

THE SOCIETY OF THE PLASTICS INDUSTRY OF CANADA
LA SOCIÉTÉ DES INDUSTRIES DU PLASTIQUE DU CANADA
1262 DON MILLS ROAD, SUITE 62, DON MILLS, ONTARIO M3B 2W7 TELEPHONE 449-3444

October 7, 1974.

Dr. V. L. Tidey,
Acting Director,
Occupational Health Branch,
Ontario Ministry of Health,
15 Overlea Blvd.,
Toronto, Ontario.

Dear Sir:

The Canadian VCM/PVC Industry "Ad Hoc" Committee has reviewed the vinyl chloride data sheet draft number 5 prepared by the Occupational Health Branch, Ontario Ministry of Health.

The Committee has a number of comments and suggestions (attached) for your consideration in preparing the final draft of this data sheet.

The Canadian VCM/PVC Industry "Ad Hoc" Committee was formed on May 31, 1974 and consists of technical representatives of Dow Chemical of Canada Limited, Esso Chemical Canada, B. F. Goodrich Canada Limited, and Monsanto Canada Limited who are knowledgeable in the technology of producing and handling of VCM and/or PVC.

This Committee acts under the auspices of The Society of the Plastics Industry (SPI) Canada and is active in the rapid communication of information which will assist the members in the early resolution of the VCM health problem, and in liaison with governmental and other agencies concerned with the VCM situation.

The activities of the "Ad Hoc" Committee do not restrict direct communication between the individual companies represented and the Ontario Ministry of Health or with other government agencies.

Our activities are intended to complement such direct communication and to assist the individual companies involved to implement the techniques essential to the resolution of the problem.

We believe that it is to the mutual advantage of the Ontario Ministry of Health and to the VCM/PVC industry and to the public that a document such as the subject vinyl chloride data sheet be factually accurate, effective in

....cont.

RSV 0000190

Dr. V. L. Tidey

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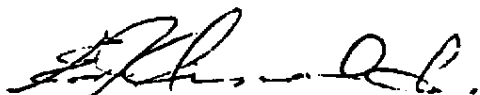
October 7, 1974.

controlling the health problem, concise and still remain technically feasible.

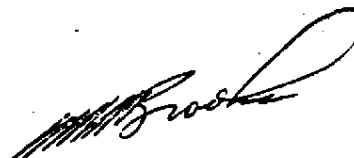
It is with this belief and in this spirit that we offer the attached suggestions for preparation of the final draft of this document.

Respectfully yours,

VCM/PVC "Ad Hoc" Committee



E. J. Arnold
Esso Chemical Canada



D. A. Brooks
B. F. Goodrich Canada Limited



R. S. Deakin
Monsanto Canada Limited



E. J. Sills
Dow Chemical of Canada Limited



E. R. Evason
The Society of the Plastics
Industry of Canada

Encl.

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MAN.

VCM DRAFT NO. 5

VINYL CHLORIDE MONOMER

DESCRIPTION

Vinyl Chloride Monomer (VCM) is made by oxychlorination of ethylene or by hydrochlorination of acetylene. It can be polymerised to form polyvinyl chloride or copolymerised with other monomers to form materials such as Saran.

It has been used in the United States of America, but not in Canada as a propellant in pressurized spray containers.

It is a colourless flammable gas at normal conditions of temperature and pressure but is usually transported and stored as a liquid under pressure (40 psig). It has a pleasant ethereal odour and is practically insoluble in water, but soluble in alcohol, ether and carbon tetrachloride.

Chemical Formula	CH ₂ = CHCl
Molecular Weight	62.5
Boiling Point	-13.37°C (8.9°F)
Density	2.55 gm/litre
Flash Point	-78°C (-108°F)
Auto Ignition Temp.	472°C (882°F)
Explosive Limits	2.5-69.9% by weight in air
con't.....2	

"Ad Hoc" Com.

RECOMMENDED CHANGES

DESCRIPTION ✓

Vinyl Chloride Monomer (VCM) is manufactured by thermal dehydrochlorination of ethylene dichloride or by hydrochlorination of acetylene. VCM can be polymerised to form polyvinyl chloride or copolymerised with other monomers to form copolymer plastic materials (eg's)

Delete sentence "It has been used.....spray containers".

VCM is a colourless flammable gas at normal conditions of temperature and pressure but it is usually stored and transported as a liquid under its own vapour pressure.

Boiling Point (760 mm Hg)	-13.37°C (7.9°F)
Density (Vapour)	2.15 (Air = 1.00)
(Liquid)	0.9121 g/ml 20/20°C
Explosive Limits	4-22% by volume in air

COMMENTS

The oxychlorination of ethylene does not produce VCM, per se.

Saran is only one copolymer of VCM and it is a registered Dow product trade name. We do not recommend its use as such in this document.

Spray cans using VCM as a propellant have been marketed and used in Canada. They have possibly not been packaged in Canada but we do not know this is true.

-13.37°C calculates +7.9°F

We recommend that both liquid density and vapour density be stated.

Explosive limits of 4-22% by volume in air is the standard value used in industry. Chemical Safety Data Sheet 6D-56.

RSV 0000192

Fig. 2 con't

OCCUPATIONAL EXPOSURE

Exposure to vinyl chloride may occur in the manufacture of the monomer and also in the polymerisation process. Loading and unloading of tank cars and tank trucks also presents an exposure risk. The polymerisation process is the main source of exposure especially when cleaning the polymerisation kettle. The polymer usually contains free VCM which is partially given off in the drying process, packaging operation and storage. Residual monomer may be given off during mixing, compounding and extrusion of polyvinyl chloride. Polyvinyl chloride decomposes on heating to form hydrochloric acid, carbon monoxide, phosgene and possibly other gases.

No VCM is produced when the polymer is decomposed. PVC products do not constitute any known health hazards.

SUPPLY

VCM is supplied in tank cars or trucks in liquid form.

HEALTH ASPECTS

Acute exposure at 1000 ppm or over has been reported to produce dizziness and confusion and may lead to unconsciousness with possible respiratory arrest.

con't.....3

OCCUPATIONAL EXPOSURE

Delete "Residual monomer.....other gases". Replace with: "The unreacted VCM if present in the PVC resin, is given off during mixing and compounding. In general only trace amounts of VCM are released during the extrusion or forming operation. Excessive heat leads to decomposition of PVC and the formation of hydrochloric acid gas, carbon monoxide and traces of other gases."

TRANSPORTATION

VCM is transported in dedicated tank cars and tank trucks as a liquid under its own vapour pressure, and by dedicated pipeline under pump pressure.

HEALTH ASPECTS

Acute exposure at 6000 ppm or over has been reported to produce dizziness and confusion and higher concentrations may lead to unconsciousness and possible death.

will be reviewed

Levels of residual VCM in PVC resins currently vary from zero to 1000 ppm, depending on the manufacturing process, handling and storage.

Decomposition of PVC does not occur under normal processing conditions.

In the event of fire or excessive heating, HCl gas is the main decomposition product which is readily detectable.

Phosgene may be generated in trace amounts but this requires rather special conditions. (See joint report of Task Group C, Manufacturing Chemists Association Safety and Fire Protection Committee, dated March 12, 1970.)

VCM must be stored and transported in the pure liquid state in the interest of safety, hence the phrase "under its own vapour pressure" is essential to any statement on storage and transportation.

The American Industrial Hygiene Association Hygienic Guide series reports:

"Based on 5 minute exposures of human subjects, it is estimated that prolonged exposure to a level above 6000 ppm is necessary to produce

Chronic exposure has been reported in a few cases to cause scleroderma - like skin changes, Raynaud's syndromes, vascular changes, acro-osteolysis, thrombocytopenia, splenomegaly, esophageal varices, liver fibrosis, and pulmonary ventilation disturbances.

VCM has been recently reported to be carcinogenic, with angiosarcoma of the liver occurring among a small number of polymerization workers. Acro-osteolysis has been reported as occurring in some manual cleaners of polymerizers.

THRESHOLD LIMIT VALUE

The American Conference of Governmental Industrial Hygienists recommendation for 1973 is 200 parts per million or 510 mg/M³. This is reported, subject to change, pending investigation underway.

For the present, the Occupational Health Protection Branch, Ontario Ministry of Health, is using a time-weighted average of 10 ppm during an eight hour day and a ceiling of 25 ppm which is not to be exceeded for any period of time.

PRECAUTIONS TO BE OBSERVED

ENGINEERING

1. Operations are to be carried out in closed systems whenever possible.
2. Those operations that cannot be contained are to be fully enclosed and provided with local exhaust.

con't.....4

*means for
eg. a hood*

*seals,
valves, etc. except since
normally contained*

After ".....manual cleaners of polymerization".
Add: "No cases of acro-osteolysis or angiosarcoma
have occurred among Canadian VCM and/or PVC workers"
are known to have

THRESHOLD LIMIT VALUES

For the present, the Occupational Health is proposing a time weighted average of 10 ppm during an 8 hour day and a ceiling level of 25 ppm as measured over a 15 minute time period.

PRECAUTIONS TO BE OBSERVED

ENGINEERING

Those operations that cannot be contained are to be fully enclosed or provided with adequate local exhaust.

minimal symptoms of intoxication". Symptoms with exposure to 16000 ppm are similar to those listed in Draft No. 5.

It is not technically feasible to adhere to a ceiling of 25 ppm which shall not be exceeded for any period of time.

Fifteen minutes is a realistic time period on which to base a ceiling standard compatible with the 10 ppm TWA standard.

Some segments of the industry will require a reasonable time period to implement process changes to achieve compliance.

The individual companies will review their programs and time tables with the Ontario Ministry of Health.

pg. 4 con't

3. PVC polymer storage areas are to be adequately ventilated.
4. Adequate mechanical general exhaust is to be provided in all process areas.
5. Entry into vessels (e.g. polymerization kettles) is to be done with adequate safeguards including wearing of air supplied respirators and full protective clothing. All other precautions for entering confined spaces are to be followed.
6. Monitoring of work areas is to be provided where potential high exposures may occur, depending on the severity of the potential exposure monitoring may be intermittent or continuous.
7. A carefully controlled maintenance program is to be carried out to reduce the possibility of leaks and spills to a minimum.
8. In clean up of spills or leaks, full protective clothing including air supplied respirator is to be worn.
9. During maintenance or repair work or any operation where a worker is liable to have high exposure, he is to wear full protective clothing including an air supplied respirator.
10. Emergency procedures are to be developed, including evacuation of personnel, for areas where it is possible to have a serious leak of VCM.
11. No food, drinks and tobacco are to be permitted in the exposure area.

con't.....5

4. Adequate ventilation is to be provided in all process areas. *maintain - as per.*

5. Entry into vessels.....including wearing of air supplied respirators (when the level of VCM in the vessel exceeds 10 ppm) and protective clothing.

*→ not impervious suits
eg. coveralls*

8. In clean up of spills or leaks, protective clothing and air supplied respirator is to be worn (where the level of VCM exceeds 10 ppm).

9. During maintenance.....he is to wear protective clothing and an air supplied respirator.

5. Air supplied respirators are currently being used for vessel entry where VCM level is above the threshold limit in use. The use of air supplied respirators should not be mandatory where VCM levels can be maintained below the new TWA of 10 ppm.

*5. May reverse statement and
make less restrictive*

8. Same as above.

9. Same as above.

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pg. 5 can't

12. No eating, drinking, chewing and smoking are to be permitted in the exposure area.
13. Safety showers and eye wash fountains are to be provided in VCM manufacturing, storage, loading and unloading and polymerisation areas.
14. For persons who handle PVC powder containing detectable levels of VCM or who are required to wear protective clothing, the following precautions may be required.
 - (a) A double locker system is to be provided such that:
 - (i) each worker has a locker for street clothes in a "clean" locker room and a locker for work clothes in a "dirty" locker room.
 - (ii) a shower is located between the two rooms so that each worker may take a shower before putting on street clothes.
 - (b) Each worker is to be required to wash before eating, drinking, smoking, or using toilet facilities and to shower at the end of his work shift.
 - (c) Laundry facilities are to be provided and each worker's clothes are to be laundered at least weekly. As an alternative, disposable work clothing could be used.

- This implies dirty dusty conditions to MOH.*
14. For persons who handle PVC powder containing significant levels of residual VCM or who are required to wear protective clothing, the following precautions may be requested.

- (a) Delete reference to dual locker rooms.
- (b) Each worker is to be encouraged.....at the end of his work shift

MEDICAL

The medical aspects and medical programs required are currently under discussion between the company industrial physicians and Ministry of Health staff physicians.

14. The problem is not residual VCM in the resin but relates to the VCM that emits into the breathing zone of the man handling the resin.

- (a) The dual locker arrangements are generally in use, and we concur with this arrangement (i.e. dual locker with a shower room adjacent).

We do not agree that dual locker rooms are necessary.

It would be feasible to require that dual locker room with showers between in a new facility to be built, however, to incorporate this feature into existing plants is not feasible unless absolutely essential which we question.