CASE STUDY

OISD/CS/2023-24/P&E/15 Dt.: 28/03/2024

INTRODUCTION

Title: Fatal Incident due to fire in wet slop oil pump house.
Location: Refinery
Loss/ Outcome: Property Damage and One fatality

BRIEF OF INCIDENT

Fire occurred in the wet slop pump house due to accumulation of hydrocarbon vapor. Electrical cables in the wet slop pump building were damaged and a contract employee suffered burn injuries in the fire. He was admitted in a Burn Hospital and succumbed to his injury after seven days.

Site Photographs









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OBSERVATIONS / SHORTCOMINGS

1. The complete manpower in ETP, including maintenance, was outsourced. However, no bridging document defining the roles and responsibilities of involved parties was evident nor it was elucidated in the work order.
2. As per the work order conditions contractor was to perform operation and routine maintenance of ETP/BTP and TTP as per organization “safety norms and work practices”. However, evidence of any communication, handover of document or imparting of any instructions related to safety norms and work practices, being followed by organization, was not found, neither in the Kick-off Meeting minutes nor subsequently.
3. A single storied building housed the two wet slop pumps. The two wet slop pumps were situated in basement of the building at 5.7 meter below ground level. it was a confined space. However, no practices related to confined space were being exercised for the pump house including permit issuance.
4. Pump building was provided with windows on three sides with entrance on south side. Four flame proof exhaust fans were provided just below the roof of the building. It was observed that the circulation of the air was restricted to the grade level only because of the entrance opening/ windows/ other openings. The exhaust system was ineffective in providing any draft in the basement side.
5. Due to low discharge flow from both the wet slop transfer pump, strainer cleaning job was planned in evening shift. It was also observed that the strainer cleaning was a repetitive practice being done every 2nd or 3rd day. The analysis for frequent requirement to clean the strainer was not carried out by the contractor nor by organization.
6. A work permit was issued by the evening SIC to his company’s mechanical technician for wet slop transfer pump suction strainer cleaning job. Permit did not cover risk associated with the job. Job safety analysis was not evident.
7. There was a practice to drain the suction and discharge line hold up material by partially opening the strainer end cover because of unavailability of any low point drain in the circuit. However, as per SOP the draining was to be done by opening the casing drain of the pump.
8. Accordingly, on the day of incident the pump suction strainer end cover was loosened by the mechanical technical. The technician left the location while the line-fill dripped.
9. The dripping of the hydrocarbon continued even after 15 minutes due to probable passing of the pump suction valve. The area operator tried closing the valve further, but no improvement was observed.
10. Despite running all four exhaust fans, the area operator sensed hydrocarbon smell and requested electrical supervisor to provide a portable exhaust fan.
11. No permit was issued to provide temporary electrical connection at pump house building. Only electrical panel de-energization / energization at substation was issued by contractor SIC in their own format.
12. Electrical technician had provided temporary electrical connection for portable exhaust fan in pump building. Temporary connection was taken from Flame proof distribution board located at the ground floor inside the building from where permanent exhaust fans were already connected. However, the distribution board cover was not closed after providing the connection, as evident from the site photographs taken just after the incident, compromising the flame proof integrity.
13. As per temporary portable exhaust fan details, the fan was neither PESO approved nor flameproof.
14. After temporary electrical connection, electrical supervisor informed area operator on Walkie-Talkie to operate the portable exhaust fan. Fire occurred on switching on the additional portable exhaust fan, and area operator sustained burn injury.
15. No near-miss/ unsafe-act/ unsafe-condition reporting or safety audit was being conducted by the contractor. No process mock drill had been conducted in the area in last one year. Effective communication channel between owner and contractor was missing except daily report submission. No record of safety committee meetings or participation of contractor personal in the safety committee of entity was evident.

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16. Awareness related to plant related hazards among contractor personnel was inadequate.

REASONS OF FAILURE / ROOT CAUSE

Source of Hydrocarbon: The pump and pipeline holdup material, being emptied on the pump floor for strainer cleaning job, may have created a pool of slop on the floor (aggravated by the suspected pump suction valve passing). The liquid pool on the pump floor must have created a vapour cloud well above the LEL level (corroborated by the smell that IP felt and for which he had requisitioned an exhaust fan).
Source of Ignition: Flameproof electrical distribution board was provided in wet slop oil pump building according to hazardous zone classification, but the integrity of electrical system was compromised when it was left open while providing the temporary electrical connection for the temporary exhaust-fan, which was also non-flameproof. Source of ignition was likely the electrical plugin for the temporary exhaust fan that may have generated spark while switching on, leading to ignition of the hydrocarbon/ air mixture.

RECOMMENDATIONS

1. **Facility Development:** Organization shall review and develop proper draining facility for pumps, through management of change procedure, to avoid spillage during preparation for strainer cleaning. Reason for requirement of frequent strainer cleaning shall be investigated and corrective actions shall be taken accordingly.
2. **Electrical Integrity:** Electrical equipment integrity shall be ensured as per hazardous area classification drawing approved by PESO. All electrical equipment and instruments shall conform to the hazardous area classification requirements and shall have appropriate PESO approval.
3. **Work Permit:** Wet slop building basement qualifies as confined space. Accordingly, confined space entry permit supplemented with a hot or cold work permit shall be followed as per the type/ nature of work inside the building.
4. **Documentation:** Bridging document shall be made to ensure defined roles and responsibilities of all the involved parties and shall cover the elements in line with OISD-GDN-206
5. **Pump House Ventilation:** Building ventilation study shall be carried out w.r.t to IS:3103 :1975 (Code of Practice for Industrial Ventilation) requirement and necessary modification to ensure proper ventilation of basement area.
6. **Training:** Training to the contract manpower shall be ensured as per OISD-STD-154 before taking charge and subsequently at defined periodicity. The requirement shall form a part of the contract.
7. **Other Recommendations:**

a) Risk assessment shall be revisited to adequately cover fire scenario in ETP area. Appropriate response plan and mitigation measures shall be formulated accordingly and the same shall be practised in mock drills.
b) Hydrocarbon gas detectors shall be installed as per clause 14.1 of OISD-STD-116.
c) CCTV shall be provided at strategic locations in ETP area with adequate recording facility.
d) Manpower requirement to be reviewed to ensure that the designated person can carry out the assigned roles and responsibilities.
e) As per cl no 7.5.1 of OISD-GDN-206, Management shall conduct safety meeting with contractors at defined intervals. They should be communicated on the safety performance, violations, concerns arising out of inspection, audit etc. Obtain feedback/ Concerns from the contractors and act accordingly.
f) Management shall carry out gap analysis of the safety management system with respect to OISD-GDN-206. Necessary corrective actions shall be taken as per the gap analysis recommendations.

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