

CONFIDENTIAL

REPORT FOR RESPONDENTS TO

ESSO CHEMICAL PVC QUESTIONNAIRE

Submitted by:

O'Connor Associates Environmental Inc.

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Esso Chemical Canada in conjunction with O'Connor Associates Environmental Inc. has synthesized the data obtained from the "Level 1 Questionnaire" distributed to PVC producers in the United States, United Kingdom and Europe. The enclosed summary is for your perusal, and represents Esso's commitment to inform the respondents of the results on a confidential basis.

1.0 OVERVIEW OF REGULATORY PRACTICES

1.1 UNITED STATES AND CANADA

For regulation of vinyl chloride emissions the majority of U.S. jurisdictions still follow NESHAP Regulations; however, an increasing number of states are adopting more stringent air emission standards as a condition of permit approval. The manner in which standards for toxic substances are being enforced varies; available data are summarized on Drawing No. 1.1. It is evident from this figure that existing sources are subject to less stringent regulatory programs relative to new/proposed sources. For carcinogens, the control approach most frequently identified by STAPPA and ALAPCO utilizes a combination of control technology requirements, acceptable ambient levels and risk assessment. The principle method for implementing these programmes throughout the United States is the permitting process.

Our discussions with various state and local air pollution control officials indicate a wide variance in interpretation of how PVC plants should be monitored. The majority of States with operating PVC plants have yet to impose ambient air quality standards (AAQS). On the other hand, at least 12 states have daily or long term ambient air quality standards or guidelines for vinyl chloride which would be thought of as stringent.



Within this group, only 1 state has a plant which is subject to the AAQS, 2 states have plants which are exempt from these standards ("grandfathered"), and the remaining 9 states have no PVC producers. One aspect of this trend is that the stringent regulations may become a deterrent to industry establishing PVC plants in these states.

In Canada, the federal Vinyl Chloride National Emission Standards Regulations became effective July 1, 1979, under Canada's Clean Air Act. These regulations establish the point source limitations for vinyl chloride emissions; however, no emissions from fugitive sources are included under the CAA. Based on re-drafted regulations under the Canadian Environmental Protection Act (Canada Gazette Part 1, Sept. 30, 1989), this situation appears unlikely to change. Nonetheless, there is a Canadian "Code of Good Practice" which is designed to minimize fugitive emissions from the plant.

The Ministry of Environment in Ontario has proposed interim AAQC and POI concentrations of vinyl chloride* as follows:

- 3 ug/m ³	0.5 hr POI
- 1 ug/m ³	24 hr average AAQC
- 0.2 ug/m ³	annual average AAQC

Our analysis of jurisdictions in Europe, North America and Australia indicate that these interim standards, if promulgated, will be the most stringent in the world.

*1 ug/m³ = 2.57 ppb at STP.



Quebec and Alberta, the only other provinces in Canada with PVC producing facilities, follow Federal Regulations Table 1.1 , although Quebec has recently established an ambient air guideline which is not as stringent as proposed by Ontario.

1.2 UNITED KINGDOM AND EUROPE

Regulatory authorities in the United Kingdom use the BACT (Best Available Control Technology) approach without ambient air quality guidelines. As in North America, there are limits for emissions released during reactor openings and following stripping. Of interest is the provision to make some allowance in standards based on the heat sensitivity of certain suspension grades.

In Europe the regulatory approach is undergoing legislative changes, and the most comprehensive regulations at present appear to be embodied in the German (GFR) TA-Luft, promulgated in 1986. These regulations appear to be destined to be adopted in several other countries. From the ambient air quality perspective, the only country with any guideline is the Netherlands.

1.3 JAPAN AND AUSTRALIA

Emission regulations are still under development in Japan, although industry stewardship is in place through the Japanese PVC Association. In Australia, the vinyl chloride regulations appear to be patterned after the EPA in the United States. Ambient fence line monitoring requirements have been set for the 1 plant for which Esso Chemical Canada was able to obtain data.



2.0 SURVEY RESULTS

Questionnaires were circulated to PVC manufacturers in North America and Europe* resulting in a total of 17 responses. In the United States the Toxic Release Inventory (TRI) List was used as a means of scanning those companies reporting significant vinyl chloride emissions to the EPA. A total of 12 responses were received from the United States, spanning the spectrum of small to large PVC producers (20 kT to 380 kT PVC annual production). Four responses were received from European producers, and 1 of these was indicated to be representative of a large number of plants owned by the same company in 4 countries.

2.1 AMBIENT/PROPERTY-LINE AIR QUALITY AND COMPLIANCE

- Two companies indicated that AAQS limits (standards) were established and enforced by the regulatory authorities through fenceline monitoring.
- An additional 2 companies indicated that AAQS guidelines were established and enforced through permitting using dispersion modelling.
- One country has a stringent annual "strive value", monitored periodically by the government.
- A total of ten companies indicated that their plants were subjected to some form of fenceline monitoring (periodically or continuously) and/or dispersion modelling (based on risk analysis factors) to demonstrate compliance or renew permits.

*Including the United Kingdom.



2.2 EMISSIONS AT SOURCE

- All respondents indicated that they were normally compliant with the existing regulations.
- Ten companies indicated they were required to demonstrate compliance continuously (mostly for recovery vents). Several indicated they were only asked to demonstrate compliance "on demand", "only during permitting", "quarterly" or "semi-annually".
- Six companies indicated that in order to compare plant performance to the regulated limits, VCM emissions were determined by direct measurement of concentrations and flow rates. The remainder indicated that flow rates were estimated.
- In terms of gauging the need for technology change in response to new regulations, North American companies either had not assessed the impact of such changes, or indicated that they believed technology changes were not required. In contrast, all European respondents indicated that some technology changes would be required.

2.3 CONTROL TECHNOLOGIES

2.3.1 Reactor Openings

- Eleven companies indicated they used closed reactors in combination with antifoulant technology.
- Ten companies indicated that reactor opening emissions were controlled by steam sweeping.



- Six North American companies incinerated the reactor ventilation stream, whereas none of the European respondents used this technology.

2.3.2 Slurry Stripping and Post Stripping Technologies

*MACT
has no come!*

- ~~Continuous steam-stripping towers were employed by all respondents except 2.~~
- A variety of downstream technologies were employed including incineration of slurry blend tank vents (3), air stripping (2) or containment (1). Eight respondents indicated that no post-stripping technologies were employed.

2.3.3 Recovery System Venting

- Eight companies utilize refrigerated condensers, 6 of these in combination with incineration of the vent stream, and 2 in combination with absorbers.
- Four companies use only incineration technology, and 3 companies use absorbers exclusively.

3.0 TOXIC CHEMICAL RELEASE INVENTORY (TRI) DATA

The Toxic Chemical Release Inventory (TRI) data provide a basis for determining the performance of PVC producers in the United States. Despite some inherent differences in the manner in which such numbers may have been generated, the emissions data offer a first basis for comparing plant performance.

In order to normalize the data, we have ratioed the total emissions reported (in kg) on an annual basis as submitted to TRI over the annual capacity (in metric tonnes) of the



plant as reported by the Digest of Polymer Development. The plant capacities reported in this document matched closely the capacities reported by respondents to the questionnaire.

These ratios, designated by O'Connor Associates as the "TRI Factors" are plotted on the accompanying Figure. Your plant has been highlighted in colour to give you a relative measure of performance. Note that the proportions of suspension, emulsion, solution or bulk product are based on figures quoted in the Digest of Polymer Development, and may not be totally accurate.

Respectfully submitted,

O'CONNOR ASSOCIATES ENVIRONMENTAL INC.

L.W. Curtis, Ph.D.



TABLE 1.1

AMBIENT AIR QUALITY VINYL CHLORIDE

GUIDELINES OR STANDARDS ($\mu\text{g}/\text{m}^3$)

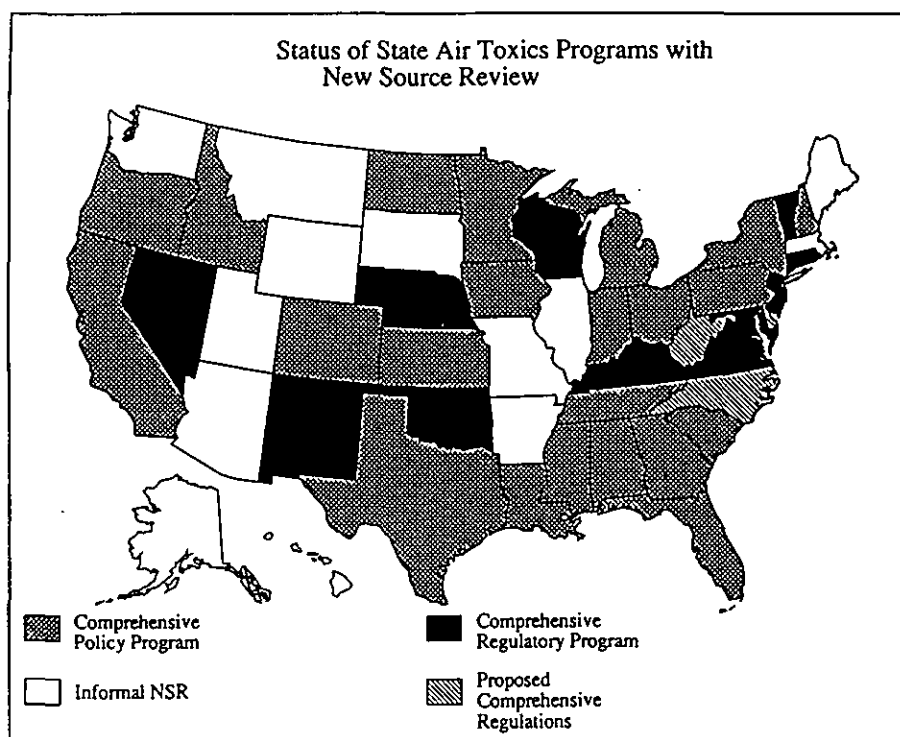
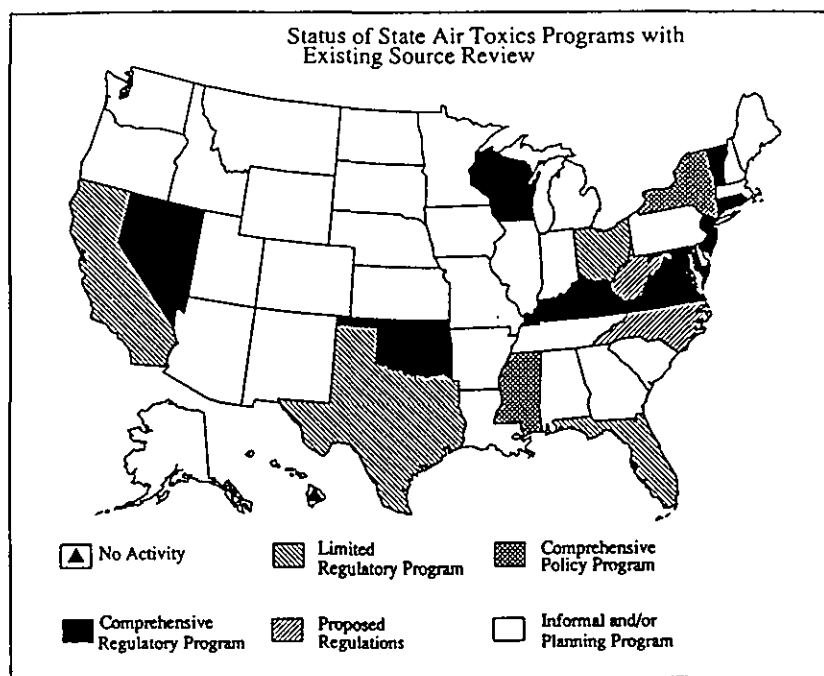
UNITED STATES AND CANADA

<u>Jurisdiction</u>	<u>Status</u>	<u>Short Term</u> <u>($\leq$ 1hr)</u>	<u>Daily</u> <u>($\leq$ 24 hr)</u>	<u>Long Term</u> <u>(Annual)</u>	<u>VCM/PVC</u> <u>Plant</u>
California ¹	S		24 hr 26		Yes ¹
Connecticut			8 hr 50		No
Kansas				3.85	No
Massachusetts			24 hr 3.90		No
Michigan	G			0.4	No
North Carolina	G			0.38	No
Nevada			8 hr 238		No
New York	G			0.4	Yes ²
Pennsylvania	G			6.18	Yes ²
South Carolina			24 hr 50		No
South Dakota			8 hr 50		No
Vermont				0.2	No
Virginia			24 hr 1		No
Quebec	G	0.25 hr 150	8 hr 50		Yes
Ontario	IS	0.5 hr 3	24 hr 1	0.2	Yes ³
	G	0.5 hr 560	24 hr 280		

1. Guideline enforced; jurisdiction is SCAQMD, Rule 1163-1.
2. Guideline not enforced on existing VC/PVC plants.
3. Proposed change to guideline/standard.

S Standard
G Guideline
IS Interim Standard





Status of Air Toxic Programs
United States

O'CONNOR ASSOCIATES

JOB NO. : 10.1293

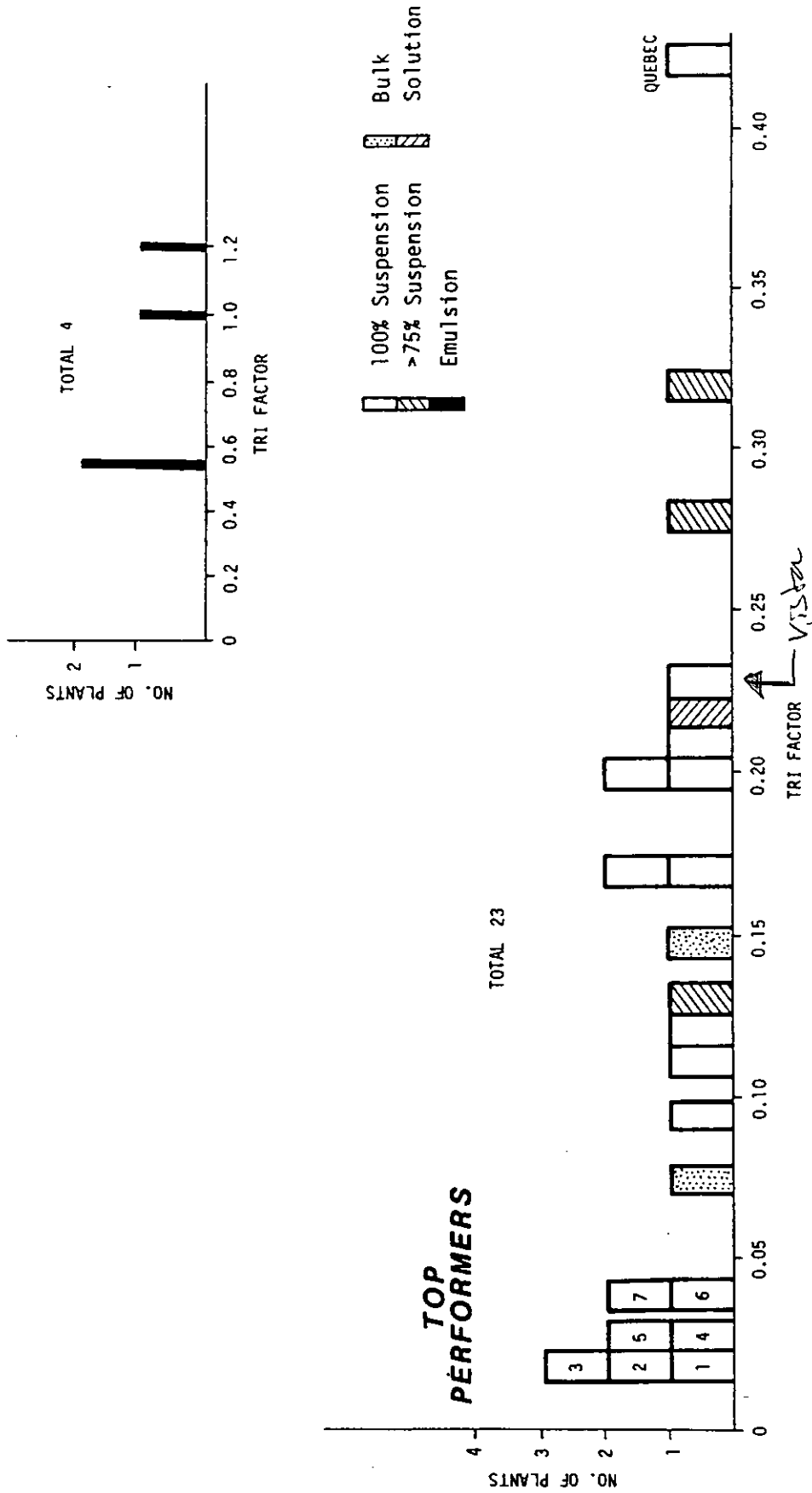
DATE : 90/03/30

DRAWN BY : LWC

DWG. NO. : 1.1

TOXIC RELEASE INVENTORY (TRI) DATA, NORMALIZED TO CAPACITY FOR UNITED STATES' PVC PLANTS

1987-1988



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VCM
Emission Data
United States

TRI FACTOR = VCM(kg)/Capacity(metric tonnes)

JOB NO.: 10.1293

DATE: 90/03/30

DRAWN BY: LWC

DWG. NO.: 1.2