Learning Event

Safer Together

OPERATING PROCESS EQUIPMENT

HAZARD
Chemical
(Explosive)

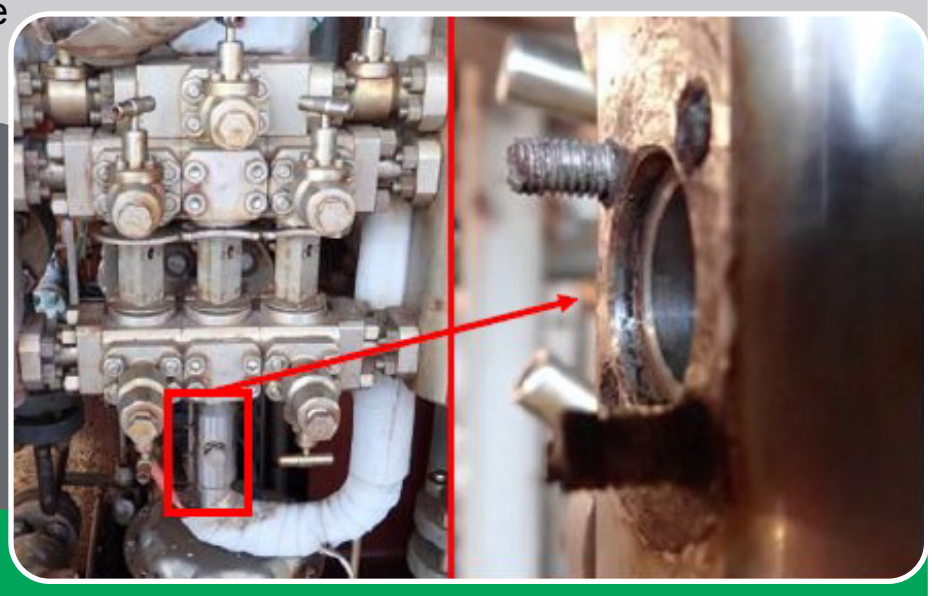
Loss of Containment

CONSEQUENCES
Actual: No harm to persons
Potential: This could have caused multiple fatalities

WHAT ARE YOU DOING TO MINIMISE LOSS OF CONTAINMENT RISKS FROM EQUIPMENT OPERATING IN CONDITIONS THAT ARE VUNERABLE TO CHLORIDE EXTERNAL STRESS CORROSION CRACKING?

What Happened?

During routine operation on a Floating Production Storage and Offtake (FPSO) facility, a technician heard an unusual noise from the compressor module. Control room operators identified a single gas detector with inconsistent readings. Site investigation found hydrocarbon gas leaking from a valve on the seal gas filter of the online compressor. Three bolts on the double block and bleed valve, attached to the seal gas filter had failed.



Why did it Happen?

The seal gas system was routinely operating at a temperature above 80°C. The bolts on the double block and bleed valve were made of SS316 grade stainless steel. SS316 is susceptible to chloride external stress corrosion cracking at temperatures above 50-60°C in marine environments / chlorides present. SS316 is not the correct material for this service. This had not been identified during design or subsequent operation.

What did they Learn?

- Ensure engineering design does not specify SS316 in conditions that are vulnerable to chloride external stress corrosion cracking (i.e. operating temperatures above 50-60°C in marine environments / chlorides present).
- Check that pressure-containing equipment in conditions that are vulnerable to chloride external stress corrosion cracking does not contain SS316.
- Establish assurance processes to ensure that materials supplied on vendor packages during projects do not contain SS316 for equipment in services that are vulnerable to chloride external stress corrosion cracking.

IOGP Process Safety Fundamentals

- ✓ We improve our understanding of process safety hazards at our location and our roles in controlling them.
- ✓ We are vigilant about the potential impacts of uncontrolled process safety hazards.
- ✓ We proactively look for indicators or signals that suggest future problems.
- ✓ We speak up about potential issues even if we are not sure they are important.
- ✓ We persistently explore the causes of changing indicators or unusual situations.

Ask yourself or your Crew:

- Do you have pressure containing equipment operating in conditions vulnerable to chloride external stress corrosion cracking (i.e. operating temperatures above 50-60°C in marine environments / chlorides present)? Is any of this equipment made from SS316? How would you know? What would you do if you identified equipment made from SS316 operating in these conditions?
- Do your inspection processes check for the presence of SS316 in equipment operating in conditions vulnerable to chloride external stress corrosion cracking? Are competent personnel reviewing and inspecting this type of equipment?
- Do your engineering designs ensure that SS316 is not specified in conditions that are vulnerable to chloride external stress corrosion cracking? Are adequate quality systems in place to ensure the correct materials are delivered and installed on your facility?

Further Information:

SCAN ME
API 571: Damage Mechanisms Affecting Fixed Equipment in the Refining Industry

SCAN ME
ISO 21457:2010 Materials Selection and Corrosion Control for Oil and Gas Production Systems

SCAN ME
Energy Institute - Guidance for Corrosion Management in Oil and Gas Production and Processing

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