

FACT SHEET No. 20

Albright & Wilson America Limited

2772 Marie-Victorin Road

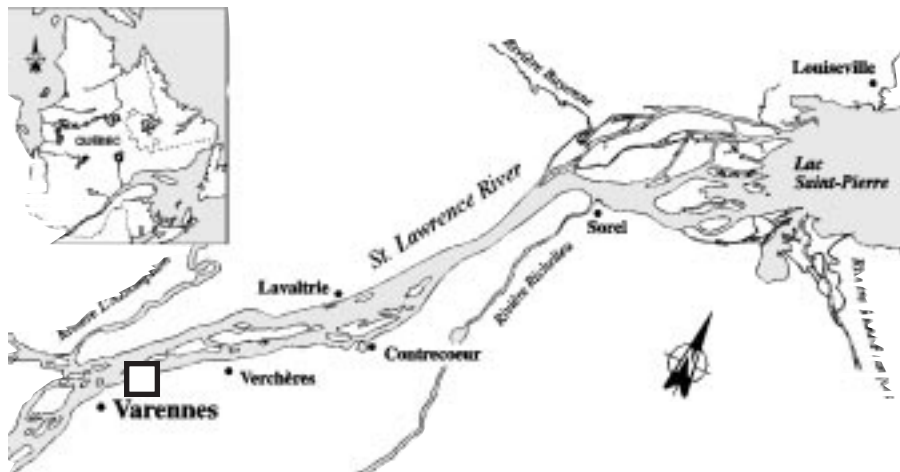
Varennnes, Quebec

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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 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 ALBRIGHT & WILSON AMERICA LIMITED plant, located in Varennnes, 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

Production stopped, distribution continues

The ALBRIGHT & WILSON AMERICA LIMITED plant in Varennnes stopped making elemental phosphorus in October 1993. Up to then, it used electric-arc furnaces to transform phosphate rock, coke and silica into elemental phosphorus and solid silicates. The process sludge was clarified, filtered and distilled to optimize phosphorus production. Since shutdown of the production facilities, activity has been confined to the distribution of phosphoric acid and briquest ADPA-60 AW. In 1995, the plant had a work force of 25.

PRODUCTION

Before closing

PRINCIPAL RAW MATERIALS

- Phosphate rock
- Coke
- Silica

FINISHED PRODUCT

- Food-grade elemental phosphorus

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

Mostly phosphates

According to company data, in 1988 the plant had an average effluent discharge of 5414 m³/d, containing:

- 2752 kg/d of phosphates
- 1300 kg/d of fluorides
- 782 kg/d of ammonia
- 26 kg/d of cyanides

RESOURCES AND USES TO PRESERVE

A commercial fishing area

The ALBRIGHT & WILSON AMERICA LIMITED plant discharges its wastewater into the St. Lawrence, 1.5 km above Cap Saint-Michel. The river section between Montreal and Lake Saint-Pierre is a choice environment for Lake sturgeon, a valuable commercial species. The bay at Cap Saint-Michel is vital to the populations of Lake sturgeon between lakes Saint-Louis and Saint-Pierre. The area also contains large spawning grounds for several fish species. The municipality of Verchères draws its water from the river, about 10 km below Varennes' industrial park.

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 ALBRIGHT & WILSON AMERICA LIMITED are available on request.

EFFLUENT TREATMENT

Physicochemical treatment until production stopped

Prior to 1993, gas condensation for the transformation process produced liquid phosphorus, "phosphorous liquor," and an intermediate by-product called "phosphorous sludge." Wastewater from all sources, with the exception of runoff, was circulated to clarifiers, then released to the river through the main plant sewer. Basically, treatment consisted of buffering and clarifying the wastewater. That produced "phosphorous mud," which was all returned to the distilling shop. Although the plant entered into a wastewater treatment program (PAE) in 1990, the treatment systems were shut down along with the final production units in October 1993. In 1994, wastewater included floor wash water, water from the pump gaskets and site runoff, all discharged untreated into the river.

PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

Production unit shutdown and site restoration

In 1990, the plant took a number of measures under the wastewater treatment program (PAE), one being the installation of a closed-circuit setup for the silicate-pit cooling system. From June 1992 until all production units stopped operating in 1993, the metal parts from the disassembled units were decontaminated in the distilling unit. During that decontamination phase, the distilling unit and rainwater from the plant site made for a discharge of some 250 m³/d of wastewater to the river. The distilling unit was shut down once the plant had been fully dismantled. In 1994, ALBRIGHT & WILSON AMERICA LIMITED began drafting plans and specifications for restoration of the Varennes site. Upon completion of that work, which began in 1995, discharge will be evaluated to determine the need for a water treatment system.

REGULATORY COMPLIANCE - WATER COMPONENT

New standards to be negotiated

Certain requirements of the wastewater treatment program implemented in 1990 became obsolete when production ceased. New standards will have to be negotiated for the restored site.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Smaller loads after production shutdown

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 1989, as well as the Chimiotox values estimated from those figures, for an effluent flow of 6801 m³/d. In testing for more than 120 substances, 17 were found. The figures show a predominance of total phosphorus in the treated wastewater. Total phosphorus makes up 90% of the Chimiotox index, followed by elemental phosphorus (4%), cyanides (3.5%) and arsenic (1%).

Figure 1 is plotted from the 1989 characterization data, which were used to extrapolate Chimiotox indices for the period 1988-1992 after adjustment to reflect monthly company data. The 1993-1995 indices are projected from the 1989 characterization, adjusted for shutdown of the phosphorus production shop in 1992.

The treatment measures begun in 1990 and the drop in production as of 1991 lowered the Chimiotox index by 70% between 1988 and 1992. Looking at the period 1988-1993, cessation of all production activity at the plant reduced the index by 98%.

Table 1 *Chimiotox Index (1989) - Albright & Wilson America Limited**

| Substance | Load (kg/d) | Toxic Weighting Factor | Chimiotox Units (CU) |
|-----------------------------|-------------|------------------------|----------------------|
| Total Phosphorus | 2 793.000 | 50 | 139 650 |
| Elemental phosphorus | 0.600 | 10 000 | 6 000 |
| Cyanides | 28.000 | 200 | 5 600 |
| Arsenic | 0.022 | 57 143 | 1 262 |
| Mercury | 0.004 | 166 667 | 731 |
| Ammonia Nitrogen | 607.000 | 0.8 | 486 |
| Zinc | 13.423 | 9 | 127 |
| Di-n-butylphthalate | 0.424 | 250 | 106 |
| Di-n-octylphthalate | 0.021 | 5 000 | 104 |
| Total Phenols | 0.471 | 200 | 94 |
| Copper | 0.130 | 424 | 55 |
| Bis-(2-ethylhexyl)phthalate | 0.016 | 1 667 | 26 |
| Iron | 5.833 | 3 | 19 |
| Butyl benzylphthalate | 0.004 | 5 000 | 18 |
| Cadmium | 0.013 | 909 | 12 |
| Nickel | 0.121 | 10 | 1 |
| Naphthalene | 0.005 | 34 | <1 |

CHIMIOTOX INDEX

154 292

* For effluent discharge of 6801 m³/d (17 substances detected in testing for more than 120).

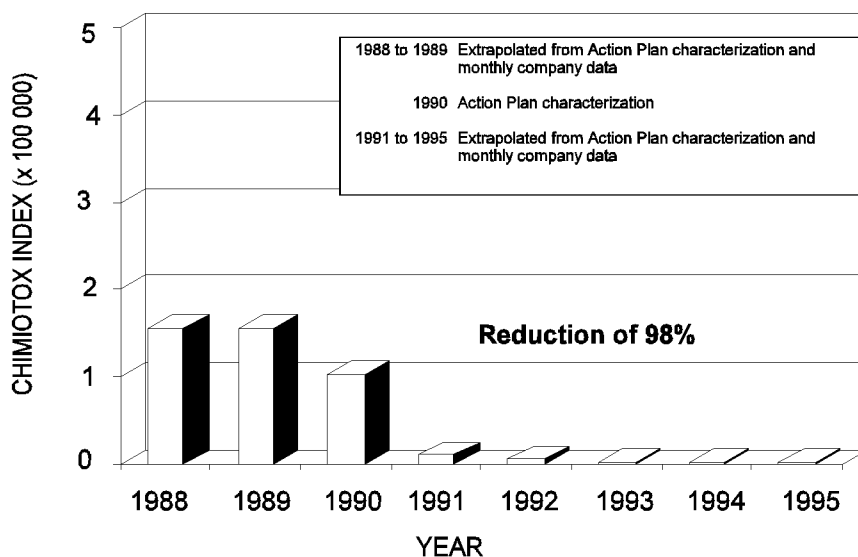


Figure 1 *Changes in toxic effluent discharges, 1988-1995 - Albright & Wilson America Limited*

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

Presence of mercury to be confirmed

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.

Some mercury was detected (0.004 kg/d) during the 1989 Action Plan characterization study. According to projections based on the study findings, shutdown of the phosphorus production shop could be expected to eliminate all mercury from the effluent. The SLV 2000 monitoring characterization to be conducted once the plant site has been restored will determine whether or not mercury is still present and provide guidelines for virtual elimination of that toxic substance.

PEEP TOXICITY REDUCTION

Average 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. One series of bioassays was conducted for the ALBRIGHT & WILSON AMERICA LIMITED plant in Varennes. The 1990 PEEP index was estimated at 4.8, in the average range of the PEEP indices found for the 50 plants.

REDUCTION IN SUBSTANCES MONITORED

Significant reductions

According to company data, in 1995 the average effluent discharge (from the plant and the creek running through the property) was 558 m³/d, containing:

- 5.6 kg/d of phosphates
- 4.76 kg/d of fluorides

From 1988 to 1995, the phosphate load dropped by 99.8% and the fluoride load by 99.6%. Ammonia and cyanides have not been detected since the production units were decommissioned in 1992.

KEY POINTS

- 98% reduction in the Chimiotox index
- Shutdown of the phosphorus production unit in 1992
- Beginning of site restoration in 1995

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):** Odette Picard (514) 928-7607.

**Environment officer at ALBRIGHT & WILSON
AMERICA LIMITED:** Frank J. Crocker
(514) 652-2911.

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