LFI: Process Condensate Pipeline Rupture

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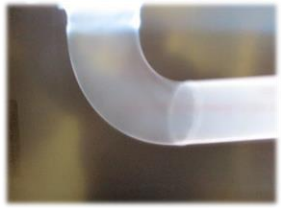
LFI: 2” Process Condensate Elbow Ruptured Upon Leak Seal Box Installation

1. What happened?
2. Why did it happen?
3. What were the learnings?

What happened?



Day & Time	Activity/ Event	Context
Day 1	Pinhole leak on 2” elbow of process condensate pipeline and production personnel load SAP defect.	Operating conditions: pressure= 1650 KPa, temperature = 120ºC.
Day 1	Onsite risk assessment conducted.	Type of leak on 2” elbow is a pinhole due to internal erosion. The leaking product is non-hydrocarbon. Given the operating conditions and product, decision made to install a temporary enclosure clamp until permanent repairs is executed at earliest opportunity.
Day 3	Leak Seal Request form completed.	Permission to Contractor to initiate Leak Sealing scope of work. Contractor takes measurement of onsite piping for manufacturing the leak seal box.
Day 8	Area Inspector perform both visual and X-ray inspection.	Inspection results confirmed that although the elbow (defective section) is thin 1-2mm wall thickness (WT), the piping section is still intact with 3.5 to 4mm wall thickness (WT) where clamp would be fitted.

What happened?

Day & Time	Activity/ Event	Context
Day 8	Leak Seal Request Form approved for Contractor to proceed with leak sealing.	Inspection results used as justification for approval to Contractor to design, manufacture and install a leak seal box.
Day 14	AIA receive and review design calculations and drawing for new leak seal box.	Design drawings and calculations prepared by Contractor and issued to AIA (both design and inspection departments) for review and acceptance. Design accepted and work scheduled on SAP look-ahead to execute the following week.
Day 22	PTW issued to contractor to install the leak seal box.	Permit issued with PSM risk level score of 2111, which requires an informal Risk Assessment. Number of persons involved on the job is four which includes the permit receiver. PPE requirements specified are: gloves, spectacles and ear protection only. NO special precautions were identified within the PTW given the nature and risks of the job.
Day 22	Installation of the leak seal box onsite.	Whilst Contractor busy installing bolts on the box, the process line elbow ruptured and splashed the injured with hot process condensate water. Whilst trying to escape, the injured tripped over a scaffold pipe and fell on his back. He sustained 1st and 2nd degree burn wounds to the right hand, chin, chest, and abdomen. Work was stopped immediately and he was rushed to Medical Station and then the hospital for treatment. The injured was booked off work for 4 weeks. **Process Safety Tier 1 Incident and Occupational Safety LTI.**

Why did it happen?

At-Risk Conditions:

1. Time Duration: Pinhole discovery to Seal Box installation
   - Metallurgical report confirmed internal corrosion.
   - 3 week Timeline from discovery to repair too long – further degradation.
   - Leak seal procedure does not specify re-evaluation of defect (i.e. inspection) prior to seal box installation.
2. Management of Change: Previous metallurgical report recommended material upgrade
   - Material upgrade recommendation not specified on drawings.
   - Change not effectively communicated and referenced to suit retrofitting.
3. Inadequate Assessment of Job's Risk Level
   - Leak Seal Procedure does not mandate a formal risk assessment.
   - PTW procedure enables both a generic and formal risk assessment.
   - PTW procedure enables subjective matrix based evaluation of the job's risk level.
   - PTW procedure does not contain an objective PSM based risk evaluation.
4. Assessment of the Job Site for High Risk Task Execution
   - Job site occupational safety risks not inspected and assessed.
   - Formal risk assessment to mandate site safety risk assessment for high risk task execution.

Why did it happen?

At-Risk Behaviours:

1. Lack of Hazard Recognition
   - Process condensate at 120˚C and 16 Bar, although not hydrocarbon - is a hazardous substance (motive force & temperature).
   - Complacency in that similar service leak seal box installations did not result in a PSI and thus risk matrix assessment result - being subjective – determined to be generic (low).

2. Relative Priority of Risk Assessment Sessions – Invitee Support
   - Attendance of risk assessments are not given highest priority.
   - Production staff then use own and not required expertise for risk level decision.

3. Lack of Risk Assessment Expertise (Leak Sealing)
   - Training sessions necessary to cement the requisite level of expertise (procedures and practices – Contractors and Staff).

4. Lack of Change Recognition (MOC)
   - Refresher training on MOC processes must use historic incidents to cement expertise in change recognition.

What were the learnings?

1. Process Condensate, although non-hydrocarbon - is not water - and presents serious hazards which must be widely known.
2. Leak seal boxes to be installed timeously and the pipe integrity must be verified again prior to installation.
3. Formal risk assessment must be mandated for the installation of all leak seal boxes – as equipment operation is maintained during installation.
4. Refresher training for MOC and HIRA must include own historic incident recalls to cement understanding and application.
5. Mandate site safety risk assessment for all leak seal box installations.
6. Incorporate a PSM based objective evaluation of the risk level for PTW risk assessments in conjunction with the matrix based assessment

Thank You…

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