EPA

October 2, 1975
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To: Mr. J. M. Gilmore
Plant Manager

Subject: VCM Reduction Status.

Attached is a summary of O.S.H.A. and E.P.A. regulations and our Niagara Falls position in regard to these regulations. Also included are a status and a summary of our programs to reduce VCM in resin.

ACKNOWLEDGEMENT: J. F. Blickley and D. J. Snyder assisted in this preparation.

S. H. Karnaghan
Technical Superintendent

SHK:mw

Attachments

200013

I. O.S.H.A.

A. VINYL CHLORIDE O.S.H.A. STANDARD (FEDERAL REGISTER 1910.1017)

1. EXPOSURE LIMIT

1 ppm. averaged over 8 hour period.
5 ppm. averaged over period not exceeding 15 minutes.

2. MONITORING EMPLOYEE EXPOSURE

Establish program.
Repeat monthly monitoring over 1 ppm.
Repeat quarterly monitoring 0.5 - 1.0 ppm.
Discontinue when below 0.5 ppm.

3. ESTABLISH REGULATED AREAS (LIMITS IN 1. ABOVE)

Daily entry roster.
Written engineering and work practice methods.

4. RESPIRATOR PROTECTION REQUIRED

5. PROVIDE CONTINUOUS MONITORING AND ALARM SYSTEM

6. TRAINING REQUIRED ONCE/YEAR

Hazards and Precautions.
Health.
Emergencies.
Standards.

7. MEDICAL SURVEILLANCE REQUIRED

Physical every 6 months over 10 years service otherwise annually.

8. SIGNS AND LABELS REQUIRED

Regulated Areas.
Hazards - Emergencies.
Waste PVC.
Containers PVC and VC.

9. RECORDS REQUIRED

Monitoring and Measuring. Keep 30 years.
Medical - Employment +20 years. (30 years if longer)

10. REPORTS REQUIRED

To: O.S.H.A. Area Director.
Regulated Areas.
Number Employees in Areas.
Emergencies (Within 24 Hours).
Employee Exposure (10 Working Days).

200014

I. O.S.H.A. (Cont'd)

B. OVERALL TWA VC LEVELS (PPM) IN ENVIRONMENT

1946 - 1972		260.
1973		53.
1974	(January & February)	32.
1974	(April - May - June)	10.2
1975	(2nd September) (From 4,000 Points During 7 Days)	0.75
1974	To Feb	0.5

Older reactor building, included in above, was shut down at the end of 1974.

Included in 1975 figure are newer reactor building, VC unloading and transfer. Finishing building has been removed as a regulated area.

C. PERSONNEL EXPOSURE TO VCM REQUIRING RESPIRATOR PROTECTION

PERIOD	TOTAL MAN HOURS	MAN HOURS PER DAY
April, 1975 (11 Days)	69	6.3
September, 1975 (11 Days)	9	0.8

Difference due primarily to solvent cleaning of reactors rather than manual cleaning.

D. CARBON TUBE - PERSONNEL MONITORING 8 HOUR TWA (TIME WEIGHTED AVERAGE)

BASIS: 23 Employees

	% Tests ≤ 0.5 ppm	% Tests 0.5 - 1.0 ppm	% Tests > 1.0 ppm
December, 1974	87.0	13.0	0*
September, 1975	95.7	4.3	0*

*April 1 - September 16, 1975, had 6 tests > 1.0 ppm; however, none were in above test periods.

I. O.S.H.A. (Cont'd)

E. PROGRAMS IN EFFECT

1. VCM LEAK DETECTION OF EQUIPMENT

Four (4) Shift Monitors.
Bendix Chromatograph.

2. MONITORING PERSONNEL & AREAS

Carbon Tubes	8 Hour TWA
Bottle	15 Minute

3. OPERATIONAL CHANGES

Personnel Oasis in Reactor Area.
Closed Charging of Reactors.
Solvent Cleaning of Reactors.
Improved Slurry Stripping.
Warning System Activated > 5.0 ppm.
Emergency Ventilation.
Respirators Above 1.0 ppm Required.
Ventilation PVC Resin Laydown Area.
Emergency Procedures.

4. GENERAL

Training.
Medical Surveillance.
Records.
Reports.

II. E.P.A.

A. E.P.A. PROPOSED STANDARD FOR VCM EMISSIONS

1. LIMITS FOR EQUIPMENT UPSTREAM & INCLUDING STRIPPER

STANDARD	EMISSION EXAMPLES BY E.P.A.
a. 10 ppm Max. (One Hour Average)	1. Reactor Vents (Includes Reactor Opening). 2. Stripper Vents. 3. Mixing, Weighing, Holding Vessel Discharges. 4. Monomer Recovery Vent Condenser. 5. Vent of Any Control Device Used for Evacuating, Degassing, or Venting of Equipment. 6. Manual Venting of Equipment Containing VC. 7. In Process Waste Water if > 100 ppm.

II. E.P.A. (Cont'd)

A. E.P.A. PROPOSED STANDARD FOR VCM EMISSIONS (Cont'd)

1. LIMITS FOR EQUIPMENT UPSTREAM & INCLUDING STRIPPER (Cont'd)

	STANDARD	EMISSION EXAMPLES BY E.P.A.
b.	2% By Volume VC Max. in Equipment or Lines	1. Residual VC in Unloading Hoses Opened to Atmosphere. 2. Any Equipment > 50 Gallons in Volume Prior to Opening for Any Reason. (For Equipment < 50 Gallons, Pressure Must Be Reduced to 375 mm Hg Absolute.)
c.	No Discharge of VC (Except Emergency)	1. Relief Valve Leakage to be "Minimized" by Installation of Rupture Discs Between Equipment and Relief Valve.
d.	"Minimized" Emissions	1. Rotating and Reciprocating Pumps to be Equipped with Special Seals or Equivalant.* *Equivalent Equipment or Procedures must be Approved by E.P.A. Administrator Upon Written Application.

2. VC EMISSION LIMITS FOR ALL SOURCES DOWNSTREAM OF STRIPPER

a. 0.20 Pounds VC/100 Pounds Dry Product for Dispersion Resins

b. 0.04 Pounds VC/100 Pounds Dry Product for All Other PVC Resins

} Total Emission Limit for All Sources Following Stripper Including In-Process Waste Water.

However, emissions shall be considered in compliance if weighted average residual VC in all grades of resin after stripping on each calender day does not exceed:

1) 2,000 ppm for Dispersion Resins.
2) 400 ppm for all other PVC Resins averaged separately for each type resin.

II. E.P.A. (Cont'd)

A. E.P.A. PROPOSED STANDARD FOR VCM EMISSIONS (Cont'd)

3. FUGITIVE VC EMISSIONS

a. LEAK DETECTION AND ELIMINATION

Formal program to be instituted and description of program to be submitted to E.P.A. Administrator within 45 days of effective date of regulation.

Formal Program to Include:

1) Multi-point VC Detector.
2) Portable Hydrocarbon Detector.
3) Standard Operating Procedure Including:
   a) Personnel Position Responsible for Program.
   b) Procedure for Calibration and Maintenance of Instruments.
   c) Action to be Taken When Leak is Detected.

B. NIAGARA FALLS PLANT VC EMISSION STATUS

1. EQUIPMENT UPSTREAM & INCLUDING STRIPPER

EQUIPMENT	JUNE, 1974	SEPTEMBER, 1975
VC Recovery Vent Condenser	262,000. ppm	93,000. ppm
Evacuation Pump Vent	76,000. ppm	1,418. ppm
Reactor Vent (Includes Selectrol)	537. ppm	174. ppm
Wall & Roof Fans (Fugitive Losses)	13.6 ppm	1.22 ppm

II. E.P.A. (Cont'd)

B. NIAGARA FALLS PLANT VC EMISSION STATUS (Cont'd)

2. DOWNSTREAM OF STRIPPER

EMISSION POINT	VC PPM JUNE, 1974	SEPTEMBER, 1975
Centrifuge Vent	292	39.
No. 10 Storage Tank	787	< 0.5
Oliver Wash Vent	3,800	108.
Dispersion Resin (AO - WO) Dryer Exhaust Vent	23	0.6
Suspension Resin ("M") Dryer Exhaust Vent	88	3.

C. EMISSION POINTS EXCEEDING E.P.A. LIMITS AND REQUIRING CORRECTIVE ACTION

UPSTREAM OF STRIPPER - 10 PPM VC MAXIMUM

EMISSION POINT	CORRECTIVE ACTION
Batch Still Vent Condenser (Approximately 3 CFM)	Carbon Adsorption.
Wash Vent	Eliminate Use Through Closed Reactor Charging.
Reactor Vent (Includes Selectro)	Divorce Reactor Vent from Selectro and Recheck.
C-1, C-2, K, E-2 Pumps and Compressors	Being Studied.

200019

III. VCM IN RESIN

A. REDUCTION OF VC MONOMER IN NIAGARA FALLS PVC RESINS

	SLURRY AVG. (PPM)	OFF DRYER AVG. (PPM)	AS SHIPPED AVG. (PPM)
1. "M" Suspension Resin			
March, 1974	4,000	-----	2,400.
June, 1975(1)	315	64	5.0
August, 1975(2)	450 (63% < 400 ppm)	68	2.8
2. Emulsion Resin			
March, 1974	21,000	-----	< 10.
June, 1975(3)	592	N.D.(5)	N.D.(5)
August, 1975(4)	750 (100% < 2,000 ppm)	N.D.(5)	N.D.(5)
3. Compound Pellets			
March, 1974	<— NOT APPLICABLE —>		5.
August, 1975	<— NOT APPLICABLE —>		N.D.(5)

1, 2) Reduced production in June, 1975 had better reactor to degassing receiver ratio as compared to full production in August. Two new receivers on order which should lower VCM in slurry.

3) Not full production.

4) Full production.

5) Not Detectable.

B. REDUCTION OF VCM IN RESIN OBTAINED BY:

1. Deep steam batch stripping under vacuum.

2. Optimizing time of steam treatment (without destabilization of PVC resin).

III. VCM IN RESIN (Cont'd)

C. PROGRAMS BEING STUDIED FOR FURTHER VCM REDUCTION IN RESIN

1. Two new 7,500 gallon batch degassing strippers on order for better ratio of reactors to strippers.

2. Agents (Example - Propane) for lowering glass transition temperature (tg) of PVC resin could aid stripping of VCM from resin. Plant trials have reduced VCM 35% in slurry.

3. B. F. Goodrich "VCM Stripping Process"

a) Process is continuous with PVC slurry pumped to top of a column and with steam fed at bottom countercurrent.

b) Cost of one time license fee is $150,000; no per pound royalty.

c) VCM reduced in general purpose slurry to 7 - 10 ppm.

d) Pilot stripper in operation at Avon Lake handling 6,000 pounds/hour dry weight.

e) Co-polymers more difficult to handle because of stability.