

VINYL CHLORIDE SAFETY ASSOCIATION MEETING
Program Minutes of February 10-11, 1971 meeting, Memphis, Tenn.

1. Plant Safety Design - J. T. Barr, Airco Chemicals

All aspects of control room design were discussed. Location is certainly one of the most controversial items. A poll indicated 16 have control rooms, 11 do not. There were 13 near or adjacent to the poly room and 5 remote with distances varying from 60-300 feet. Two were of blast proof construction, 13 were pressurized by a remote source of air. The actual strength of a blast proof wall is subject to considerable variation. One such wall moved by the force of the explosion and interrupted the power source. In another explosion a section of wall was projected through the reactor room, laboratory and into a nearby building. Suggested correction for that one was reinforcing rods on the side where personnel protection is needed.

Pressure in the protected control rooms was 0.1 in. water, most used standard electrical fittings. One had a sensor in the duct for the remote air. Some have delta pressure alarms or other flow indicator alarms.

Windows between the control room and poly room - 2 spoke against them, one had none but put one in during an expansion reasoning that the operators were more interested and more conscious of reactors and conditions with visual contact.

Question: Are groups on reactor floor separate from those in the control room? Answer: 1 - Yes, Many - No. One newly constructed plant designed its control room 300 feet away with TV and radio contact.

Fireproofing for structures varied somewhat. Concrete grout around steel is common. Factory Mutual reportedly specifies 2-3 in. from glass held by SS clamps covered by grout. They also accept reinforced concrete structural wall.

Valves. Teflon. Where there is metal to metal seal, teflon is all right but ground contacts must be maintained.

Open versus closed buildings. Seemed to conclude that in the south open buildings are fine but in the north, not so.

Flexible lines; 8 use. Copper; only 1 company uses monel.

2. Emergency Procedures - R. S. Allen, Conoco

MSA, Johnson-Williams and 3 others now make continuous monitoring sensors. Normal activation is 25 and 50% LEL for high speed from operation and deluge respectively. Factory Mutual would not accept a pressure fog system seemingly because they had no experience with it. Steam ^{sprayed} in the air ventilation at 25% LEL will help raise humidity fast. Deluge heads can be sheared off in an explosion and render the system ineffective. Fires can be piped from the area with valving to isolate damaged sections. Conoco's new plant has 8 headers leading to the reactor area from a pill box across the road. Activation can be manual or automatic or combined. Electrical rooms are remote. A provision is made for water run off.

Personnel safety can be increased by providing guide ropes for people caught in heavy smoke or blinded. In an emergency, hit the deluge and get out.

Batches can be terminated on power failure or excess exotherm. Seven have auxiliary power, one has total auxiliary power. Ten have drills on emergency shutdowns and 7 tag valves to be sure all were checked. Be sure to have head count after ordering evacuation.

Bomb threats. Five have procedures. The Army will assist in setting procedures and handling the bomb. There were 7 reported bomb threats. Seven are planning bomb scare procedures. Normally the police and firemen won't hunt for bombs but may provide deactivation service when located.

Recycle VC. One company stores at -10°C. Some add inhibitor and then distill to purify. Should use recycle as quickly as possible to prevent peroxide and polymer problems.

3. Disposal of Vented Vapors - G. B. Speed, Escambia

Rupture discs and relief valves. None had rupture discs only and none had a valve only to protect tank contents. One had a relief valve only. Thirteen had a rupture disc and relief valve. Three had rupture discs in series. One had rupture discs in parallel.

Blowdown tanks. Three have unagitated tank outside the building and can put isoprene (or other) stopper in to kill batch. Tanks normally hold 2½ batches.

4. Review of Recent Accident at Diamond - E. A. Rose, Diamond

The Deer Park, Texas plant started in 1953 and has open construction. New employees are trained to appreciate the hazards of vinyl chloride even to a witness of burning VC and the fumes given off. The accident record was good - first lost time accident was a ladder incident in 1959 - received Best Safety Awards in 1956, 1957 and 1960 and accumulated 1,000,000 man hours accident free record.

The accident was reviewed essentially as it was written. A large manhead gasket gave way and an explosion occurred from the vapors released. A banlon shirt caught fire and was responsible for unnecessary burns. The insurance people credit static for the initiation of the explosion but two other possible sources, a light fixture and a gas burner for the dryer, could have been responsible.

Heat melted wires and power was lost, discs and valves blew on 5 reactors but no fire came from these vapors released to the roof.

The large manheads of the remaining reactors of similar design have been welded (certified) to the reactors. Agitation will be cut up to be removed and split hub type used. A caution was issued to consider the possibility of vinyl vapors trapped in the shaft and not cut with a torch. An outside ladder will be installed in the dryer tower. Glass lined pipe has been removed since static can build up and cause sparking. A deluge system is being installed. Rings were welded to the smaller heads to provide better seals for the Lenape heads. Improvements are being made to the lighting system. A Loss Prevention Committee has been formed. All gaskets will be changed annually at least.

5. Review of Accidents at Other PVC Plants.

A. Atlantic Tubing - E. T. Biehl, Pentasote

OCC 2615

A reactor manhead gasket was reused and not properly centered - a very slim part formed the seal on one edge. The reactor wouldn't pressure test but was charged anyway and blew out. Static is the suspected cause although an electrical short is possible. The roof concrete lifted and fell bending relief valves and piping. Reactors are 2200 gal.

B. Tenneco - C. G. Thompson, Tenneco

The release of vapors was purely accidental caused by an operator reaching out to grab something and grabbing the handle of the drop valve on a recently charged reactor. The source of ignition was approximately 150 feet from the source of vapors. A sketch showed the burn areas and buildings involved and slides showed damage and protective measures during the succeeding days. All valves now require a wheel geared for several turns to open to prevent a "quick full open" accident. All personnel are required to wear long sleeves with collar buttoned, long pants, hard toes and hard hat. Having the body fully covered could have prevented much of the body burns sustained.

*Short in
Grinnell
Tenneco
VC*

Fan operation is this:

Normal - Winter - 15 changes/hour
Summer - 30 changes/hour

High Speed - Winter - 30 changes/hour
Summer - 60 changes/hour

Some of the complications of "outside" help such as volunteer fire department people, state police and the press were outlined. Consider a fire control van from which operations can be directed.

Panel Discussion. Fog vs. Deluge.

Mr. Schwab of Allied Chemical discussed their deluge system. The normal air change is 10 per hour - at 20% LEL the fans automatically go to 20 changes per hour. At 40% LEL the deluge comes on. Coverage is .35 gallons per sq. ft. per minute. Pump pressure is 125 psi with one electric and one diesel pump with capacity of 2000 gpm. They are adding a 2 million gallon reservoir for additional capacity. To test the sensors they prepare a bomb with the desired percentage of vinyl and air and check each point. Each sensing point monitors continuously as contrasted to the system at Atlantic Tubing which monitored each point in a sequence which required 8-10 minutes to complete the cycle. Grinnell Multimatic valves are used.

Mr. Dowell of Goodrich discussed their fog system. The sole purpose of the fog is to increase the humidity to prevent the possibility of static spark. Target is 80-90% humidity. The units are operated at 80 psi, are about 7-8 feet above the floor and disperse 1.1 gpm. Coverage per unit is 10 f t diameter area. The folly of using black iron pipe was pointed out but galvanized pipe has proven satisfactory. At 21 changes per hour the humidity was raised sufficiently in 1½ minutes. At 6 changes per hour the humidity was raised from 53% to 85% in one minute.

Additional comments from the floor - one installation can deluge three buildings in 12 hours at 10,000 gpm and also provide steam injection at the inlet fans. One company has been requested by insurance to go away from the HAD system and install deluge. One fire was caused by venting from a dipstick to cool down a sample bomb but the bomb wasn't arounded.

6. Safety Procedures with High Pressure Water

Cleaning Systems - M. G. Glenn, General Tire

In this installation the high pressure pump is installed in the utility building (and considered a utility) which is about 70 feet from the reactor building. The pump is a Manton Gaulin 3600 KL4 which was surplus equipment and available. Horse power is 50 at 1200 RPM (cut from 100 HP originally). Relief is set for 3500 psi. The lance has 6-800 psi rating, socket welded - used Vogt unions, certified welder. Orbit valves at 6000 psi are used. The gun is rated at 6000 psi with other models available. Capacity at 3000 psi is 26 gpm. The hose is attached to the header running down the reactor row and is approximately 8 feet long and can be quickly moved from one location to another. The major failing in this set up is the dome area which can't be adequately cleaned. Nozzles have limited life. 6-800

Other comments - can shield couplings for personnel protection. One company pressure tests hose every 3 months (nine companies do this). Hose lengths were up to 25 feet. Must go into reactor anyway. Glass etching at high pressures is no problem. Deionized water has caused sparks up to 30 inches. If an abrasive is put in the water, steel or concrete can be cut (as well as the nozzle).

7. Gasketing Material - E. A. Rose, Diamond

(Note that the numbers follow the proposed program and not the sequence of presentations.)

Gasketing was discussed and samples shown. Two people are using polypropylene gaskets with the Lenape head. Polypropylene will expand 20-30 times and still be a good gasket. Only the filled gaskets should be used on manheads and one suggests only the corrugated ring should be used.

9. Spark Sources - J. T. Barr, Airco

Spark sources are numerous with some hot enough to cause an explosion and others not hot enough. Sparks from metal contact (tools) and personnel are not supposed to be hot enough, but moving equipment can generate enough heat. Non polar liquids passing through a polar medium or visa versa may create a hot spark. In one case a monomer pump seal failed. It was valved off and let run and a flash occurred. Possibly cutting off the pump and then valving off might have prevented the spark. Electric fittings were discussed along with motor control centers and use of remote air for pressurizing. The sealing compound used to seal conduits was soluble in VC and VC was found in the conduits. Personnel training, smoking provision, etc. were discussed. Various organizations have films for training including Bp Mines, Ethyl Corp. and Caromody Trainer (?)

All synthetic clothing shouldn't be allowed. One company supplies cotton clothes to all employees. One man was burned from flash caused by cloth static spark. Some fluids are so prone to buildup of potential that flows must be restricted despite all efforts to ground (e.g. kerosene). Fiberglass pipe or glass lined pipe cannot be adequately grounded. Vinyl acetate is difficult to ground totally - run dip leg to below surface to prevent potential from falling through the air.

The opinion was expressed that vinyl vapor escaping from a reactor leak won't create enough static to spark but the fcaming brings liquid to the leak and this will create the potential to spark.

On small leaks the vinyl may be diluted before it reaches a sensing head and not trigger the high speed fan or deluge but near the leak there may be explosive conditions.

Seven plants use lightening rods or arrestors to prevent lightening damage.

In the Thompson disaster, there were three explosions, one due to static generated in the dryer dust collector. During all the ocmon the purification column was broken and vinyl spilled. After a period of time when nothing happened four men re-entered the area presumably from curiosity and were killed when the vapors ignited. In other words, four of the five killed were unnecessary.

In a Spanish plant an operator had overcharged a reactor, opened to relieve into the knockout vessel above, valved the KO vessel off and the vinyl and catalyst reacted rapidly enough to blow out a 139 lb. section of the KO tank and hurl it 600 feet away.

12. Noise Policies - G. D. Schaaf, Goodrich

(The choice of this last discussion was by voice vote from the floor.)

There is an article in the Plant Engineering magazine, November 12, 1970, issue on noise. The Walsh Healy Act was described and various decibl (db) level significance pointed out. Threshold of pain is 140 db, a compressor (not defined) may be 90-100 db, a room with people may be 50 db. Ear protection is provided where a loss of 5 db is evident in a year's time. If more loss is sustained the man is removed from that area. Either ear plugs or muffs can be used.

END

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