

# CASE STUDY - FIRE INCIDENT AT SOUR WATER STRIPPING UNIT IN A REFINERY

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## 1.0 Introduction:

An incident of fire took place in the battery limit of sour water stripping unit of sulphur recovery unit block when a contract workman was carrying out welding job on sour fuel gas line at the unit battery limit.

## 2.0 Incident:

The sour water stripping unit of sulphur block was under shutdown as a part of planned M&I. As per Inspection work list (IWL), replacement of three elbows on the sour fuel gas line was under progress. Simultaneously, another contract workman opened the upstream flange of isolation valve on the stripped water line for blinding to carry out hydro test. While opening the flange, the holdup material containing hydrocarbon liquid from the 8" line fell on the floor which got ignited due to falling spark of welding job. The fire engulfed the welder and another workman escaped with minor burn injury in his right hand. The sequence of the incident is described below:

- I. The single stage sour water stripping unit of sulphur block was under shutdown for carrying out planned M&I of the Refinery.
- II. Inspection had identified replacement of two elbows on the sour fuel gas line. Accordingly, operation has handed over the line after proper flushing and isolation for replacing the elbows.
- III. Further, 3" stripped water line from the bottom of the II-stage stripper column (of hydro treating units) joins the single stage stripped sour water line (8") just below the second floor inside the unit area. As identified by inspection, the thinned portion of this line has been replaced and hydro test was pending.
- IV. As per IWL list, replacement of three elbows on the 6" sour fuel gas line was under progress. (Fig – 1)

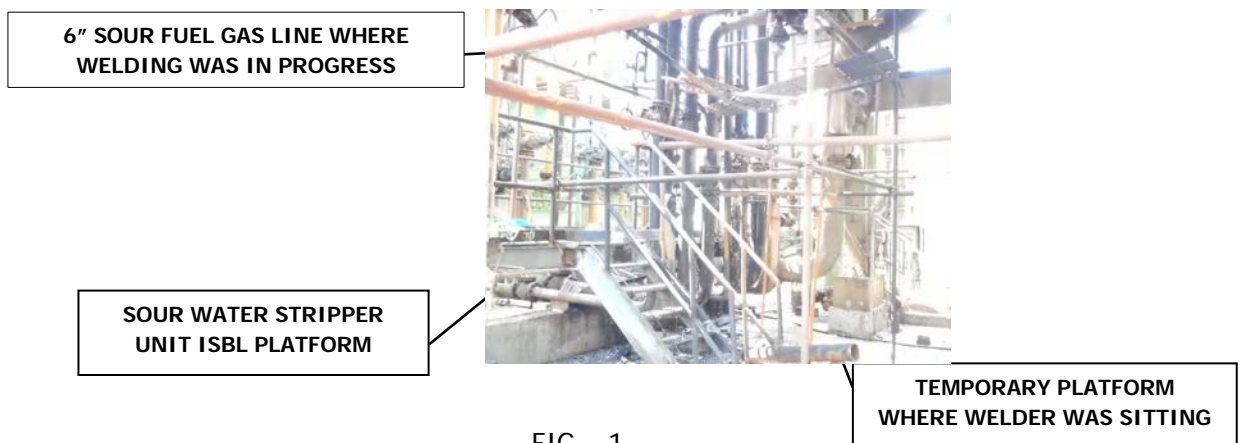
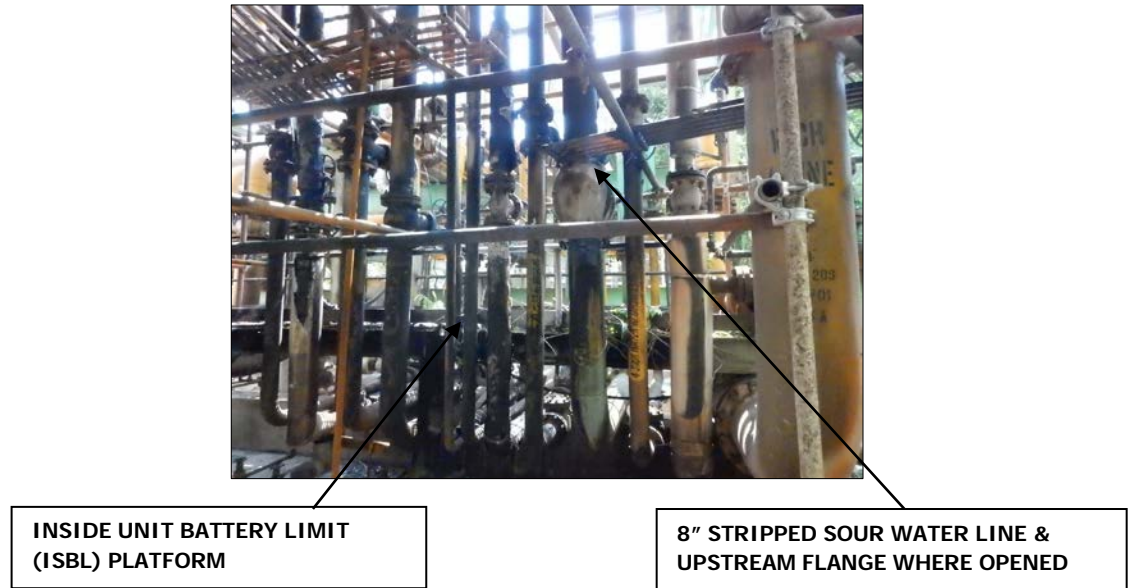


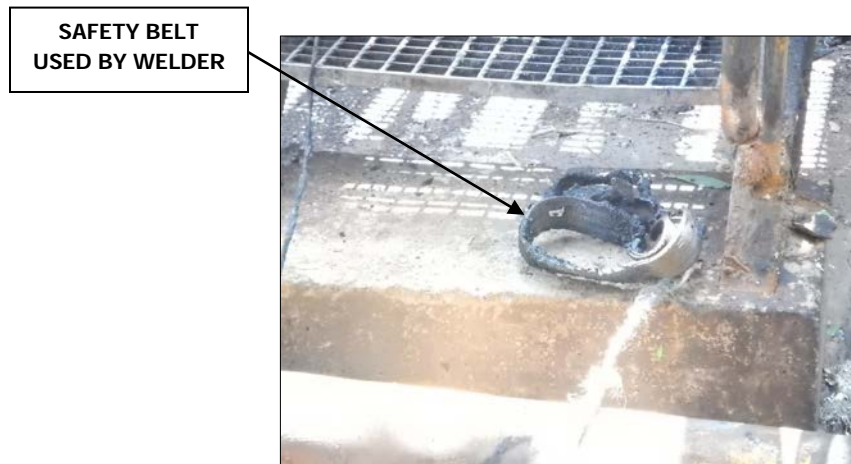
FIG – 1

- V. As per verbal instruction, another contract workman started opening the upstream flange of isolation valve of 8" stripped water line at the unit battery limit for carrying hydro test. The holdup water containing lighter hydrocarbon liquid started coming out and fell down on the floor as the line was not drained at the lowest point during shutdown of the unit for M&I. (Fig – 2)



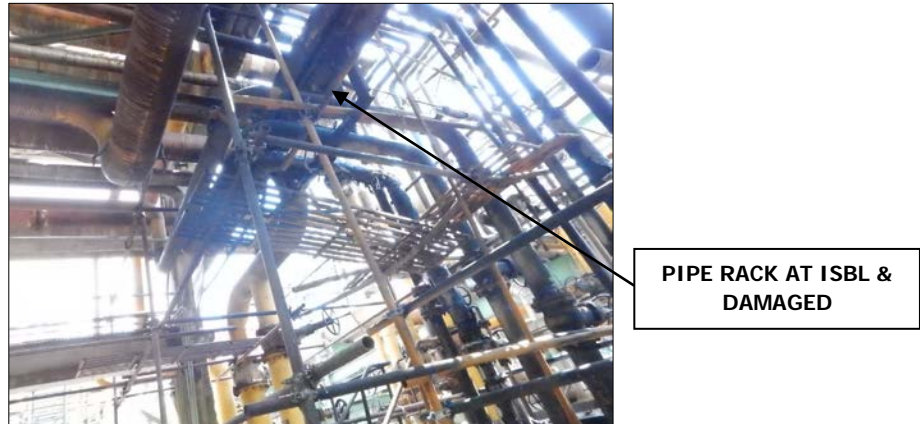
**Fig – 2**

- VI. At the same time, welding job on the sour fuel gas line was going on and the falling metal spark first has ignited the liquid at the floor. Before the other standby man tried to increase the water floor, fire become high and engulfed the welder. As the welder had hooked his safety belt on the nearby pipe, he could not disengage himself for escaping. He fell down to floor due to snapping of safety belt on fire. (Fig – 3)



**Fig - 3**

- VII. The welder was sent to occupational health centre for immediate medical attention, where he was declared dead.
- VIII. Another contractor workman who was opening the stripped sour water flange escaped through other side of the walkway with minor injury in his right hand.
- IX. There was minor damage to the insulation, structure beam etc. (Fig – 4) and fire was finally put off.



**Fig - 4**

**3.0 Root cause of the Fire:**

- I. Non-flushing/complete draining of process pipeline (8" stripped sour water) from connected process system up to ISBL resulted in spill over of lighter hydrocarbon while opening the valve flange.
- II. Carrying out cold job (blinding) on verbal instruction instead of written clearance.
- III. Responsible personnel neither Contract supervisor nor Operation were present during the work.
- IV. No safety briefing / training were provided for all Contractor & its workers.

**4.0 Recommendations:**

- (1) Work permit system including JSA must be strengthened when different agencies involved.
- (2) Whenever any planned hot job is under execution, it must be ensured that no other cold job involving process lines is undertaken in its vicinity unless or otherwise strict monitoring is made.
- (3) All critical jobs must be undertaken under strict supervision. Responsible officers from Operations/Maintenance must periodically check such critical activities; Fire & Safety must also check & monitor such activities.
- (4) It must be ensured that one copy of hot work permit is always available with the issuing authority for quick and ease of reference.