7. Narrative
ALT
1996

The GEON Company
One Geon Center

Board of Incident Review
Vinyl Chloride Monomer Release
Building 413, 3 Liter Laboratory
12/5/96

Summary of the Incident

At approximately 3pm on December 5, 1996 the Resin R&D 3 liter pilot operations experienced a clamp failure on reactor #1. Approximately 1 hour into the reaction the reactor retaining clamp failed which allowed the reactor to separate at its mating flange. Upon separation a combination of polyvinyl chloride resin and vinyl chloride monomer was released to the atmosphere in the room. It was calculated that approximately 2.1 pounds of vinyl monomer was released. There were no injuries and no exposures over the OSHA reporting criteria.

Board of Review

A Board of Review was convened on Thursday the 5th of December 1996 at 4:15 PM with the following in attendance:

Jerry Bialko	Facility Manager
Bob Tebbutt	Director R&D Resin & Intermediates
Al Kalzewski	R&D Senior Process Specialist
	Resin Pilot Plant Lead Operator
Kevin Maggioli	Resin Pilot Plant Engineer
	Resin Pilot Plant, 3 Liter Operator
Ben Homas	Research Technician, Resin R&D
Dale Wahl	Maintenance Supervisor
Shane Ryan	Maintenance Supervisor
Jason Barnes	Environmental, Health & Safety Engineer, OGC

Narrative

The discussion began with a review of the incident and the circumstances leading up to it. , 3 liter operator, had prepared reactor #1 according to standard operating procedures. As part of the preparation, pressure and vacuum tests were performed on reactor #1 prior to charging. The reactor held pressure and vacuum within specified limits and he began the experimental charge. Approximately 1 hour into this process observed that the charge was beginning to solidify instead of normal polymerization, he then began to cool the reactor down as per procedure. 2 to 5 minutes after the cooling began,] : suspension resin technician were discussing the reaction characteristics by the computer control console in the lab when they heard and felt a pressure concussion, Both men observed that the reactor had failed, they immediately left the laboratory.

REDACTED

The VCM warning alarm lights activated at the 1 and 5ppm levels almost immediately with the 100ppm warning alarm horn sounding approximately 20 seconds later.

Phil Bak a resin scientist who was standing outside the lab when the reactor failed, immediately went to the fire alarm pull station and pulled the alarm to evacuate the building as per emergency protocol. However, the alarm did not function. Phil then proceeded to begin a manual evacuation of the building. E,H&S personnel and the Facility Manager were contacted by radio and immediately responded to the scene. The Emergency Response Team (ERT) was also activated via radio. The operators involved were checked for injuries by ERT personnel and the areas outside the laboratory were monitored for VCM. No VCM was detected outside of the 3 liter lab. Building personnel were then allowed back into the building. After determining that over 1 pound of VCM had been released we immediately began the emergency notification protocols as outlined in site environment policies E-101 through 103. All notifications were made within the required time frames. were sent to the dispensary for medical evaluation for potential chemical exposure, no problems were found.

Once the VCM levels in the lab were below 1 ppm, personnel were allowed to reenter the room to begin the investigation. Upon investigating, it was determined that the reactor had failed at approximately 196 psi of internal pressure, which is well below the vessel pressure rating of 300 psi. Normal operating pressures vary from 160 to 230 PSI. The reaction was a typical reaction performed in the 3 liter pilot plant.

The investigation revealed that the bottom portion of the vessel had blown down and slightly back bending the support structure and hydraulic system as well as tearing the cooling water outlet line from the vessel. A more detailed inspection showed that the cooling jacket had been fractured as well. 3 pieces of the vessel retaining clamp, the T bolt assembly and the clamp ring (in 2 pieces) were found near the failed reactor.

Upon examination it was determined that the flexible banding steel on the clamp had fatigued directly along a spot weld which lead to the clamp failure. Normal procedure is to visual inspect the clamp prior to securing the vessel. The T bolt was examined, the threads were intact and the bolt assembly was found to be within specification. The age of the clamp is not known. It appears when the clamp burst that one of the pieces flew towards the computer console striking it with enough force to snap several pieces off of its casing.

The Avon Lake fire department came to the scene to inspect the damage and assess if any remaining hazards existed.

Systems Investigation:

The fire alarm system did not function properly.
Upon investigating it was determined that the mechanical reset switch on the master control box did not engage fully the last time the system was reset. This has been remedied.

The VCM detection and lab ventilation systems functioned as designed.

Cause

The cause of the incident was determined to be mechanical fatigue failure of the reactor retaining clamp flexible banding ring

Corrective Actions:

1) Remove all present clamps from service and inspect them for evidence of wear. Bialko 12/6/96 Complete

2) Replace all present clamps with new clamps. Maggioli 12/10/96 Complete

3) Replace present flexible, T bolt locking clamp design with a 2 piece dual locking clamp for all 3 liter reactors. Maggioli 1/10/97

4) Assess ways of preventing clamps from becoming projectiles should failure ever happen again, i.e. shielding, tethering ect. Maggioli 12/20/96

5) Assess damage and repair costs to 3 liter reactor #1. Maggioli 12/20/96

6) Check and repair faulty fire alarm system. Ryan/Wahl/Barnes 12/5/96 Complete

7) Check and replace damaged computer control monitor in 3 liter lab. Kalzewski 12/6/96 Complete

8) Clean lab of all resin particles. 12/6/96 Complete

9) 3 liter laboratory operations are to be suspended until replacement clamps are received. Bialko 12/5 Complete

Facts Surrounding the Incident

There were no injuries
The notifications to all outside agencies were made as required
Internal management notifications were made as required
The laboratory ventilation system worked well
The VCM monitoring system worked well
OGC sustained a reportable release of vinyl chloride
The operator has been an employee of Geon for 8 years
The operator followed all procedures as required

Conclusion

It was the conclusion of the board that the environmental release was a result of mechanical failure of the reactor retaining clamp and no operator error or recipe related factors contributed to the release. The 3 liter operations are suspended until such time that new clamps can be secured.

Jason E. Barnes
Environmental, Health & Safety Engineer, OGC