspended solids (ss)
- 260 kg/d of oil and grease (o&g)
- 44 kg/d of ammonia
- 7.3 kg/d of xylene
- 4.8 kg/d of acrylonitrile

At the time the data was collected, the workshops that produced phthalates (closed in 1988), maleic anhydride (closed in 1991), and anti-oxidants for rubber (closed in 1992), were still in operation.

RESOURCES AND USES TO PRESERVE

A highly industrialized area

The effluent from the MONSANTO CANADA INC. plant in LaSalle is now discharged into the treatment plant during dry weather. When it rains, the effluent empties into the St. Lawrence River between Nun's Island and Verdun. Nun's Island is popular with bird-watchers. There are also spawning grounds there. In 1994, serious natural resource degradation was evident in the section of the St. Lawrence around the island.

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.

In the case of MONSANTO CANADA INC. there are no water quality based objectives, as the company's effluent discharges into the municipal sewer system.

EFFLUENT TREATMENT

Neutralization of wastewater

The MONSANTO CANADA INC. plant in LaSalle is connected to the public sewage system of the Montreal Urban Community (MUC) by four conduits. One of these carries industrial wastewater; the other three carry rainwater.

Process wastewater is mixed and neutralized in two 5000-gallon tanks. Effluent from the tanks gravitates into the Saint-Patrick main sewer. Blow-down from the cooling towers is discharged downstream into the same sewer.

Oil and grease in the water from the plasticizer workshop are recovered through a sedimentation, separation and reuse system. Herbicide is manufactured in a closed system that does not discharge wastewater. Water from the scripset workshop is decanted in order to recover the solvent before it is recirculated in a closed circuit. The water from the polymerization workshop is collected in order to recover plastic beads through sedimentation. The various alcohols in the wastewater coming from aminoplastic resins are recovered by distillation.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

Major investments

Since 1988, cleanup measures have been introduced to cut discharges of ss and o&g, and to limit fluctuations in the pH level and the volume of wastewater. The addition of a separator in the polymerization unit and the replacement of the neutralization system for the final effluent (using CO₂) are examples of such measures.

REGULATORY COMPLIANCE - WATER COMPONENT

Under the Action Plan, MONSANTO CANADA INC., the Montreal Urban Community (MUC) and the Ministère de l'Environnement et de la Faune du Québec (MEF) agreed to have the plant undertake a waste reduction program. In 1996, the discharge objectives are to be reviewed.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

The Chimiotox index gauges the load of all the toxic substances 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 characterization data gathered in February 1992 pursuant to Action Plan requirements, as well as the Chimiotox values calculated from them for an effluent discharge of 1630 m³/d. Twenty-one substances were detected in testing for over 120. From the data, it appears that the presence of non-halogenated volatile organic compounds (VOCs) in the form of acrylonitrile is preponderant in the treated water. Acrylonitrile represents 70% of the Chimiotox value. It is followed by oil and grease (26%), then by mercury (2%) and styrene (1%).

Figure 1 is plotted from the characterization data from 1992. Company data were used to project back to 1988 and forward to 1993-1995 from the characterization year. The 89% drop in the Chimiotox value between 1988 and 1993 reflects a reduction of toxic substances in the effluent. This reduction can be attributed to the work carried out under the MUC and MEF program for discharge reduction, as well as to the closure of certain sections of the plant (for example, the rubber anti-oxidants shop closed in June 1992).

Table 1 Chimiotox Index (1992)- Monsanto Canada Inc.

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Acrylonitrile	2.777	1 538	4 272
Total Oil and Grease	16.040	100	1 604
Mercury	5.850x10 ⁻⁰⁴	166 667	98
Styrene	0.836	53	44
Total Phosphorus	0.451	50	23
Nitrites-Nitrates	3.284	5	16
Ammonia Nitrogen	16.183	0.8	13
Bis-(2-ethylhexyl)phthalate	0.007	1 667	12
Xylenes (o,m and p)	0.374	25	9
Phenol	0.028	200	6
Iron	0.985	3	3
Ethylbenzene	0.098	33	3
Toluene	0.280	10	3
Copper	0.006	424	2
Zinc	0.116	9	1
m-Cresol	0.004	200	1
o-Cresol	0.003	200	1
Di-n-butylphthalate	0.002	250	1
Chloroform	0.002	64	<1
Benzene	0.004	25	<1
Chlorobenzene	0.005	14	<1

CHIMIOTOX INDEX

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*For effluent discharge of 1630 m³/d (21 substances detected in testing for more than 120).

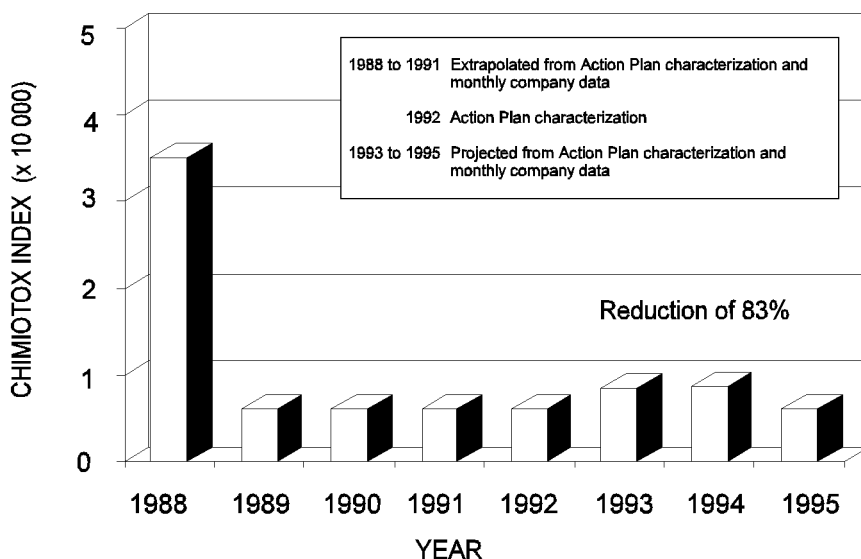


Figure 1 Changes in toxic effluent discharges, 1988-1995 - Monsanto Canada Inc.

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

Presence of mercury

One long-range objective of SLV 2000 is the virtual elimination of 11 persistent and 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.

At the time the characterization study was carried out for Action Plan in 1992, mercury (one of the 11 persistent toxic substances) was detected. The mercury load was 0.585 g/d.

PEEP TOXICITY REDUCTION

Average toxicity

The Potential Ecotoxic Effects Probe, or PEEP, combines the 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. In the case of the MONSANTO CANADA INC. plant in La Salle, one series of bioassays were carried out. The PEEP value found in 1992 was 4.3. This was an average value when compared with results from the other 50 plants.

REDUCTION IN SUBSTANCES MONITORED

Significant reductions

According to company data, in 1995 the plant had an average total effluent discharge of 1429 m³/d, containing:

- 4202 kg/d of chemical oxygen demand (COD)
- 620 kg/d of suspended solids (SS)
- 126 kg/d of formaldehyde
- 43 kg/d of butanol
- 36 kg/d of oil and grease (O&G)
- 3.0 kg/d of methanol
- 2.8 kg/d of xylene
- 2.0 kg/d of styrene

Company data for the period 1988 to 1995 show the following reductions: 39% less COD, 32% less SS, 89% less formaldehyde, 86% less oil and grease and 62% less xylene. Cleanup measures introduced since 1988 are responsible for these reductions.

KEY POINTS

- Several cleanup efforts carried out under the effluent discharge reduction program agreed upon with the MUC and the MEF
- 83% reduction in the Chimiotox index value

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

ADDITIONAL INFORMATION

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