

## Does the Piping Meet the Specification?

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▲ A cast iron Y-strainer failed during operation and released flammable isobutylene. See the U.S. Chemical Safety and Hazard Investigation Board (CSB) Report No. 2019-02-I-TX for more detail.

A vapor cloud explosion and fire led to one fatality and two serious injuries. At least 28 other workers were injured. About 10,000 lb (4,500 kg) of flammable isobutylene was released when a 3-in. (75-mm) Y-strainer failed, likely due to thermal expansion. The vapor cloud ignited, causing an explosion. Many factors played a role in the incident, but this Beacon focuses on the importance of using piping materials that are approved in the pipe specification.

The piping and instrumentation diagram (P&ID) for the piping had several errors. It didn't show the Y-strainer, a check valve, or a manual isolation valve. A process hazard analysis (PHA) was performed when the system was installed and was revalidated about a year before the accident. No one noted that the P&ID did not match the field piping. According to the drawing, the piping was welded or flanged 304 stainless steel. The 3-in. diameter cast iron Y-strainer was connected to the stainless steel line using threaded joints. Most industry pipe specifications would certainly prohibit 3-in. threaded connections in isobutylene service.

Cast metal devices, like this strainer, are more brittle than stainless steel. They can fail and are specifically prohibited in pressurized hydrocarbon service by several industry piping standards.

### Did You Know?

- The design of new piping systems should follow industry-approved piping specifications. These specifications provide guidance for temperature, pressure, and correct materials.
- Most companies have internal piping specifications for various process and utility fluid services.
- If your company doesn't have its own piping specifications, groups like Process Industry Practices (PIP), the American Society of Mechanical Engineers (ASME), the European Committee for Iron and Steel Standardization (ECISS), and the Japanese Industrial Standards Committee (JISC) have standards that companies can use.
- Threaded connections are seldom used in larger-diameter hazardous service piping. They may be used for small-diameter instrument or sampling connections.
- Any deviation from pipe specifications should require a management of change (MOC) review that includes an analysis of the modification by a technical team.
- All piping installations should have a pre-startup safety review (PSSR) to ensure that the piping meets the correct specification.

### What Can You Do?

- The P&IDs should accurately show the process piping as it exists in the field. If they do not, report it to your supervisor.
- A good practice is for the PHA facilitator to field-check the accuracy of the P&IDs before starting the study.
- If you see any threaded connections with diameters over 3/4 in. (19 mm) in hazardous service, report them to your supervisor so they can be checked.
- If a piping change is needed, use the company's MOC system to ensure that the proper reviews are performed.

Ensure that your company follows its pipe specifications.