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Safety Culture Spotlight

Blindness to Chemical Reactivity—Hazards Analysis

- Failure to understand chemical process hazards results in fatalities
- Pressure gauge failure hides the hazard
- Previous indicators normalized

BACKGROUND

A plastics extrusion plant suffered a multiple fatality incident when workers were attempting to open a waste plastic tank to clean it. The vessel pressure gauge showed no pressure in the vessel, but the gauge had become blocked with plastic and did not show the actual pressure in the vessel. After half the bolts fastening the vessel cover had been removed, the cover flew off, killing the three workers. The cover also severed hot oil lines, leading to a fire that took several hours to extinguish.

WHAT HAPPENED

Investigators (Ref E.9) discovered the plastic had a reactive chemical hazard, an exothermic decomposition reaction at hot temperatures. As the plastic in the catch tank cooled on the outside, the plastic in the center remained hot and molten, allowing the decomposition reaction to continue to build pressure, while the solid plastic outer shell shielded the pressure gauge from detecting the high pressure in the tank.

Investigators found the company was not aware of the plastic's decomposition reaction, though the company had more than 20 minor incidents or near misses over nearly 10 years that provided many hints of the existence of this hazard. While some of the minor incidents or near misses could be explained individually by labeling them as "process fires", some of the fires occurred in environments without oxidant or ignition source. The plant launched a process fire prevention program, but it was unsuccessful and abandoned.

What culture factors were involved in this incident? It is not unusual for facilities that handle materials that are not considered "chemicals," such as petroleum, plastic, food, etc., to neglect the potential for chemical reactivity hazards. Which culture elements need to be strengthened in such companies to help them evaluate potential hazards that might be thought to be "outside the box" for them, but really are not?

This appears to be an extreme example of the normalization of deviance. Why ultimately did the reactivity hazard issue get normalized?

SAFETY CULTURE FOCUS

- ✓ Strong leaders must ensure incidents are investigated to identify root causes to mitigate risk.
- ✓ A questioning environment is critical to avoiding an attitude that normalizes hazards.
- ✓ Continuous improvement is only possible when risks are understood and mitigated.

****Only 54% of those surveyed indicated risk planning was a strength in their organization.****

IMPROVING HYDROGEN SAFETY CULTURE

LEARNING OPPORTUNITIES FROM OTHER'S EXPERIENCES

"Safety culture is how the organization behaves…
…when no one is watching."

Safety Culture Framework

- Safety is everyone's responsibility
- Strong leadership support
- Integrated into all activities
- Open, timely, effective communications
- Questioning/learning environment
- Mutual trust
- Continuous improvement

What are the benefits?

- ✓ Eliminates common weaknesses identified as contributing factors to catastrophic events.
- ✓ Promotes trust in the hydrogen energy industry's ability to deliver safe, reliable, quality products and services.
- ✓ Supports a sustainable legacy for companies and the hydrogen industry.
- ✓ Fosters efficiency and productivity in the workplace.

Resources

- ✓ For further information and resources on safety culture, see: https://www.aiche.org/ccps/safety-culture-what-stake
- ✓ For further case studies on safety culture, see: https://h2tools.org

Keywords: weak, poor, minimum, regulations, flammable, chemical, checklists, compliance