

## Formosa Plastics Vinyl Chloride Explosion

By: Christina Meyer

<https://www.csb.gov/formosa-plastics-vinyl-chloride-explosion/>

### Activity

The Formosa plant, located in Illiopolis, Illinois, manufactures polyvinyl chloride (PVC) plastics. The reactor building is set up with multiple groupings of four reactors throughout.

### Hazard

The Safety Data Sheet on vinyl chloride states:

- Extremely flammable gas.
- Contains gas under pressure; may explode if heated.
- May cause frostbite.
- May form explosive mixtures in Air.
- May displace oxygen and cause rapid suffocation.
- May cause cancer.
- May cause damage to organs through prolonged or repeated exposure.



### Preventative Actions and Safeguards

Ensure reactors can be distinguishable and can tell their status. Reduce as much human error as possible. Have proper safeguards in place so valves cannot be inadvertently turned.

### Contingency Plan/ Mitigating Actions

Have proper emergency evacuation in case of release.

### Initiating Event

April 23, 2004, an operator who was on the upper level of the reactor building was water blasting a reactor to clean it. He then needed to go down to the lower level of the building in order to open two valves to drain the reactor contents.

### Incident

While going downstairs, it is believed the operator turned towards the wrong cluster of reactors and went to the one he believed he was cleaning, which ended up being the wrong reactor. The reactor he was trying to turn valves on was in the process of making PVC, so the drain valve opened but the other bottom valves would not open. The valves would not open because there was a safety interlock, which prevented them from opening while the reactor was pressurized. Instead of questioning why the valves were not opening, the operator instead attached the air hose that provided adequate pressure to override the interlock; this hose was to be used in the case of emergency only. Once the valve opened, the highly flammable vinyl chloride immediately flowed out onto the floor and the vapor filled the air. Alarms detecting the release sounded throughout the reactor building. The supervisor and operators attempted to slow the release of the vinyl chloride by relieving the reactor pressure, but just as the supervisor attempted to get down to the lower level, the vapor exploded. Five of the workers ended up dying, while two others were seriously injured.

### Lessons Learned

Instead of evacuating the building when the alarms sounded and saving their lives, operators remained in the building in a vain attempt to mitigate the release. It is important to have proper emergency and evacuation procedures in place when a release happens. Proper safeguards were not in place to reduce the potential of human error. Other additional safeguards in place could have prevented these critical valves from being opened when the reactor is running. The design of the building was extremely poor, considering there was no way to tell the operator the status of the reactor from the lower level. The design of the building should try to reduce human errors, not increase them. There was also a lack of communication due the fact no radios or intercoms were present, simple communication can prevent incidents from happening. There have been other incidents of releasing vinyl chloride previously, but no adaptations to prevent future releases were made.