GENERAL TIRE

INTER-ORGANIZATION MEMO

TO: H. E. Jewett

ATTENTION:

FROM: Jerry Brumbaugh

DATE: October 30, 1980

SUBJECT: Vinyl Chloride Safety Meeting
October 23 and 24, 1980

Joe: Please read & return HD

cc: A. D. Jeffrey
R. W. Laundrie
R. L. Jackson
E. R. Senra
D. L. Jenkins
H. O. Graff

Attendance

There were 44 companies represented -- 20 companies were outside the U.S.A. About 60 people attended the meeting.

Presentations and Discussions

1. VCM Monitoring System Evaluation
Henry Smith, Ethyl Corporation
PVC Plant - Baton Rouge, La. Operations Manager

Ethyl has a dual gas chromatograph system to find leaks and is used to test for personnel exposure. They have 4 - 10 point units, 2 for PVC and 2 for VCM production. The points are tested every 15 minutes. The points use teflon lines and sample points concentrate on the breathing zone -- 5 - 5-1/2 feet off the floor.

The points used for leak detection are in areas determined to be high probability areas -- pump seals, compressors, tank car unloading, etc. There are no boundary monitoring points.

Ethyl had to prove their calibration gas complied with OSHA regulations for standard gas. Ethyl has used this calibration gas to check for leaks in their lines by connecting their teflon tubes to the standard gas cylinder. This calibrates the gas chromatograph as well as the collection system.

Ethyl reported the following values of VC in their plants.

Monomer production
Gas chromatograph results

0.2 ppm VC average

Resin facility

0 - 1 ppm - 93% of time
1 - 5 ppm - 6% of time
5 - 25 ppm - 0.8% "
25 and over - 0.2% "

Leak detection will be started if the same point reads over 25 ppm on two consecutive readings.

1978 - 1980 Carbon Tube Data (personnel monitoring)

Monomer Operators

0.1 ppm average
0.2 min
1.6 max
0.4 mean

Polymer Cleaners

9.7 ppm average
0.4 ppm min
60.0 ppm max
2.0 mean

Loading Tank Cars

1.4 ppm average
0.1 ppm min
2.7 ppm max
0.9 ppm mean

Compressor Operator

1.4 ppm average
0.2 ppm min
5.1 ppm max
0.6 ppm mean

Lights are set to warn employees at

1 ppm -- amber light
10 ppm -- red light

After 1 ppm must wear 3M respirator or leave the area. An air supplied respirator must be worn when working on leaking equipment or over 10 ppm alarm.

Most people agreed the gas chromatograph could get by with weekly calibration, not daily.

Eleven people had VCM inspections by OSHA during the last year. No further details on the inspections were given.

All people in attendance claimed their plants were less than 1 ppm 90% of the time.

2. VCM Emissions Controls and Redundancy
Tom Moore, Tennaco, Pasadena, Texas

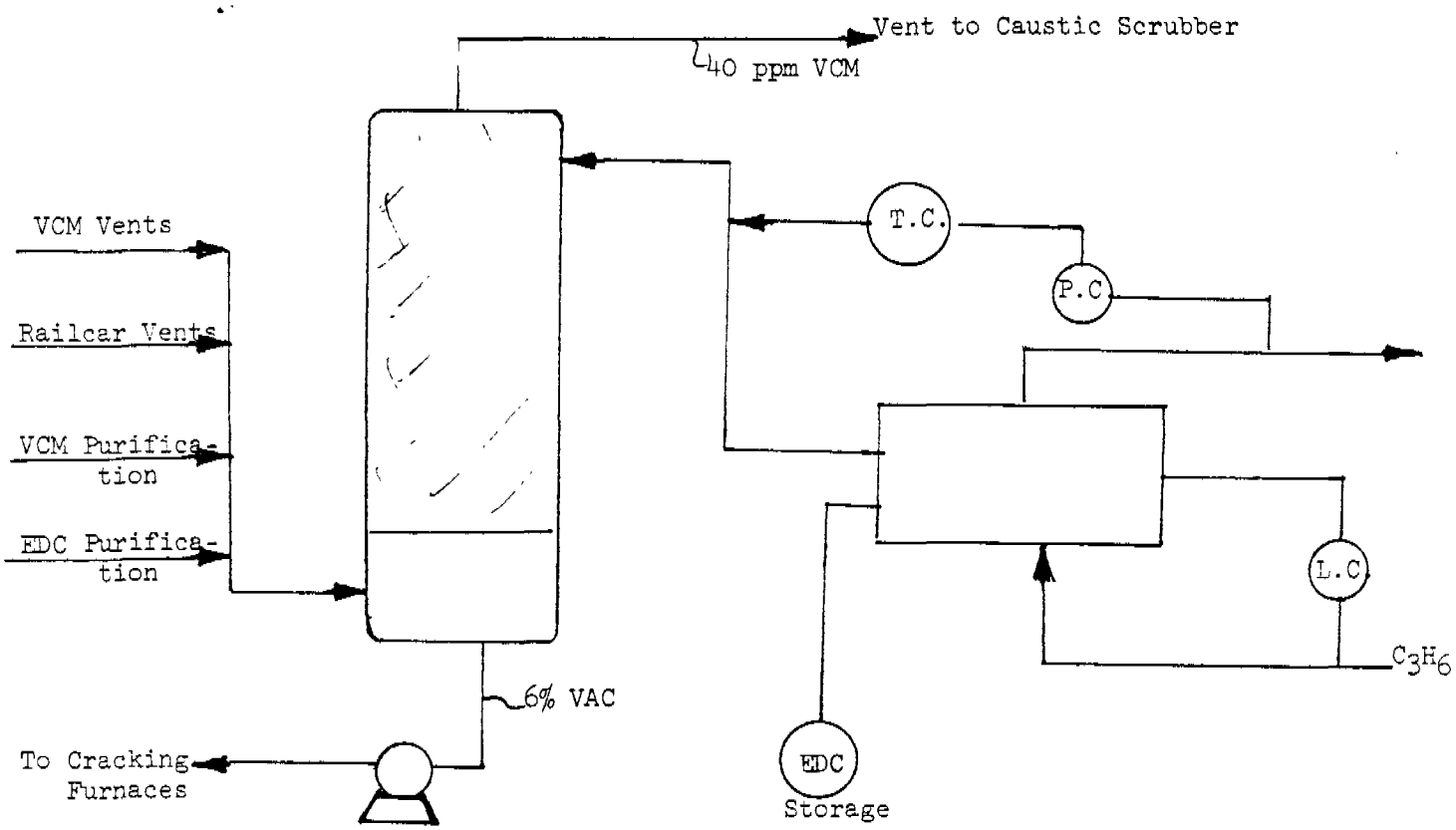
Tennaco at Pasadena uses large reactor technology (30,000 gallons) and computer control. The basis for redundancy is to reduce errors not prevent them.

Objective	Primary Device	Redundant Device
Control reactor sequences	Operator	Two computers
Instrument electrical power	Utility company	Battery system with a diesel generator
Reaction emergency termination	S/S with quantity to control reaction	S/S with twice the quantity to stop reactions
	One N_2 pressurized S/S tank	Two N_2 pressurized S/S tanks
	N_2 pressure system	N_2 pressure bottles
		One S/S tank over reactor which will equalize into reactor and drain into reactor
Reactor emergency operators	Temperature limits	Combination temperature and pressure units
	Four emergency levels	Fifth emergency level - S/S
Reactor overpressure control	Emergency pressure controller to flare	Dual relief valves to flare @ 95% of relief, then Dual relief valves to atmosphere
Reactor discharge complete	Nuclear level gauge	Agitator speed change
VCM gasholder High or low level	Analog level transmitter	High level switch to close inlet. Dual low level switches to stop compressors. Low pressure switch to stop compressors
Reactor cooling	Electrical pump	Diesel pump with cold water tank
Vent gas	Incinerator	Back up incinerator

3. VCM Emission Reduction by Absorption in EDC
Mr. Zwinkel, AKZO

In 1971 vents went through a caustic scrubber to remove HCl. Limit was 25 kg/hr of hydrocarbons. Then the limit was changed to 10 kg/hr of vinyl chloride.

The following system was installed.



Discharge to atmosphere is 1 to 5 kg/hr of VCM.

There was insufficient data given on the operation of this scrubber to make any economic evaluation. Need data on energy, loss of EDC, cost of operation, recovery efficiency.

4. Respiratory Protection
Glen Schaaf, B. F. Goodrich

B. F. Goodrich uses two types of respirators --
(1) The self contained unit - Scott air pak or MSA
(2) Type C air supplied continuous flow - half face piece for all levels under 1000 ppm.

The air line has connections every 20 feet in the polymer building. The alarm is set for 2-3 ppm. Then all must wear a respirator or leave the area.

Training for the use of the Type C mask is given only when issued because the mask is used frequently enough that retraining is not necessary. Training on the Scott air pak is given every 6 months.

The fit of the mask is tested yearly for everyone in the plant. For people with beards or facial hair, they are tested every 6 months. The test consists of wearing a breathing air mask and checking the seal with an irritant smoke. The smoke tubes are stannic chloride tubes from MSA. If a person fails the test because of facial hair, he must remove the portion of hair that causes the failure (sideburns, beard, etc.).

The continuous flow positive pressure respirators were chosen so they would not have to make medical decisions if a person can use a cartridge type respirator. B. F. Goodrich does have a form signed by their doctor that allows an employee to wear a respirator.

All employees are responsible for cleaning their own respirator -- B. F. Goodrich provides sink, soap, brush, etc. Respirators not assigned to an individual which have been worn are cleaned in a dish washer without going through the drying cycle. These respirators are stored in plastic bags until next use. Respirators are inspected yearly. All employees are required to carry their respirator when in restricted areas.

There is a D.N.E.W. (NIOSH) Publication No. 78-193A which covers respirator handling. This is available from Supt. of Documents, Government Printing Office, Washington, D.C. The stock number is 017-033-00326-2 and cost is $2.30.

10 plants require the employees to be clean shaven.
13 companies have a two respirator program.
10 companies have a three respirator program (use cartridge type).
14 companies test fit with smoke tubes.
3 companies have test booths for testing respirator fit.
No company would send employee into explosive mixture except for life rescue. However, all admitted that in most emergencies, the hard job was keeping people out of the area.

5. Preparation for Vessel Entry
Glen Schaaf, B. F. Goodrich

Avon Lake plant has about 180 vessel entries/month. Avon Lake uses a mechanical standby or safety watch. Every three minutes an alarm will sound in the vessel; if the employee does not acknowledge this alarm - a general alarm will sound outside the vessel. This alarm means the employee in the vessel needs help.

No company allows entry to a vessel with just the valves closed and no other shutoff.

11 companies use a double block and bleed on hazardous lines.
22 companies blank all lines to the vessel.
3 companies use a mechanical standby.
15 companies require wearing of life line except in very confined spaces.
4 companies take radios into the vessel.

An OSHA standard for vessel entry is coming.

6. Regulatory Update
John Barr, Air Products

-- A new fire brigade standard was issued on September 12, 1980 by OSHA.

-- No one would report an emergency release of vinyl chloride to OSHA unless someone was exposed to over 100 ppm VC.

-- Regulations on labeling of pipes, vessels, tanks, etc., in the plants is overdue. Do not know when it will be issued.

-- Revision to EPA vinyl chloride standard will depend on the carcinogen policy decision. TRW is conducting review. Feeling is that TRW will recommend that further studies are necessary.

-- Reactor cleanout material will be labeled a hazardous waste this November.

-- Agreement reached between EPA and OSHA -- suspected violations will be reported to each other. For example, an OSHA inspector will report to EPA any suspected EPA violation found in his inspection.

7. High Pressure Water Cleaning System
Warren Clark, Dow

Dow uses high pressure water for cleaning equipment. They do not make PVC, but most companies indicated they use high pressure water for cleaning reactors. Most use a programmed system rather than hand held units.

However, Dow had two accidents using high pressure water. In one accident the water was valved off and the pump was left running. When the operator started to use the jet lance, the rubber hose burst from the steam pressure caused by overheating the water. He was burnt from the steam.

The second accident occurred when an operator dropped the lance. The auto shutoff did not work fast enough and the operator was struck by the high pressure water. The operator lost one eye and suffered cuts.

Two modifications were made to the high pressure units. A continuous bleed was installed in the unit so it was impossible to completely shut off the water to the unit. The second modification was to change the automatic dump valve system. The dump valve must be located within 25 ft. of the lance, and they connected the lance to the 3-way diversion valve electrically to improve response time.

8. Vent Relief Systems
Glen Schaaf, B. F. Goodrich

Relief valve systems

a. Most reactors had both rupture discs and relief valves.

b. All relief valves discharge directly to the atmosphere.

c. Almost 100% can manually vent to either the atmosphere or the recovery system and gasholder.

d. A few companies had block valves preceding the relief valve -- these are 3-way valves with 2 relief valves.

e. B. F. Goodrich vents to a tank based on pressure with an automatic valve.

f. All have a S/S system, either manual or automatic.

9. Failure of Excess Flow Valve on Tank Car Unloading
Joe King, Firestone

Their unloading hose is fitted with an ever tight joint. The locking ears on the ever tight joint were not wired closed, and they vibrated loose and the hose disconnected. The valve, which is to sense excess flow, did not shut off. About 5000 lbs. of VC went on the ground. The operator wore a Scott air pak to go to the car and close the valves. He suffered frost bite because he contacted vinyl chloride. OSHA fined Firestone $13,000 for failure to protect worker and failure to provide protective clothing. Later, fine was reduced to $900. They have since gone to screw type fittings on their unloading hoses. (We use screw type fittings.)

10. Electrical Short and Fire at B. F. Goodrich
Glen Schaaf

Two people were burnt when they tried to install a 1600 amp. fused type breaker (Allis Chalmers LA-1600F) into a non-fused breaker box. The fusing portion of the breaker contacted the hot supply line and the box grounded against the panel. The resulting flash and fire burnt the two employees.

11. Power Loss and VCM Release
Jack Zimmerman, Diamond Shamrock

On March 6, 1980 at Deer Park, Texas, the PVC experienced a total power outage resulting in 12 relief valve releases totalling 42,000 lbs. The plant is served by a grid electrical service to two independent transformers. Maintenance work was to be done on one transformer, the other transformer was to be in service. The maintenance personnel drained the oil from the wrong transformer. This transformer overheated, shorted and the plant lost total power. There is no diesel backup for electrical power. They lost power to cooling water, agitation, etc.

At this time the automatic S/S system was out of service for repair. Some reactors responded to manual S/S but most did not. All were equalized to the strippers. All told, there were 6 reactors and 6 strippers which had relief valve discharges.

12. VCM Charge Pump Fracture
Jim Miller, Esso Canada

A VCM charge pump was run for less than 10 minutes with both the inlet and the discharge valved closed. The vinyl chloride overheated by the impeller reached a high pressure and the pump exploded causing pieces of the back plate to be thrown throughout the room. These pumps are started remotely, and the operator who valved the pump off went on break, and another operator started the pump.

Firestone reported similar experiences, and B. F. Goodrich had a slurry pump do the same thing when it was full of water.

This system has since been modified so the pump cannot be started up if the suction is valved off.

13. Explosion at Great American Plastic
Ray Asti

After a reactor was dropped to the blowdown, the reactor was opened and cleaning was started with a high pressure water lance. The operator noticed the water was not going out the drain and thought the bottom

valve on the reactor was not opened. The operator removed a flange and opened the automatic dump valve on the wrong reactor -- not the one that he was cleaning. However, the VCM and water did not immediately come out of the reactor and the operator left the immediate area. The reactor that was opened had just been charged. Either PVC was in the drop valve and acted as a temporary plug, or the valve did not immediately respond to the signal. In either case, the VCM and water did not come out of the reactor until the operator had left the area.

The VCM and water came out of the reactor unto the bottom of the reactor building. At 20% of L.E.L. the fans went to high speed and exhausted up a 80-90 ft. brick stack. At 40% of L.E.L. the sprinklers went off. When the liquid stopped discharging from the reactor, the VCM vapor started whistling out of the valve.

It was assumed that a static spark from the vapor going through the discharge valve caused the vapor cloud to ignite. This was the area of the ignition -- in the area below the reactors.

A ball of fire rose from the source and consumed the vapor cloud which had drifted through the plant to the surrounding area. There was relative little damage from this fire -- burned trees, some burned buildings, etc. However, the fire ignited the vapor from the building vent stack. The fire traveled up the vapor from stack and then down into the stack. The vapor in the stack exploded causing the brick stack to fall. The stack fell on the reactor building knocking the roof down on to the reactors. Also, pipes were broken, electrical conduits were broken, live wires were sparking, and many small fires were started.

Two employees suffered 3rd degree burns, mostly to the hands and arms. These employees were reactor operators who were trying to find the source of the VC. They were on the steps of the reactor building when the fire started.

The explosion occurred about 2 minutes after the alarm sounded for high concentrations of VCM in the building. The total loss of VCM was 15,000 lbs. -- 10,000 lbs. VCM from the 3750-gallon reactor and 5,000 lbs. from a VCM storage tank.

EPA arrived about 2 hours after the explosion and took VCM readings around the boundary of the plant. None were found. The fire department arrived but did not enter the plant.

One recommended change is to have sprinkler heads under the reactors. All of theirs were over the top of the reactors. This may have eliminated the spark that started the fire.

Permits for rebuilding the plant have been submitted, and as of now, there are no objections to granting these permits.

14. Keyser Century

A similar incident occurred at Keyser Century when a reactor drop valve opened during a run. This reactor was outside. The vapor cloud drifted to a non-explosion proof switch room. This room blew up and the fire traveled back to the reactor area. The fire was contained to this area and damage was limited to this area and the control room.

They were using a Jamesbury wafer valve. This valve has a locking lever. This locking device was not fully closed and the valve vibrated open. This type of valve is not recommended for this type of service.

15. Borden - Roy Jefferson

Borden had a footbearing gasket fail causing a large escape of VCM into their reactor building. There were no injuries, fire or explosion. They were seeking any help they could get on a gasket for this service that would not fail. General Tire had a similar incident.

Jerry Brumbaugh

JB:sm