

Process Safety Incident of the Week
Formosa Plastics Vinyl Chloride Release

<https://www.aiche.org/sites/default/files/cep/20150323.pdf>

On April 23, 2004, an explosion and fire at the Formosa Plastics Corp. plant in Illiopolis, IL, killed five workers and seriously injures two others. The event destroyed most of the PVC manufacturing facility and ignited PVC resins stored in an adjacent warehouse. Concerns of the smoke from the fire forced a two-day community evacuation because the material in the mixture, vinyl chloride monomer is highly flammable and known carcinogen. PVC is produced by heating VCM, water, suspending agents, and reactor initiators under pressure in a batch reactor and once reaction is complete it is transferred through the bottom valve to a vessel for the next step. In the facility there are 24 reactors, placed in groups of 4. On the day of the incident, the reaction and the power washing had been completed in reactor D306 and the operator went downstairs to drain the reactor. It is believed when he got the bottom of the stairs he turned in the wrong direction toward identical reactors that were running a reaction. By mistake the operator likely attempted to empty reactor D310 (see picture below) by opening the bottom and drain valves, but it was interlocked because the reactor was running.



The operator instead, thinking he was at the right reactor and that the bottom valve wasn't functioning, overrode the interlock without consulting the reactor at the control panel. Once opened, VCM poured out and filled the building with liquid and vapor. The VCM vapors found an ignition source and several explosions occurred. The ensuing fire spread to the PVC warehouse and burned for hours, sending a plume of acrid smoke into the nearby community.

Causes

The operator overriding the interlock leading to the release of VCM was a cause. Formosa Plastics did not have comprehensive written standards, such as requiring shift supervisor approval, for managing interlocks on the vessels. Also employees were unprepared for a major accident at the facility.

Key Lessons

Operators and engineers must follow operating procedures and protocols intelligently, and when process moves outside the operating envelope, stop work and get experienced advice. This explosion also illustrates the importance of emergency response planning and how to properly handle a situation.