तेल उद्योग सुरक्षा निदेशालय
Oil Industry Safety Directorate
ISO 9001:2015 certified

CASE STUDY

OISD/CS/2025-26/PL/03 Dt.: 02/05/2025

INTRODUCTION

Title: Oil Pipeline leakage Incident in an Offshore Pipeline.

Location: Offshore.

Loss/ Outcome: Loss of crude oil.

BRIEF OF INCIDENT

Crude oil was being pumped in an offshore pipeline from two process platforms. Pressure at these process platforms was 28.51 kg/cm2 and 46.46 kg/cm2 respectively. At receiving end, pressure was 8.7 kg/cm2. Suddenly pressure drop was observed at both process platforms and receiving station of the pipeline. At process platforms pressure dropped to 3.76 kg/cm2 and 4.5 kg/cm2 respectively. At receiving station, pressure dropped to 1.5 kg/cm2. After receiving information about this sudden pressure drop, Inspection maintenance and repair department, mobilized two nearby vessels for leak survey.

During leak survey, one of the vessels located oil sleek and bubbles at four locations. Remote operated vehicle (ROV) launched by the vessel located bubbles emanating from the pipeline at one subsea location. The coordinates of leak point were recorded and chainage of this leak location along pipeline from process platforms was found 18.955 KM.

Figure No. 1

Subsequently pipeline was exposed and exact length of opening was established which was 1200 mm (Long) X 75mm (Maximum width). Seabed depth at this location was 81.0 meters

sea water (msw). There was a gap of 0.5m between pipeline bottom and seabed, which might have developed due to rupture of pipeline. Pipeline was buried approximately 2.0 meter below seabed in the vicinity of leak location.

Figure No. 2

OBSERVATIONS / CONTRADICTIONS

Following observations were noted basis site visit, interaction with officials and checking of existing systems, procedures and documents:

1. Due to unavailability of crude oil in required quantity post commissioning and subsequent wax build up inside the pipeline, pigging and inline inspection were never carried out. It was repeatedly highlighted during external safety audit by OISD that Inline inspection and cleaning of pipeline by pigging was not done since its commissioning. It was also specifically stressed that in absence of integrity inspection since commissioning of pipeline, any major leak in pipeline will severely affect evacuation of crude.
2. As part of compliance to OISD observations, Magnetic Tomography (MTM) survey was carried out in 2020 which had concluded that there are 333 anomalies and safe operating pressure was found below the operating pressure of the pipeline. The report indicated 32 anomalies with immediate repair condition. The report also indicated probability of failure of pipeline if it continues to operate at current operating pressure. Alternately, pipeline may be operated at lower pressure, in the event of delay in repair activity being undertaken. However, action taken report for these recommendations were not found.
3. Another MTM survey was conducted in 2023. Report concluded 1388 anomalies with Estimated Repair Factor (ERF)>1, out of which, 1368 were in initial 40 KM section. Report mentioned that pipeline segment between 0 to 40.283 KM was not safe to continue operation under the current operating conditions. However, pipeline continued to be operated at same operating conditions.
4. Safety instrumentation system and respective interlocks to trip the crude oil pumps at respective platforms in case of abrupt pressure drop malfunctioned during pipeline leak.
5. Organization reported maximum volume of oil spill as 2.2225 KL calculated as per their oil spill contingency plan (OSCP) document. However, loss of crude as per difference between pumped and receipt quantity was 382 KL, which indicated significant variation with respect to calculated volume of crude as per OSCP document.

REASONS OF FAILURE / ROOT CAUSE

1. Pipeline was continued to be operated above the safe operating pressure for more than one year after latest MTM survey report of December-2023. Immediate measures like bringing down the pressure in initial 40 KM section below safe pressure or reviewing Risk-1 anomalies for any suitable mitigation were not taken. Though future corrective actions were discussed in key management meetings, neither any immediate mitigation measures were taken nor appropriate management approval was taken to operate the pipeline above the safe pressure.

2. Corrosion Inhibitor (CI) dosing rate was not adequate to ensure that corrosion rate is maintained below 1 MPY as per clause no. 5.10 of OISD-STD-188.

RECOMMENDATIONS

1. Organization shall review the current operating pressure of pipeline from platforms considering recommendation of MTM report of Dec-23 for safe operation of the pipeline till alternate options are not fully functional. Either operating pressure may be reduced below safe pressure as per MTM report or Risk-1 categories anomalies may be evaluated for necessary mitigation for safe operation of the pipeline.

2. For all offshore pipelines, inspection shall be carried out as per OISD-STD-139. Wherever such inspections are not possible to be carried out due to operational or other constraints, management approval shall be taken.

3. Organization shall review the current corrosion inhibitor dosing rate in the pipeline and immediate corrective actions shall be taken to maintain the corrosion rate as per OISD-STD-188.

4. Organization shall reverify the estimated leak calculated under its OSCP guidelines with respect to actual loss of oil.

5. Organization shall review the existing periodic inspection schedule and maintenance system/ philosophy to ensure that safety critical equipment and interlocks do function during actual emergencies and necessary corrective actions shall be taken accordingly, if any.

6. Long-pending ESA recommendations shall be monitored at higher levels as per organization approved procedures. Gaps in roles, responsibilities and coordination among various departments of pipeline operation, maintenance and safety shall be reviewed and suitable corrective actions shall be taken.

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