

## **Critical safeguards must be kept functional!**

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In 1999, a partial power outage (in this case an electrical failure without loss of steam pressure) led to a catastrophic overpressure in several pressure vessels in an alumina slurry digestion/flash system. It caused a vessel to rupture in a Boiling Liquid Expanding Vapor Explosion (BLEVE). The shockwave and the released hot caustic liquid injured 29 people – several permanently. Damage was in the tens of millions of dollars. Fortunately there were no fatalities.

The plant had been designed with several layers of protection, but on the day of the accident several were not working:

1. The pressure control system was in manual mode so the operator could apply additional pressure to push the slurry through before it could solidify.
2. The high pressure interlock was in bypass mode to give the operator additional flexibility by going above design pressure.
3. The pressure relief valves had been disabled because they had been leaking after previous openings.

The site was in the habit of bypassing/disabling the safeguards to maintain production. They rationalized this because their process had a tendency to solidify if it wasn't kept moving (by steam pressure). When a partial power trip occurred the system pressure increased. However, since the pressure interlock was Bypassed and too many relief valves were disabled, the pressure built up to unsafe levels..

Operate equipment within its limits all the time – with all safeguards in place. This is so important that the CCPS made it one of the 20 elements of its risk-based process safety program (Conduct of Operations).



Aftermath of the BLEVE

Reference: MSHA Report of Incident on July 5, 1999 MSHA ID No. 16-00352

### **Did you know?**

- High pressure shutdown systems or other safety-related protections should never be bypassed without following standard operating procedures (for example, if a safety system must be disabled during a normal startup) or using temporary Management of Change (MOC) systems. Temporary MOCs may be used to manage bypasses for a short time while something is repaired, as long as you take other temporary measures to ensure you aren't increasing risk.
- It's not unusual for relief valves to fail to reseal completely after they have done their critically important job once.
- Closing the block valve under a relief device is a potentially significant risk increase and should only be considered after careful evaluation of all mitigation options. Typical "safety system impairment standards" require following administrative measures like tagging, logging and communication to facility management.
- Your safeguard systems are typically intended to be challenged by a real "process demand" less than once per year. If a safety system is being activated more often than that there may be a problem with your process design.

### **What can you do?**

- Understand the major hazards at your plant.
- Know the critical safeguards against those hazards and be sure they are working properly.
- If you regularly have to operate with critical safeguards bypassed or impaired, report this to management.
- Do not place automatic controls in manual, do not bypass interlocks nor disable relief valves.
- If there is no other choice while something is being repaired, use Temporary MOC procedures to manage disabling/impairing of safety systems for a short time, with all affected persons made aware of this.
- Make sure that unreliable controls and safeguards are considered in Process Hazards Analysis reviews.

**Your safety is built in layers. Make sure they are working!**