CASE STUDY

INTRODUCTION

Title: Fire incident in a Charter Hired Workover Rig

Location: Onshore Asset

Loss/ Outcome: Fire resulting in six fatalities

BRIEF OF INCIDENT

- The well was drilled to a target depth of 1610 m, 5 ½" production casing was lowered with shoe at 1608.52 m and cemented. This well was spudded in October 1992 and was completed after a month. It had produced 17240 m3 oil and 2051 m3 water as on February 2019. Hydro fracturing operations was carried out in the year 2015.
- A Charter hired Workover Rig commenced work over operations in mid- march 2019, at the well at noon after a Pre Work Over Conference (PWOC).
- As per the plan the well was to be subdued by displacing the hydrocarbon oil / gas present in the well, using brine with reverse circulation. Well was subdued with brine of 1.02 specific gravity. The return line was not connected through mobile testing separator unit or GGS flow line but the well fluid was unloaded into the activation tank.
- The well was put on observation and no activity was observed. Christmas tree was nippled down and Blow Out Preventer (BOP) was nippled up and pressure tested at the end of the day shift (7am–7pm) and completed during the beginning of night shift (7pm-7am). Thereafter, additional 6 numbers of 2-7/8" tubing singles were run in hole to tag bottom (tagged at 1564 m). The perforation intervals were: 1557–1554 m & 1539–1535 m. As per the plan, well bottom needed to be cleared up to 1577 m, hence the crew did bottom clearing job.
- At around 20:30 hours, Assistant Driller who was at mud pump, running the pump to clear the bottom, observed fire near rig chassis and the activation tank and he ran to rescue the injured persons. He informed the installation manager, who further communicated to Group Gathering Station (GGS) for the tenders. The first fire tenders The first fire tender arrived at 20:55 hrs. from nearby fire station followed by 8 more fire tenders including those from Municipal Corporation. Fire caused severe burn injuries to five rig crew members. All the injured persons were shifted to hospital for treatment A security guard was found dead and lying near activation tank and his body was shifted to hospital in the presence of local police. All injured persons were shifted to Hospital who later succumbed to their injuries.

OBSERVATIONS

- Operational Rig up was completed and followed by pre Work over meeting @ 12:00 hrs.
- Prepared 40 m3 brine of 1.02 specific gravity and subdued the well by 17.00 hrs.
- Nippled down X-mas tree. Pulled out tubing hanger with 01 single. Nippled up BOP by 19.00 hrs.
- BOP pressure test was okay. Tagged bottom with 6 singles and cleared well bottom by 20:30 hrs.

- Fire broke out at well site @ 20:30 hrs.
- First of the nine fire tenders reported @ 20:55 hrs.
- Fire was controlled @ 21:20 hrs.
- One person died at the incident site and five of the crew members were injured.

INVESTIGATION NOTES

Based on discussion with personnel involved in the incident, site visit and review of documents, following are the findings:

- Fire resulted in extensive damage to activation tank, rig carrier and surrounding bushes. No damage was observed on BOP. However, hydraulic hoses were found damaged. From the damage, it can be concluded that gas had travelled from activation tank towards rig carrier during circulation. The gas cloud thus formed, got ignited due to presence of an ignition source.
- Periodic gas testing was being carried out by multi gas detector at well head. As per record last checking was done at 19:00 hrs. and 2 % LEL was recorded near well head area. No gas detection record was found for activation tank though it was informed that the LEL readings were taken at activation tank around 20:00 hrs. and nearby area where well fluid was directly unloaded.
- There was no lighting near activation tank.
- The only available portable flame proof torch was found in non-working condition.
- Cameras installed above office bunk were not functional. Events before and during incident could not be recorded.
- Only mobiles (Non-intrinsically safe) were available, which were the only means of communication from the site.
- Double earthing to activation tank had been provided.
- In Workover Daily Progress Report (DPR) time taken for different operations were clubbed and clear time wise break up of activities was not mentioned.
- Before the commencement of the operation, well data such as SBHP (Static Bottom Hole Pressure) and THP (Tubing Head Pressure) were not recorded in the DPR.
- It was informed that on the day of the incident there was no wind and the weather was calm.

ROOT CAUSE

- Deficient SOP for subduing the well w.r.t. process followed for taking well fluid in the activation tank.
- Non usage of oil / gas separator unit/ GGS flow line during subduing activity.
- A gas cloud was formed surrounding the activation tank in the absence of oil / gas separator.
- Lack of supervision by the Contractor.
- Lack of supervision by the Operator during critical jobs such as well subduing.
- Lack of periodic monitoring of LEL.
- Inadequate lighting near activation tank area.

CONCLUSION

Probable causes of ignition:

- Spark generated from rig engine.

- Spark generated from use of non-flame proof tools.
- Use of mobile Phone.

RECOMMENDATIONS

- The SOP for subduing the well should be modified. It should include the steps to be followed to ensure separation of associated gas from oil and its discharge at a safe distance from the rig. This should include a flare line also.
- In the Daily Progress Report, break up of time of every operation should be recorded separately.
- Carrying of mobile phones inside the operational area shall be prohibited and signboards displayed at prominent locations.
- Only non-sparking tools should be used where there is any chance of presence of hydrocarbon.
- Persons working in hydrocarbon environment should wear overalls made of fire retardant cloth.
- Adequate lighting shall be provided in the drill site area.

View of the Burnt Rig Carrier

View of the Burnt Carrier Engine

View of the Burnt Activation Tank

------End of report-----

Provided for information purpose only. This information should be evaluated to determine if it is applicable in your operations, to avoid recurrence of such incidents.