Process Safety Beacon
Messages for Manufacturing Personnel
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CCPS Center for Chemical Process Safety

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Are Your P&IDs Up to Date?

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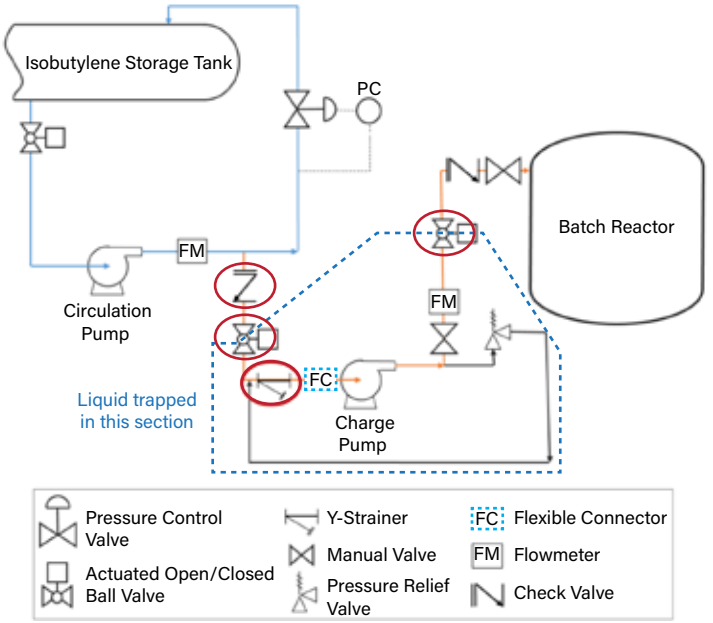

▲ An incident occurred in a process with an inaccurate piping and instrumentation diagram (P&ID). Image adapted from the U.S. Chemical Safety and Hazard Investigation Board (CSB) Report No. 2019-02-I-TX.

In 2019, an explosion followed a 10,000-lb (4,500-kg) release of flammable isobutylene from a failed Y-strainer. It fatally injured one worker and seriously injured two others. At least 28 others were injured, and the operating company went bankrupt. This Beacon focuses on just one of the many lessons learned from this incident — the tremendous pressure that occurs when trapped liquids expand.

The piping and instrumentation diagram (P&ID) for the Y-strainer piping had errors and did not accurately reflect the field. The version used for the process hazard analysis (PHA) did not show the Y-strainer, a check valve, or the manual isolation valves (circled in red in the figure). These combined to make a section where liquids could be trapped. The facility completed an initial PHA and PHA revalidation. During both PHAs, the team did not detect the incorrect P&ID and therefore failed to recognize the liquid expansion hazard.

The drawing also indicated that the piping was all welded or flanged 304 stainless steel. The 3-in.-diameter cast-iron Y-strainer was connected to the stainless piping by pipe-threaded joints, which did not meet accepted piping specifications. See the May 2024 Beacon for more detail.

Did You Know?

- Thermal expansion of liquids can generate tremendous internal pressure in pipes and other process equipment. It can occur in blocked-in lines, especially those containing liquefied gases such as isobutylene.
- P&IDs are a key input to the PHA process. P&ID accuracy is critical to a thorough and accurate understanding of the process and its hazards.
- The PHA team reviews each section of the P&IDs, looking for things that could go wrong and cause issues in that section or elsewhere.
- Good risk management practices and most process safety regulations require that P&IDs be current, accurate, and used in PHA studies.
- PHAs are required to be revalidated or reviewed regularly.
- One purpose of revalidations is to review changes that have occurred and to verify those changes are properly managed.

What Can You Do?

- Your P&IDs should accurately reflect the process as it exists in the field. If they don't, report that to your supervisor.
- If you are participating in a PHA study, check the P&IDs for accuracy. If they're not correct, point this out to the team.
- A recommended practice for PHAs is for the team to visit the process area under review. These visits are an opportunity to note special hazards, safeguards, or piping issues.
- Report any threaded connections in hazardous service with diameters over 3/4 in. (19 mm) to your supervisor.

Current and accurate drawings are the backbone of an effective PHA.