FACT SHEET No. 17

Pratt & Whitney Canada Inc., Plants No. 1, 2 and 5

1000 Marie-Victorin Road

Longueuil, Quebec

J4G 1A1

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. PRATT & WHITNEY-CANADA INC.'s plants No. 1, 2 and 5, located in Longueuil and Saint-Hubert, are 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

Manufacturing and maintenance of aircraft engines

PRATT & WHITNEY CANANA INC.'s plants No. 1 and 2, located in Longueuil, manufacture high-performance engines for the aeronautical industry, along with gas turbines for various marine and land applications; their principal activity is parts machining. The machining involves cleaning (washing and degreasing), surface treating (plating, blasting), painting, inspection and assembly operations. In addition, engines are put through a series of tests. In 1995, the two plants had a combined annual production capacity of 2400 new engines, and operated at 50% of capacity.

Plant No. 5, in Saint-Hubert, overhauls and repairs engines. The engines are dismantled and the parts are subjected to various operations: cleaning, sandblasting, non-destructive tests, plasma coating, plating, other types of blasting, painting and inspection. The overhauled engines then undergo a series of tests. In 1995, plant No. 5 had the capacity to overhaul 1500 engines per year and operated at 67% of capacity. The three plants have a combined work force of 6200.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Hydrochloric acid
- Nitric acid
- Chromic acid
- Phosphoric acid
- Alkaline cleaning products
- Nickel, chromium and copper alloys
- Cyanide compounds
- Caustic soda
- Ethylene glycol
- Preservation oils and other materials

FINISHED PRODUCTS

- Gas turbines and related parts
- Spare parts
- Overhauled engines

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

O&G and heavy metals

According to monthly company data, in 1988 the combined effluent of the three plants was about 6921 m^3/d, containing:

- 90 kg/d of suspended solids (SS)
- 25 kg/d of oil and grease (O&G)
- 2 kg/d of heavy metals

RESOURCES AND USES TO PRESERVE

Provincial park and animal species

The effluents from the PRATT & WHITNEY CANADA INC. plants are discharged into the Saint-Hubert and Longueuil sewage systems. Since June 1992, the effluents have been sent to the south shore wastewater treatment plant on Charron Island, which releases the treated wastewater into the shipping channel north of the Island. Ile Verte, about 1 km downstream from the stormwater retention basin, is surrounded by weed beds and provides a key nesting site for ducks. The Boucherville Islands Provincial Park also contains important duck nesting areas and serves as a staging site for Canada geese in the spring. The area is home to muskrats and comprises spawning and nursery areas for several fish species. As well, the Boucherville islands are a popular recreation spot.

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 treatment methods which best promote environmental protection. In the case of PRATT & WHITNEY CANADA INC.'S PLANTS No. 1, 2 and 5, there are no water quality based objectives because the company's effluent is discharged into the municipal sewer system.

EFFLUENT TREATMENT

Each plant has a treatment system

Each of the three PRATT & WHITNEY CANADA INC. plants has a wastewater treatment system. At plant No. 1, an ultrafiltration unit treats water from the engine test cells and, since December 1993, the effluent from the Steam Jenny in plants No. 1 and 2 as well. A portion of the concentrated solutions from plant No. 1 is transported to plant No. 5 to undergo ultrafiltration. The rinse water is emptied into the municipal sewage system untreated.

At plant No. 2, regeneration products from the feedwater deionization system are neutralized. The industrial wastewater is discharged directly into Longueuil's combined sewer.

The wastewater treatment system in plant No. 5 performs a number of operations: destruction of cyanide compounds, reduction of hexavalent chromium and chromate-bearing rinse water, precipitation of metals, microfiltration (elimination of residual metals), ultrafiltration (elimination of organic compounds), elimination of oil and grease, pH control and sludge dewatering. The treatment system was installed in 1994 following the issue of a certificate of authorization.

Whereas the cooling water from plant No. 1 is discharged into the St. Lawrence River through the storm sewer, the cooling water from plants No. 2 and 5 is sent to the south shore wastewater treatment plant via the Longueuil and Saint-Hubert sewage systems. The sanitary wastewater from all three plants is discharged into the sewage systems of the two cities, and goes to the south shore treatment plant.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

Retrofit of the facilities

Since December 1993, the Steam Jenny effluents from plants No. 1 and 2 have been combined with the test cell effluent. Wastewater now undergoes ultrafiltration and is routed to the south shore treatment plant. As a result of a retrofit of the facilities, the effluents are now separated and pollutant levels have been reduced in the wastewater discharged into the St. Lawrence.

Since February 1994, the ultrafiltration effluent from plant No. 5 has been directed to the final pH equalizing basin. This modification has increased treatment efficiency by eliminating dilution.

The closure of the propeller shop in plant No. 2 has resulted in a reduction in the volume of wastewater emptied into Longueuil's combined sewer. In addition, upgrading work on the production lines in plant No. 1 will reduce the amount of cooling water discharged into the St. Lawrence.

REGULATORY COMPLIANCE - WATER COMPONENT

Compliance with standards

Plants No. 1 and 2 of PRATT & WHITNEY-CANADA INC. are governed by the by-law respecting discharges into the Longueuil sewage system, while plant No. 5 is governed by the corresponding by-law for Saint-Hubert. All three plants comply with the standards set out in these by-laws.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Mostly oil and grease

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 1991 and 1994, as well as the Chimiotox values estimated from those figures, for an effluent flow of 3268 m^3/d. Two Action Plan characterization studies were carried out on effluents from the PRATT & WHITNEY INC. plants, one in 1991 on all three plants and a follow-up one in 1994 on plants No. 1 and 5 only. For plant No. 2, the 1991 characterization data were used, while for plants No. 1 and 5, the 1994 data were used. In testing for more than 120 substances, 9 were found. The data show a predominance of oil and grease in the treated wastewater. Oil and grease make up 85% of the Chimiotox index, followed by total chromium, cadmium and total mercury, with 6%, 4% and 3%, respectively.

Figure 1 is plotted from the 1991 and 1994 Action Plan characterization data. The 1991 characterization data were used to build indices for 1988, 1989 and 1990, by factoring in monthly company data for oil and grease from plant No. 1. The index calculated from the 1991 Action Plan characterization data was used for 1992 and 1993 also. The 81% drop in the Chimiotox index between 1988 and 1994 is due to the installation of an ultrafiltration system in plant No. 1 and a treatment system in plant No. 5, and the retrofit of the treatment systems in plants No. 1 and 5. The 1994 Chimiotox index was also applied to 1995.

Table 1 ***Chimiotox Index (1991 and 1994) - Pratt & Whitney Canada Inc., plants No. 1, 2 and 5****

Substance	Load (kg/d)	Toxic ponderation Factor	Chimiotox Units (CU)
Total Oil and Grease	6.287	100	629
Total Chromium	0.090	500	45
Cadmium	0.033	909	30
Total Mercury	1.259×10^{-04}	166 667	21
Total Cyanides	0.046	200	9
Iron	0.981	3.3	3
Nitrites-Nitrates	0.651	5	3
Ammonia	0.615	0.8	<1
Zinc	0.004	9.4	<1
CHIMIOTOX INDEX			**741**

* For effluent discharge of 3268 m^3/d (9 substances detected in testing for more than 120).

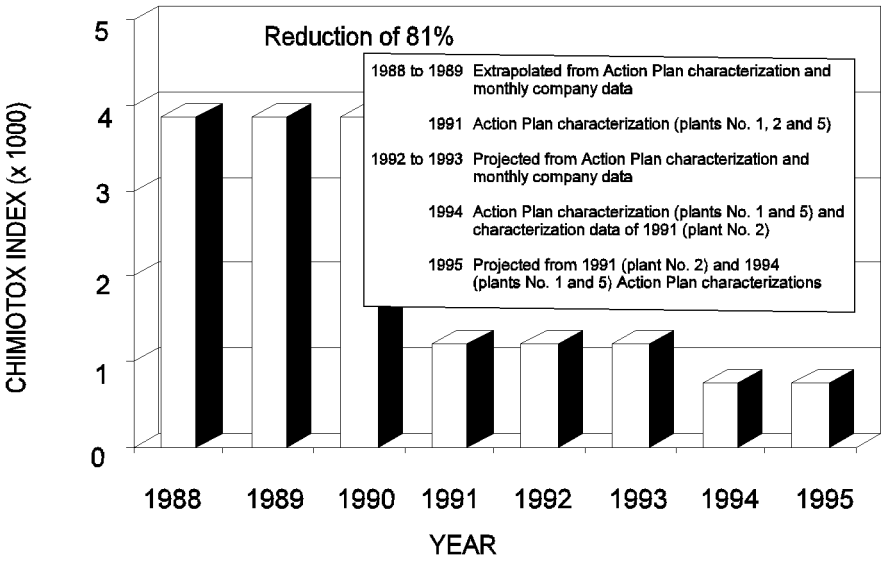

Figure 1 ***Changes in toxic effluent discharges, 1988-1995 - Pratt & Whitney Canada Inc., plants No. 1, 2 and 5***

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

Mercury 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.

At the time of the 1991 study, only mercury was detected, with a load of 0.164 g/d.

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. In the case of the PRATT & WHITNEY CANADA INC. plants, in Longueuil and Saint-Hubert, one series of bioassays was conducted for each plant. The 1991 PEEP value was 2.3, one of the lowest found among the 50 plants.

REDUCTION IN SUBSTANCES MONITORED

Reduction in flow and concentrations of metals

According to company data and the follow-up characterization date, in 1995, the three plants had a combined discharge of 2938 m^3/d of effluent, containing:

- 27.23 kg/d of oil and grease (O&G)
- 0.105 kg/d of copper
- 0.016 kg/d of nickel
- 0.013 kg/d of cadmium

Between 1988 and 1995, the effluent discharge rate dropped by 57%. The heavy metals load decreased significantlys mainly due to the ultrafiltration unit, brought on stream in 1990, and the physicochemical treatment system, installed in 1994.

TECHNOLOGICAL DEVELOPMENT

Participation in developing heavy metal treatment technology

PRATT & WHITNEY CANADA INC. participated in a project undertaken by Thermonic Inc. to develop and apply a new heavy metal treatment technology. This involved testing Thermonic's technology to remove and recover heavy metals from surface-treatment and metal processing effluents. Recovery of heavy metals entails the use of electrolysis in the case of zinc, copper and lead, and a concentrated solution for chromium. The testing began in March 1990 and ended in March 1993. The total cost of the project was $1 million.

KEY POINTS

- **81% reduction in the Chimiotox index**
- **Installation of an ultrafiltration unit in 1990 and a physicochemical treatment system in 1994**
- **Retrofit of wastewater treatment facilities at plants No. 1 and 5**

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.

Records officer at the Ministère de l'Environnement et de la Faune du Québec (MEF): Ana Lopez (514) 928-7607.

Environment officer at PRATT & WHITNEY CANADA INC., plants No. 1, 2 and 5: Frank Parrot (514) 647-6878.

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