CHEMICALS — PPG INDUSTRIES — INTEROFFICE / LAKE CHARLES

TO Distribution

DATE September 28, 1982

FROM Ben Reynolds

SUBJECT Vinyl Chloride Safety Association Meeting

The 1982 meeting of the Vinyl Chloride Safety Association was held in Toronto, Ontario on September 23 and 24, 1982. As usual, the "true confessions" were very interesting and merit thorough review as many could potentially happen here.

Highlights of the discussions were as follows:

1. VCM SPILL - ICI - Runcorn (John Vaughan)

   This incident involved a remote-operated VCM transfer pump. For a week prior to the incident, the operators were getting air monitor alarms from the monitoring point above the pump. The pump was taken out of service, cleared with nitrogen, and the seal was replaced. The pump was returned to service. The nitrogen hose was left connected to the suction of the pump with the valve on the pump open. The hose ruptured outside of the diked area. The operators started getting air monitor alarms but ignored them as they had become accustomed to frequent alarms from the leaking seal. The alarms were showing over 100 ppm (off-scale). Ten tons of VCM were released before the leak was stopped. An ice layer 2 feet thick and 40' x 10' was formed. It took over 2-1/2 days for the ice to melt. Procedures were revised to include restoring the pump to service properly.

2. CAM-FLEX VALVE PROBLEM - ICI - Australia (John Vaughan)

   A gland leak developed on a 4" Masoneilan Cam-Flex control valve in VCM service and maintenance was called to replace the packing. They decided to leave the valve in place instead of taking it to the shop. Instead of removing the actuator, they removed a locking collar and pulled the spindle out of the valve. When it was reinstalled, the spindle was one spline off from where it had been originally. This computer-operated valve was showing "CLOSED", but the plug was not seated because of the incorrect reassembly. When the line was returned to service, one ton of VCM leaked by the valve into an open charge pot and was released to the atmosphere.

3. VCM SPILL - Pequiven - Venezuela (Jose Perez)

   The incident occurred in August, 1982 at the El Tablazo facility (Cl_2, olefins, VCM, PVC, fertilizer). A 1-1/2" carbon steel line on the bottom of a 200 metric ton sphere failed from corrosion and released 21 metric tons of VCM. The line had been in service for 6 years. There were no

3. VCM SPILL (Continued)

injuries and no fire. They stopped traffic in the area and used fire water to dissipate the vapor cloud. Maintenance was unsuccessful in stopping the leak. They tried venting the sphere to a flare and then to the atmosphere. They considered pumping water into the bottom of the sphere, but this was their 'off-grade' sphere used for start-up material, and they were afraid of excessive corrosion from HCl attack. Recommendations after the incident included:

a) Stop pumping into sphere (they forgot to do this).
b) Kill all flares downwind.
c) Install fixed fire water monitors on each side of sphere.
d) Don't vent to atmosphere.
e) Improve PM and inspection program.
f) Improve training and emergency procedures.

4. INCIDENCE OF CANCER - Norsk Hydro - PVC

A study of cancer cases at Norsk Hydro was conducted by the Norsk Hydro Medical Department based on the Norwegian Cancer Register which was started in 1953. Four hundred fifty-four PVC employees with more than 10 years experience (some since start-up in 1950) were compared with a control group of the same size and age. Findings were as follows:

Deaths from all causes	- Expected 59 Observed 50
Total cancer deaths	- Expected 20 Observed 23
Liver Angiosarcoma	- No new cases. One had been reported in 1972.
Lung cancer	- Expected 3 Observed 5 (Smoking habits not addressed in study)
Malignant Melanomas of skin (Neck and chest)	- Expected 0.8 (Unexplained) Observed 4

The time period of the study was short, and the group small. The study will be repeated later. Exposure levels at Norsk Hydro from 1950-1970 were probably "very high". More information is available in Dr. Stafford's report which I will cover later.

5. MEXICAN VCM FIRE - Primex - (Jorge Zarate)

The 1977 fire (involving 1500 metric tons of VCM) at Primex was reviewed. Roy Sanders has a copy of their presentation which was given at an earlier VCSA meeting. In this incident, a large VCM spill occurred from a bullet when a mechanic incorrectly disassembled a control valve to remove the actuator and the plug blew out. The VCM was ignited by a furnace 250 m. away in an adjacent plant which had been shut down, but was still hot. There was one fatality and several burn injuries. Damage was significant, but the plant was back on line in 45 days. The following changes were made after the fire: Replaced 7 bullets with 1 sphere. The sphere is water-sprayed and the bottom half is insulated with Pyro-Crete for a four-hour fire rating. They now have excess flow checks in the outlet lines. Larger capacity relief valves were installed. Vapor detector coverage was increased from 16 pts. to 76 pts. At the 20% LFL, alarms are sounded. At 40%, all of the valves in the system close. Nozzle size of the liquid outlet line was reduced from 4" to 2". They believe they can form an ice block to plug a 2" hole by spraying water on it. They were unable to freeze up a 4" hole. Every employee, including secretaries, makes a job safety analysis monthly.

6. SPILL FROM SLURRY LINE - Primex - Puebla (Jorge Zarate)

On May 6, 1982 an operator forgot to close a drain valve on the slurry line from a PVC reactor to the stripper after a cleaning operation. A transfer to the stripper was started from an adjacent reactor and 2200 lbs. of VCM escaped to the atmosphere through the manway of the opened reactor.

The reactor checklist has now been revised and is checked by 2 people before starting a transfer. Vapor detectors now activate closure of valves if VCM is detected.

7. VCM EXPOSURE RISK STUDY - Air Products, Trexlertown, PA. (Tony Santay)

Air Products initiated a detailed reliability study in 1980 prior to the installation of a pilot emulsion reactor. They initially planned to make vinyl acetate-ethylene copolymer emulsions. When the scope was enlarged to include vinyl copolymers, they decided to do a risk analysis. The facility was a 15-gallon reactor with several 200 lb. D.O.T. cylinders for VCM storage. Their eight-man team consisted of representatives from Corporate Safety, Corporate Engineering, Process Technology, Research and Development, and Manufacturing Safety. The study lasted six months. The team was charged with: generation of fault trees, quantifying frequency and magnitude of releases, defining recommendations, calculating dispersion, calculating probability of exposure vs. level of exposure. The possible exposure levels were compared to the OSHA limits of 1 and 5 ppm for 8-hour and 15-minute periods respectively. Many of the meeting participants felt this was a lot of effort to be put into a study of such a small installation.

8. CHLORIDE STRESS CORROSION UPDATE - ESSO, Canada (Jim Wallace)

A general survey of stress corrosion in the PVC industry was started in 1978. Problems were being seen as temperatures had to be raised in PVC plants to remove residual VCM. The basic conclusions were: SS 316 is preferred over 304, low carbon S.S. is preferred, and neutral pH is better than acidic. No cracking was seen in Carpenter 20.

Conoco reported a catastrophic failure from chloride stress corrosion in a 304 stainless vessel. The vessel was insulated with a black foam rubber. The external stress corrosion was attributed to the high chloride levels found in the insulation and adhesive.

9. SAFETY AND CONSTRUCTION - ESSO, Canada (Dave Mathews)

Dave Mathews, Operations Superintendent, reported on how they coped with a major expansion in an operating plant at the ESSO Chemical PVC facility in Sarnia. Their approach was basically one of providing for good communications between operations, maintenance, the start-up team, and the contractor (LUMMUS). They were the top site in the area for construction safety. They had no fires and no equipment damage during the construction. They trained their employees to be "safety watchers" to make them more aware of potential problems.

10. RADIOACTIVE LEVEL INDICATORS - ESSO, Canada (Joe Serratore)

Esso-Canada investigated the use of radioactive (Cesium 137) level indicators for their PVC reactors to provide for better reactor level monitoring and to prevent overcharge. They experienced significant buildup on level probes. They had a number of problems and finally gave up. Some of their problems included:

a) Calibrations were not linear, but depended on vessel shape and source location.

b) They required extensive calibration.

c) Their reactors were too close and reflection from the indicator on an adjacent reactor gave false levels. A 1/4" lead shield helped.

d) The radiation level at the detector was too low, even with a 1000 millicurie source. They started with a 500 millicurie source, but it was too weak. They did not try the 2000 millicurie source as it would require more shielding.

e) The reactor domes had been painted with a non-slip paint for maintenance. This caused problems with the indicators.

10. RADIOACTIVE LEVEL INDICATORS (Continued)

Safety Aspects:

a) Protective cages were built around the source to keep people from passing through.

b) The source was turned off automatically whenever the agitator was off to prevent vessel entry with the source on. A check with a Geiger counter was added to the entry permit.

c) Operators were taught to use Geiger counters and the meters were made available to them.

d) X-raying in the plant caused serious interference problems with the detectors. (We've seen this, also.)

They have had success with radioactive level devices on the bottom of reactors to indicate when reactors were empty. John Vaughan of ICI reported that they have had success with radioactive level indicators on their reactors.

11. VCM SPILL FROM HORTON SPHERE - BFG - Australia (Herm Waltemate)

The incident occurred on February 25, 1982 in Australia. They lost essentially the entire contents (676 metric tons of VCM) over a 5- to 6-hour period. The incident was similar to the Primex spill, but there was no ignition. It happened during a three-week outage, so the boilers were down. A safety audit had recommended replacement of a 3" line, 34' long, leading from the bottom of the sphere. The valve on the bottom of the sphere was a 4" Kitz ball valve with an air-operated piston actuator on it. The valve was a remote-operated production valve, operated from the control room to charge reactors. There was no emergency isolation valve on the sphere. Maintenance began removing the pipe, but no instrument man had been assigned to remove the actuator. The piston was attached to the pipe with U-bolts. After the U-bolts were removed, they bumped the piston on the valve and VCM started leaking out. The fire water was turned on and an electrical supervisor killed all power to the plant. They tried to close the valve by forcing the piston with a 7-foot 2 x 4. The board broke and the valve opened fully. All surrounding plants were shut down. A four-lane highway 2 miles away was closed for 6 hours. The 12 mph wind blew the cloud away from the residential areas. At the tip of the cloud five miles away, they measured 1 ppm VCM. They tried to put water into the sphere, but this took four hours and most of the VCM was gone by then.

Basically, they feel their maintenance work order system failed. The work order was written by a maintenance engineer, not the regular planner. An instrument man was not assigned to remove the actuator. The work permit was signed by the production foreman instead of the storage area foreman. The production foreman was in the middle of an outage and probably did not pay much attention to the job.

The incident did point out a number of deficiencies.

12. PLANT TEAM SAFETY AUDIT - BFG (Mark Tawney)

An audit team was formed by BFG to develop a corrective action plan to prevent the Australian incident from occurring again. The team surveyed storage facilities throughout the corporation to determine potential for releases of toxic and flammable materials, including VCM, chlorine, butadiene, and isobutylene. The 7-8 man team is made up of representatives from Manufacturing, Engineering, and Safety.

Approach:

a) Determine existing hardware and procedures.

b) Define deficiencies and recommend corrective action.

c) Develop corrective action plan at each location.

d) Implementation and follow-up.

Recommendations:

a) Revise maintenance work order system.

b) Clarify plant organization and responsibility for tank farm areas.

c) Standardize vessel inspection frequency.

d) Standardize SRV test frequency. They settled on 3 years.

e) Hardware standards and revisions - new installations and retrofit.

1) Liquid valves at bottom of vessels - minimize number, must have air-operated valve at vessel which can be closed from remote location. Must be quick-closing. They chose a ball valve. Must pass fire test for leak-thru. No top entering valves, no bonnet bolts.

2) Relieving system - 3-way valves or Castell/Kirk key interlocks on block valves.

3) Deluge system.

4) Continuous gas monitor - alarm, close valves, trip deluge.

They have not had much success with excess flow checks in VCM service so they probably won't require them. They do use them in chlorine. They will issue a standard for vessels in VCM service and will send us a copy.

13. COMPUTER ACTIVITIES UPDATE - Georgia-Pacific, Plaquemine (Jim Gabbett)

Their computer control system for the PVC reactors is very reliable. Jim says that for the last year it was available 99% of the time. Part of the downtime resulted from an outage to install a larger memory disk.

Jim feels that computers generally don't make mistakes and that most problems attributed to computers are actually 'people' failures - failure to understand what the computer can and cannot do, failure to understand what the computer is telling you, or manual defeat of computer controlled systems. He feels that in their plant some of the problems start with management/supervision. For example, operators are given a goal of a certain number of batches/shift. In order to meet this goal, they must override computer functions. He related two incidents that occurred in their plant.

a) The slurry blowdown tank is protected from overfilling by a control system which will not allow transfer to the tank if the level is over 40%. In order to meet the required batches/shift, an operator fed a false level to the computer so he could start a transfer. He forgot he had overridden the computer and the tank was overfilled with the next transfer. They had a VCM release and fire.

b) A proximity switch on a dump valve was defective. The operator used "the key" to override, but forgot to switch it back when the transfer was completed. VCM and slurry backed into an empty reactor and a VCM release occurred.

Their computer now removes all overrides every 3 minutes. It had been set up to do this every 24 hours.

He recommended the paper "Some Human Problems With Computer Control" by Trevor Kletz. I have a copy of this.

14. VINYL CHLORIDE ACTION GROUP - BFG (L. J. Weisz)

An action group is being formed to promote the use of PVC in conduit, wiring insulation and construction materials; and to combat the metal conduit manufacturers and others who are opposed to the use of PVC. Consumer groups are directing a lot of attention toward PVC's "toxic combustion products" as a result of recent hotel fires. Some unions are concerned that use of PVC piping will take work away from them. The VCSA voted to take no action at this time concerning joining or supporting the Vinyl Institute Action Group, even though some member companies may desire to belong to both groups.

15. FOUR CARDINAL SAFETY RULES - BFG (Herm Waltemate)

After a near fatality (N_2 inhalation) at their Pedricktown, N. J. PVC plant (reported in last year's VCSA minutes), B. F. Goodrich undertook an in-depth evaluation of their safety training program. Herm reviewed the 4 areas they felt were critical: Hot Work, Vessel Entry, Lock-Out, and Forklift/Trailer Entry. A study of 11 fatalities in BFG Chemicals revealed that 7 of the incidents involved these 4 areas. Their safety training emphasizes that discharge could result if safety rules are violated. Since implementation of this new program, they have had 14 "incidents", resulting in discharge of 7 employees.

16. PVC REACTOR VENT PREVENTION SYSTEM - Ethyl, Baton Rouge (Cecil Loechelt)

Ethyl has installed a vent system in their PVC plant to prevent release to the atmosphere from reactor overpressure or overcharge. The system is not designed to contain a full reactor or the entire plant vent in an upset, but mainly to give them time to initiate chain-stoppers. A sketch of their system is attached.

17. ANGIOSARCOMA UPDATE - ICI - (Dr. John Stafford)

Dr. Stafford has been keeping a register of reported angiosarcoma cases world-wide. He has registered 100 cases (1 added since survey was printed) with 98 deaths and 2 patients still living. The survey is very interesting as it breaks down the cases by country, company and plant, per year, etc. It also includes information on the victim's occupation. I have copies for those who are interested.

18. REGULATORY UPDATE - Air Products (John Barr)

Highlights of his presentation were:

EPA

a) Expect tightening up on regulations for OHC plants.

b) No major changes in VC standard, may ease up on reporting requirements.

c) Additional suits have been filed on VCM releases and Sec. 114 lett rs sent out.

d) Revised test methods 106 (determination of VC from stationary sources) and 107 (determination of VC in in-process waste water) published in September.

18. REGULATORY UPDATE (Continued)

OSHA

a) Labeling rule not expected until mid-1983. (Labeling for all valves, pipelines, etc. in toxic service)

b) Noise standard generally in effect, except for some requirements on personal protective equipment.

c) VC training film by Air Products/OSHA now available from National Audiovisual Center. (We have a copy of this.)

OTHERS

a) Unpublished report. Suggests tumors from vinyl acetate exposure.

b) Peroxides cause skin tumors (animals) in a report by EPA-TOSCA.

c) Trichlor carcinogenicity study reviewed in September. Past studies have been done with inhibited tri. New studies will look at uninhibited and determine if it is direct or indirect carcinogen.

d) FDA has taken no action on plasticizers (di-ethyl hexyl phthalate). Will undertake extensive studies - 2-3 years. They were mentioned as possible carcinogens last year.

19. SURVEYS

a) PVC reactor pressure safety relief equipment - survey of type/size/pressure rating of relief devices (SRV's and rupture discs) on PVC reactors. I have a copy of this report.

b) 1982-83 Surveys - Topics for next year to include: types of flammable vapor detectors being used, portable leak detection equipment, and explosimeters.

20. EPA VENT SURVEY/LEGAL ACTION

Air Products (John Barr) - Complaint filed in February, 1981 by EPA, Region 4, Atlanta, Ga. for 14 VCM releases at their Calvert City plant. They hope to reach final settlement in September/October, 1982. The releases were ~50% operator error and ~50% 'failures'. They were cleared on 4 releases. EPA wanted to fine them $25,000 per event for the other 10 releases. They finally settled at $12,500/event - $125,000. EPA recommended some equipment additions. This was contested and dropped. Training requirements of 90 hours for new operators and maintenance hands and 24 hours/year on-going training were added. The training is to include

20. EPA VENT SURVEY/LEGAL ACTION (Continued)

causes of all past releases and what they've done to prevent future releases. Maintenance employees must receive 9 month of classroom and field training before they are classified "artisans". Record-keeping requirements for training will be a major burden. Air Products was required to submit certain proprietary drawings and flowsheets to the court. These classified drawings were sealed by the court and supposedly will not be available through the Freedom of Information Act. It was interesting to note that their lawyers and EPA generally agreed that releases of less than 100 lbs. of VCM would not be considered.

Tenneco - Served with a suit similar to Air Products.

Georgia-Pacific - Plaquemine (Jim Gabbett) - Cited for 44 releases from their VCM and PVC plants. They received the Sec. 114 letter about the same time as we did. Their response, which weighed 26 lbs., was submitted on September 24.

B. F. Goodrich - Calvert City - Served with a suit for 18 releases. Louisville - Expecting same type of action. Plaquemine - Response was 6" thick. No action yet.

Ethyl - Baton Rouge - Received citation from EPA mid-summer, 1981. Transmittal has been submitted. They have had no discussion with EPA on fines or legal action. EPA has requested some procedural revisions and minor equipment changes/additions. Ethyl had ∿144 releases.

Pantasote - (Henry Rzempoluch) - One plant has heard from EPA, the other has not. No action yet.

PPG - Lake Charles (Ben Reynolds) - Response to 114 letter submitted on September 16. No action by EPA yet.

Conoco - (John McCully) - Westlake - 114 letter response submitted to EPA. Oklahoma City - Cited by EPA in May, 1981 for releases totaling 40-50,000 lbs. of VCM. Conoco's response was satisfactory and EPA has decided to take no action.

The 1982 VCSA meeting was very informative and I highly recommend that we continue to send representatives from VCM operations at Lake Charles. The 1983 meeting will be held in New Orleans in October.

bjm

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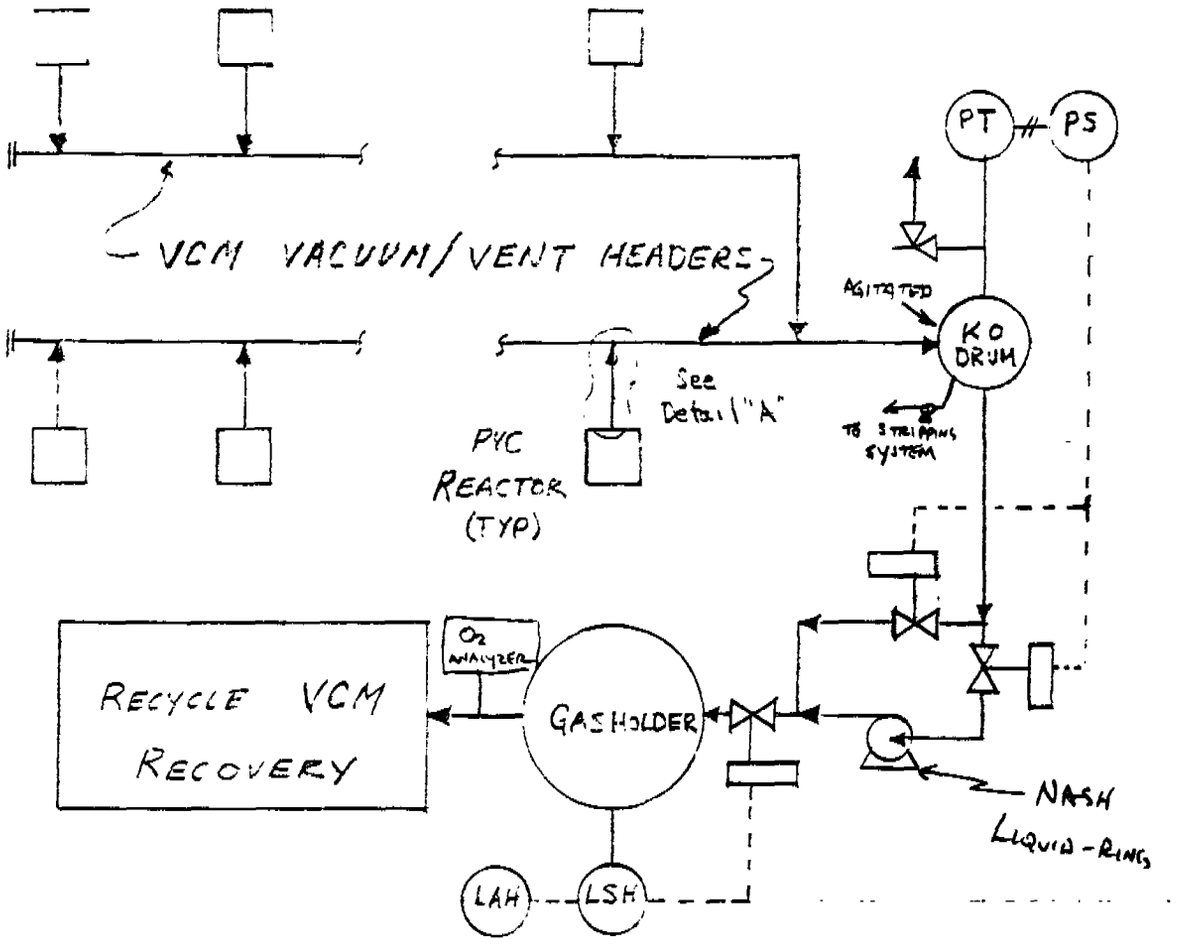
PVC REACTOR

VENT PREVENTION SYSTEM



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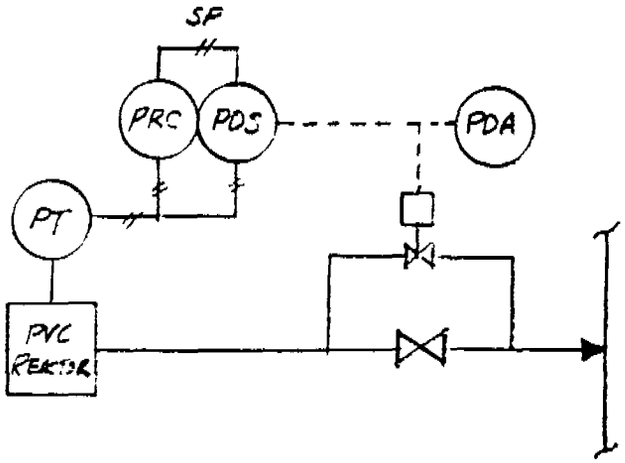

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CPL
VCSA
9/24/82

EPA is appealing 83 Mfg enviro
2 other court cases opposite Judge Parker's decision

Barton - Borden
3 lawsuits

1. Mass. Lynster 4 releases, in 1982, EPA says preventable used Judge Parker's decision in defense, denied motion to dismiss, is continuing
not sure expect settlement like Air Products, hope to follow Ethyl's case
Technicality - used proposed preamble

2. LA. - same district as Parker former Monroe
Borden - Uniroyal
2 under Monroe
3 " Borden
also failure to report - found reference in log book
not continuous monitoring on incin, 210

Rapid Moved for dismissal on releases
hearing in early Nov.

3. Borden - Geismar KM 34 1977-1983
18 not within 10 days
filed for dismissal

$2,500 ea

Update on EPA Holbrook

Primary interest in updating relief valve discharges
propose 25 lbs/mm lbs production through vinyl chloride

Propose extending time for reporting emergency to (10 days) from 10 to ???

Court Action 12 suits 3 settled
Air Products - Calvert City Plant
Carl Suit - settle out of court
21 or 22 releases $125,000 forgiveness for all suits up to date of settlement
1600 # $12,500 for 10 cases
more training - tell about past releases & prevention
ongoing & specific training
2 yrs operating 3 yr total time $500
Automatic payment non-compliance to consent decree
copy of settlement

Herb Chem - Ethyl 98 releases $2.45 MM
U.S. Dist Judge Parker - work practice stds
Dec '75 1st issued not emission stds

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OXY

Joe King

Addio July 83 served suit
OXY / firestone
3 days $1 MM ½ failure to report
also failure to report

Oct 7, dismissed by T. Parker, EPA ~~agreed~~ filed for
Jersey
Burlington, N.J. Apr 81 114 letter, no follow up
by EPA
5 releases in 2 mos. in 1983
Mgt. approached gov't since they hadn't found
Reg 2 + state, EPA didn't come, not pursuing
State contracted out, law firm said non-
preventable
Received cease & desist order - no past
future - penalty by state
Citing state permit to operate incinerator
Informal meetings, asked for formal hearing

Pottstown PA PVC state - settled 22 excursions
stripped resin $1500, 17 more during next period
expected same State had guideline document $9000-30,000
could not see

→ mtg. early November (W) state
State taking up evang. disch 4 this year 1 < to
dismiss

BFG Holbrook
2 lawsuit
VCM colu-city Reg 4 EPA
PVC Longview

VCM Aug 82 filed, alleged harm to public health
expect it to be dropped
18 releases from 1978
16 partial bypass of incin.
14 < 100 ft have internal memo from EPA
3 plant visits
Trial date - Dec 16 no settlement offer
filed for dismissal, J Parker
EPA filed amendment to complaint, if dropped
exceed 10ppm std

PVC same as above
no response
17 counts
12 < 100 ft
will file for dismissal

California 10ppm State
filed 3 suits, each time semi-annual pmt
settled 2 3500.
1 pending, 11 counts @ 10,500 1 SRV, 1 leak by agency
RC opening loss, 1 ambient air quality

Cyrocco Chemicals
Oklahoma City PVC
LC Vcm

1st letter

Okla June 81 nothing till summer '83
sued for 6 releases, 3 large volume

BFG → status of limitations
using two 1. Judge Parker
emergencies filed for dismissal
made process changes

2nd 114 letter asking for info on other type releases > minor leak

LC sued for 16 violations 14 r.d., 2 > 10ppm
intend to use Parker
Judge Vern

BFG - plaquemine (bought from Rodyen)
114 letter, response in mid '82
19 releases ½ normal vents, some r.d.'s

GP 114 letter summer '82 70 releases
Normal vent + SRV

FP - no current info

Shell - Norco last spring plant now down
Houston no letter - waiting, no response from CP

TACQCB agree @ Shell

Gospurecz version 1 Dec

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