

Safety Snippet: Piping Dead Legs



Piping Dead Legs

Chemical processes are inherently comprised of piping dead legs, whether it be a control valve bypass, relief valve discharge, start-up line, or abandoned piping, these types of dead legs are all common. Unfortunately, there are hazards associated with piping dead legs such as leaks of hazardous materials, and therefore, it is imperative that they be identified and managed appropriately.

What is a piping dead leg?

API 570 defines a deadleg as the following:

Components of a piping system that normally have little or no significant flow. Some examples include blanked (blinded) branches, lines with normally closed block valves, lines with one end blanked, pressurized dummy support legs, stagnant control valve bypass piping, spare pump piping, level bridles, pressure relieving device inlet and outlet header piping, pump trim bypass lines, high-point vents, sample points, drains, bleeders, and instrument connections. Deadlegs also include piping that is no longer in use but still connected to the process.

There are various interpretations of dead leg classification with regards to the pipe segment length and intermittent flow lines. Batch-system piping that is used intermittently but reasonably frequently is typically not considered a dead leg. The PPTS Advisory 2009-5 study observed that 92% of dead leg related incidents occurred on pipe segments that did not see flow at least annually. Therefore, this is a good rule of thumb to incorporate into a facility dead leg program; however, this should be adjusted accordingly based on the service, historical incidents, and estimated corrosion rates. Additionally, any dead leg that is more than 3x the internal diameter of the pipe should be identified and tracked on the Dead Leg Management Program.

Dead Leg Hazards

1. Insulated dead legs are more susceptible to Corrosion Under Insulation (CUI) as they operate at different temperatures than the operating temperatures of the active line.
2. Internal corrosion is one of the leading causes of incidents associated with dead leg leaks and loss of containment.
3. Freeze damage is a concern for dead legs with processes containing water. Water accumulates and has the potential to freeze in dead legs, leading to volume expansion as water turns to ice and pipe failure, resulting in loss of containment of process fluids if system pressure can push the ice plug out or loss of containment upon thawing.

In This Issue

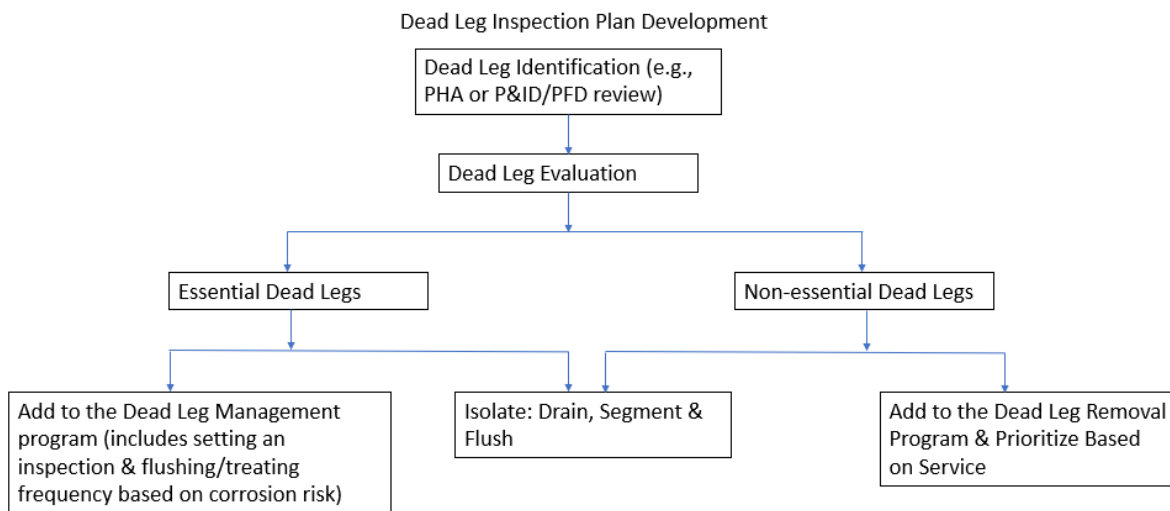
Hazards associated with piping dead legs are discussed along with recommended practices for mitigation, including the development of a Dead Leg Management Program.

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<https://www.NebulaSafety.com>

Recommended Dead Leg Mitigations

- o Dead legs can be identified by reviewing piping drawings with operations for an evaluation of normally no flow lines along with walking down the process. Additionally, the Process Hazard Analysis (PHA) can be a tool for dead leg identification and prioritization based upon the associated risk.
- o Dead legs should be evaluated and eliminated when determined unnecessary for operations. It is recommended to track non-essential dead legs and develop a removal plan prioritized based on the service and potential hazards.
- o A dead leg management program should be in place to ensure that dead legs are drained and isolated appropriately.
- o The Program should ensure that dead legs are flushed with appropriate fluids (e.g., containing biocide) to reduce the potential for internal corrosion and associated leaks.
- o It is recommended that dead legs in all services with potential safety and environmental implications are tracked on a Dead Leg Management Program that identifies required inspection frequencies based upon the potential corrosion risk.



Design for Dead Leg Mitigation

- o Pipe segments longer than a tee with a blind flange or valve should have freeze protection such as insulation or heat tracing.
- o Dead legs should be designed without pockets to mitigate potential water accumulation, especially for relief valve discharge paths and jump-over/start-up lines.
- o Avoid dead legs whenever possible in the design and when they cannot be eliminated, ensure the dead leg pipe segment length is limited accordingly.
- o Consider designing means for proper isolation such as air-gapping if possible.
- o Redesign the process to add blinds, tight shut-off valves or double block & bleed valves.
- o Ensure that potential damage corrosion mechanisms are identified and that corrosion inhibitor injection is configured as needed.

Reach out to the Nebula Safety & Environmental Team at NebulaSafety.com for additional information.

Additionally, Nebula Safety can conduct a gap analysis for your facility to identify applicable deficiencies and opportunities for improvement.

References:

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