

Addressing Dead-Legs and Corrosion Issues in a Process Hazard Analysis (PHA)

The Challenge

Identifying dead-legs and related corrosion issues continues to be a challenge in the process industry. Pipeline corrosion has been a factor in several recent incidents involving releases and fires. A review of incident reports and citations over the past ten years indicates that Process Hazard Analysis (PHA) revalidations have been noted for not addressing the hazards of a process, including corrosion mechanisms and dead-legs. In order for the hazards to be addressed, they must first be accurately identified in a PHA and documented along with any recommended actions for preventive maintenance.

Client Description

Company	Multiple Oil Refinery Sites
Project Locations	Multiple US Locations
Industry	Oil & Energy
Annual Revenues	\$20+ Billion
Employees	10,000+ employees
RISK, Inc. Solution	PHA Facilitation

The Solution:

RISK facilitators use a systematic approach for all PHAs and revalidations to identify and address corrosion and dead-leg concerns. We have introduced this approach at several sites, as well as incorporated it into PHA procedure updates.

Corrosion review:

- During preparation for the PHA or revalidation, the facilitator reviews known corrosion mechanisms associated with the unit in question. They then review process safety information in detail to note potential corrosion issues to address with the team. This information should be in the form of metallurgical or inspections reports.
- If corrosion information is not included with the PSI, the facilitator seeks information from the metallurgy or inspections department or other site experts responsible for corrosion issues for that unit.
- During the PHA brain-storming sessions, the facilitator addresses corrosion issues with the team. Additional team members from maintenance/metallurgy are brought into the sessions for this portion of the study to provide expertise. Discussions include potential accelerated corrosion during start up, shutdown or standby operations, excessive heating or cooling of a unit that may lead to increased corrosion including salt formation, mis-manifolding opportunities that may introduce material that could cause increased corrosion (particularly at plot limits), and identification of dead-legs that may see increased corrosion.
- The unit is reviewed to ensure both upstream and downstream effects have been thoroughly considered for all failure mechanisms. Corrosion of downstream equipment is considered upon loss of wash water or chemical inhibitors. Also, change in feedstock and potential for corrosion is discussed within each relevant node.

Dead-leg Identification

- As P&IDs are reviewed, each line is thoroughly analyzed. To ensure that every line has been reviewed, they are highlighted prior to beginning each node. This helps identify for all personnel what is being considered. This also helps identify lines that are not part of normal operations.
- If a line is identified as not part of normal operations, or not in operation at all, it is identified as a potential dead-leg. Further discussion follows to determine if it is a potential source of corrosion concerns in a leak-by scenario. MOCs may be reviewed to determine if it was identified as being placed Out of Service (OOS). Inspectors are contacted to discuss need for or awareness of the potential hazard. Metallurgists are contacted to discuss potential for corrosion.
- If dead-legs are identified, a PHA recommendation is made to add that information to PSI, Inspections and/or Mechanical Integrity documentation.
- An additional recommendation may be made to ensure that a dead-leg management process be developed and maintained.

It is especially important during project (MOC) PHAs and revalidations of systems that have experienced changes to uncover potential issues. Systematically approaching revalidations can uncover dead-legs created by a previous change and areas where required blanks may be missing. This can easily occur if the project PHA did not include a specific review for dead-legs and corrosion issues.

The Result:

RISK, Inc. feels strongly about this issue and has presented a more detailed paper to assist facilities in improving their approach in the identification of potential dead-legs and corrosion issues during PHAs (available on request). Review your PHAs to see if they are responsive in identifying dead-legs and corrosion issues and develop a corporate standard to ensure PHAs are more robust in identifying corrosion related concerns with the goal of preventing corrosion related incidents.