Storage tank becomes brittle and cracks

Description:
During a visual inspection of a product storage tank, a trace of solidified product was identified, indicating a crack along the drip ring and the annular bottom plate. The tank specification called for the steel to have a minimum design metal temperature (MDMT) of -40°C but the material became brittle at lower temperatures (-15°C and below), resulting in a crack.

What Went Wrong:
- The supplier substituted a higher quality steel product not knowing that it had a different MDMT.
- A risk assessment using an international standard, such as API 650 Welded Tanks for Oil Storage, was not performed.
- The tank material vendors and internal company supply chain both assumed the appropriate tests were conducted, and specifications were met.

Actions Taken/Recommendations:
- Ensure that any steel material tank substitutions are risk assessed in relation to MDMT as part of a management of change process.
- Material vendors and supply chain teams must communicate clearly and in detail about material specifications and design requirements.
- Use the tools provided in the international standards (charts, grades of metals, etc.) to ensure material specifications are met.
- Always consider the impact of temperature variability in the selection or substitution of materials.

Example of a typical tank farm

Failed annular bottom plate

Image of the brittle metal at the point of failure

Tank image source: https://www.krillsystems.com/bunker-monitoring (not related to the incident)
Questions to Consider:

- What is the potential for something similar to happen at my work site?
- How do we verify that new and existing materials meet design specifications?
- Are integrity checks in relation to material specifications part of the existing process?
- What are the potential consequences of not adhering to material specifications in changing temperatures/weather conditions?
- What systems do we have in place for proactive adherence to material specifications? How can we improve?

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