



FUELS INDUSTRY
Association of South Africa

LEARNING FROM INCIDENT

FLOW ELEMENT IMPULSE LINE FAILURE

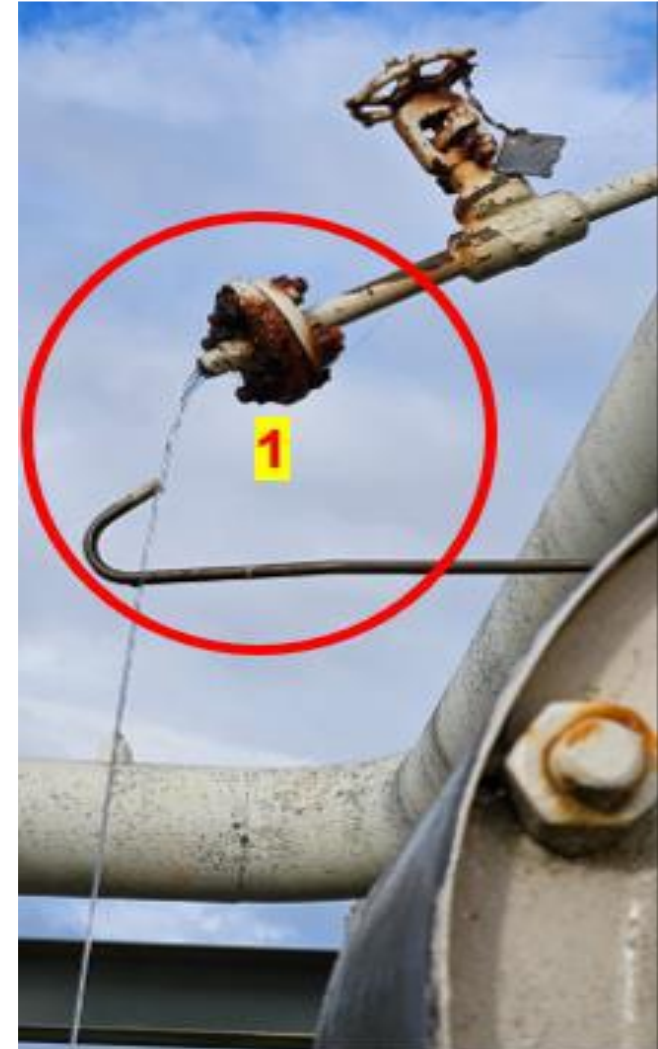
2024



FLOW READER IMPULSE LINE FAILURE

Background

The diesel was being transferred between two tanks using transfer pumps, 51PC186A/B. During routine plant inspection, an Outside Operator spotted a product spraying out from the flow element 51FE1325 impulse line on the discharge of the pumps. The Outside Operator stopped the pumps and isolated the impulse line take-off valve, then reported the extent and severity of the incident to the Panel Operator who in turn informed the Shift Manager.





INCIDENT ROOT CAUSE

The investigation to the causation of impulse line failure examined the following possibilities.

- Corrosion on tubing fittings,
- Incorrect installation (either due to poor workmanship or non-compliance of installation/process hookup),
- Inadequate design tubing support systems,
- Crack in the tubing that leads to loss of containment

Galvanic corrosion on tubing fittings and incorrect installation (insufficient tightening of the compression tube fittings that fails to properly compress the ferrule and tube connection) were ruled out as the probable reasons for failures of instrument tubing.

Vibration as a source of tubing failure was also evaluated where an instrument tubing connects between the stationary object (pump and motor) and vibrating object (impulse line legs). Vibration levels measured on the 51PC186B pump and motor were between 1.8mm/sec and 2.4mm/sec which was well within tolerance, however the levels measured on the legs of the 51FE1325 discharge flow meter was 13mm/sec. These levels were excessive and there was a visible movement of the instrument tubing that connects to the flow transmitter during the pump test. Therefore, the release was attributed to the metal fatigue causing the impulse line to break off due to pump discharge line vibrating at a different frequency with the pump/motor.

With an estimated 10 000 litres of diesel released from an open end of the broken impulse line and filled up the containment bund, the incident was concluded as TIER 1 PSE – *a release above threshold quantity in any 1 hour period.*



BARRIER FAILURES & CASUAL FACTORS

Barrier Failure: Structural Integrity

- The interconnecting oily-water drain was found blocked, resulting in the diesel product escaping the containment bund via damaged concrete wall expansion seals and entered the storm water system.
- The tundishes in the 51PC186A/B bund are too high, not allowing liquid to drain away and causing a buildup of liquids in the bund.
- Inadequate impulse line tubing support.



Casual Factors

- Lack of periodic maintenance of bund expansion seals
- Lack of reporting and failure to raise job card for blocked interconnecting drains

Concrete wall expansion seal broken and diesel seeping through into the storm water drain channel





INCIDENT LEARNINGS

- **Asset Integrity:** Assess the vibration levels and ensure that the components in the plant are designed and supported to withstand the operational conditions.
- **Inadequate design/:** Modify layout of impulse tubing and location to minimize vibration.
- **Process Containment:** Regularly maintain and test the bunds, seals and drainage systems to ensure they function as intended.



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Thank You

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