

Safety Bulletin

Process Hazard Analysis (PHA)

Observations

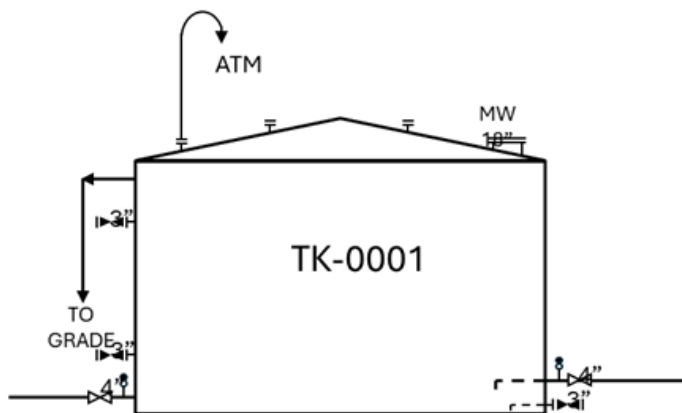


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Introduction

In a PHA we use the symbols on a schematic (P&ID) to evaluate the worst-case consequences of a process deviation. Even still, it is sometimes difficult for a PHA team to make the connections between a scenario developed on paper and how that same scenario will transpire in the real world.

The image below depicts how a typical PHA team may evaluate a tank overfill scenario and how that same scenario might occur in reality (right side image).



PHA Scenario Consequence: Potential for increased Storage Tank (TK-0001) level leading to liquid overflow and spillover of flammable liquid (gasoline) to grade with potential for fire if an ignition source is found resulting in significant personnel, environmental, business, asset, and reputation impacts.

Real World Impact: Blast created pressure wave registering 2.9 on Richter scale, pressure wave damaged approximately 300 homes and businesses up to 1.25 miles from site. Over \$5 million in damages to nearby Fort Buchanan military facility. Interruptions in air and vehicle transportation. Thousands of gallons of oil, fire suppression foam, and contaminated runoff were released to the environment.

How do we, as PHA facilitators, help the Team to connect the hypothetical on the left to the reality on the right?

In This Issue

This Safety Bulletin provides insight on the PHA facilitator's role in bridging the gap between theoretical and practical PHA scenario analysis.

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We need to use all of the tools in our process safety engineer's "toolbox". Some of these "tools" include:

- Discussions – the actual brainstorming discussion in the room should not be limited to just identifying causes and applying the severity and frequency formulations, but to also walk through the scenario from beginning to end thinking about everything that could feasibly occur along the way.
- Operator experience – what have the operators seen or heard of in the past? Typically, operators will have a story or two of how a major event "almost happened", but how they caught it in time. This is where we ask the question, what if you did not catch it in time?
- Physical and chemical properties of the materials – analysis of the material properties will alert the team to the specific material hazards that may be released including flash points, toxicity, and secondary reactions of concern.
- Previous incidents, both at the site as well as in industry – since a PHA is a theoretical tabletop exercise, an in-PHA review of previous incident like the one identified above, can help the team to engage. Per EPA RMP and OSHA PSM requirements all PHA teams should be reviewing applicable incidents. Something that has been implemented into our PHA's is that during the initial node introduction and discussion, we introduce industry incidents applicable to the node under discussion, and not just applicable to the process as a whole.

As PHA Facilitators we need to keep the team asking questions. I often have noticed that my function as a PHA Facilitator is like that of a chemical process psychoanalyst where I shutoff a pump mid-run and then ask the operator "how did that make you feel?"

References:

- 1: <https://www.csb.gov/csb-releases-draft-investigation-report-into-2009-explosion-and-fire-at-caribbean-petroleum-terminal-facility-in-puerto-rico-report-finds-inadequate-management-of-gasoline-storage-tank-overfill-hazard/>
- 2: <https://www.csb.gov/caribbean-petroleum-refining-tank-explosion-and-fire/>
- 3: https://www.csb.gov/assets/1/20/capeco_final_report__10.21.2015.pdf?15538