FACT SHEET No. 6

PETRO-CANADA

11701 Sherbrooke St. East

Montreal, Quebec

H1B 1C3

***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 PETRO-CANADA refinery in Montreal 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 large refinery in East End Montreal

The PETRO-CANADA refinery in Montreal has a maximum crude oil throughput of 15 085 m^3/d. The separation processes in place include desalting, atmospheric distillation, vacuum distillation and asphalt production. Heavier fractions are treated by catalytic cracking, thermal cracking and hydrocracking. Lighter fractions are converted into products by alkylation, catalytic reforming, BTX (benzene, toluene and xylene) extraction, polymerization, and hydrodealkylation. In 1995, the refinery operated at 88% of rated capacity and employed a work force of 368.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Crude oil
- Gas oil and naphtha

FINISHED PRODUCTS

- Gasoline, motor oil, fuel oil
- Liquefied petroleum gas
- Asphalts
- Petrochemicals

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

SS and O&G

Based on monthly company data, in 1988 the refinery had an average effluent discharge of 16 700 m^3/d, containing:

- 402 kg/d of suspended solids (SS)
- 199 kg/d of oil and grease (O&G)
- 155 kg/d of ammonia nitrogen
- 6.1 kg/d of phenols
- 2.2 kg/d of sulphides

RESOURCES AND USES TO PRESERVE

Cottaging and water sports

The PETRO-CANADA refinery in Montreal discharges its effluent into the St. Lawrence River, below the Marien wharf on the north bank. The riverbanks in the vicinity accommodate mostly industrial and residential uses. The area also has many boat-launching ramps and marinas. The Sainte-Thérèse islands, located 3 km downriver from the outfall, are very popular with water sports enthusiasts. Because of worsening water quality in recent decades, the beaches are no longer used for swimming. The islands comprise several fish spawning grounds, and are used by waterfowl for nesting and during migration. They also provide suitable habitat for semi-aquatic mammals.

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 PETRO-CANADA are available on request.

EFFLUENT TREATMENT

Secondary treatment

In 1995, the PETRO-CANADA refinery discharged into the St. Lawrence 8810 m^3/d of wastewater which had undergone secondary treatment. Industrial wastewater is circulated to an API separator and then four sand filters. Next, it is neutralized and channelled through two biofilters and a polishing pond. Stormwater is circulated to a basin (decommissioned quarry) for removal of oil, grease and suspended solids.

Sanitary wastewater is drained to septic tanks or the municipal sewer system, which is connected to the Montreal Urban Community (MUC) sewage treatment plant.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

A $20 million investment

Upgrading projects in 1990 and 1991 (control at source, treatment system optimization and operator training) boosted the efficiency of the wastewater treatment system. That work required spending in the neighbourhood of $20 million. Ferrous chloride test equipment commissioned in November 1993 has reduced the phosphorus content of the effluent.

REGULATORY COMPLIANCE-WATER COMPONENT

Full compliance

The refinery is subject to provincial regulations and federal guidelines with respect to oil refinery effluent. It must further comply with MUC by-law 87.

The plant is in compliance with all applicable regulations. However, a draft amendment to provincial regulations with respect to liquid waste proposes new measures for effluent treatment and reduction at source.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Oil and grease

The Chimiotox index gauges the load of all toxic substances present in industrial effluent, using the toxicity factor assigned to each substance. 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 monitoring characterization data gathered in December 1992 pursuant to requirements, as well as the Chimiotox indices estimated from those figures, for an effluent flow of 12 793 m^3/d. In testing for more than 120 substances, 13 were found. The figures show a predominance of oil and grease in the treated wastewater. Total oil and grease make up 89% of the Chimiotox value, followed by arsenic (4%), cyanide (3%) and total phosphorus (2%).

Figure 1 is plotted from the characterization data for 1989, 1990 and 1992. Depending on the time of year, the plant refines light or heavy fractions. The characterizations of November 1989 and February 1990 relate to the refining of light and heavy fractions, respectively. The Chimiotox value for the period 1988-1991 is the average of the two samplings. Since the process remained unchanged during that period, the same value was used. The Chimiotox indices from 1993 to 1995 are projections extrapolated from the 1992 characterization data. The 81% drop in the index between 1990 and 1992 was achieved through improved performance of the wastewater treatment system.

Table 1 ***Chimiotox Index (1992) - Petro-Canada, Montreal refinery****

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Total Oil and Grease	246.510	100	24 651
Arsenic	0.020	57 143	1 143
Cyanide	3.550	200	710
Total phosphorus	13.080	50	654
Di-n-butylphthalate	1.112	250	278
Bis-(2-ethylhexyl)phthalate	0.049	1 667	82
Ammonia Nitrogen	73.870	0.8	59
Selenium	0.190	200	38
Iron	10.400	3	35
Nitrites-Nitrates	3.940	5	20
Zinc	0.260	9	2
Xylenes (o, m and p)	0.066	25	2
Acenaphthene	0.005	333	2
CHIMIOTOX INDEX			**27 675**

* For effluent discharge of 12 793 m^3/d (13 substances detected in testing for more than 120).

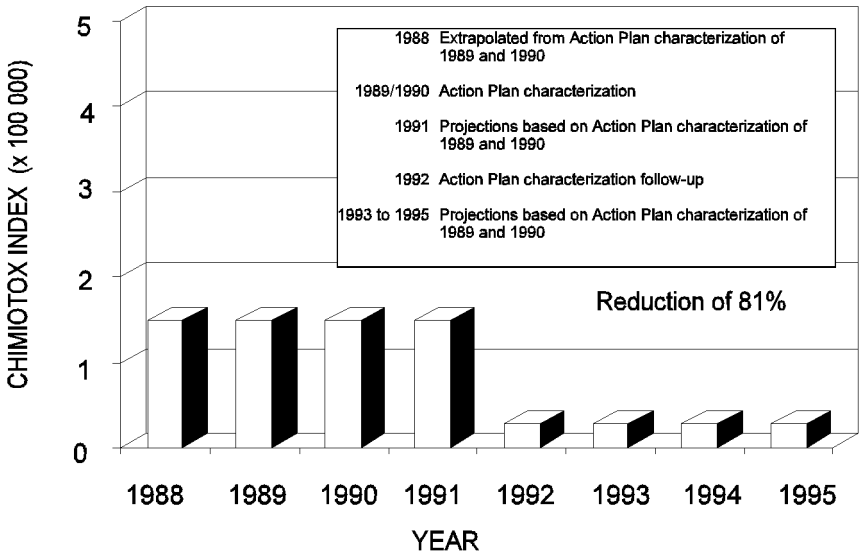

Figure 1 ***Changes in toxic effluent discharges, 1988 - 1995 - Petro-Canada***

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

No persistent toxic substance detected in 1992

One long-range objective of SLV 2000 is the virtual elimination of 11 persistent bioaccumulative toxic substances from the river 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.

Although benzo(*a*)pyrene was observed during the 1990 characterization study, none of the designated substances was detected in the effluent discharge during the most recent (1992) characterization.

PEEP TOXICITY REDUCTION

Low toxicity

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. Two series of bioassays were conducted for the PETRO-CANADA refinery in Montreal. The 1992 PEEP index of 3.9 compared closely with the 1990 index. It was among the lowest of the PEEP indices found for the 50 plants.

REDUCTION IN SUBSTANCES MONITORED

Significant reduction in oil and grease

Based on company data, in 1995 the refinery had an average effluent discharge of 8810 m^3/d containing:

- 237 kg/d of suspended solids (SS)
- 137 kg/d of ammonia nitrogen
- 70 kg/d of oil and grease (O&G)
- 1.53 kg/d of phenols
- 0.38 kg/d of sulphides

Between 1988 and 1995, company data show a 42% reduction in SS discharges, while O&G discharges were cut by 65%. These reductions are attributable to water conservation and pollutant control at source, the commissioning of new equipment (sludge box, bypass tanks, etc), separate disposal of stormwater, and rigorous operation of the wastewater treatment plant.

KEY POINTS

- **In 1990-1991, $20 million investment to optimize the secondary treatment system**
- **81% reduction in the Chimiotox index**
- **65% drop in o&g and 42% drop in ss between 1988 and 1995**
- **Compliance with the regulations in effect**

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.

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