



CASE STUDY

OISD/CS/2020-21/E&P/03

Dt.: 18/12/2020

INTRODUCTION

Title: Blast and Subsequent Fire in Storage Tank

Location: Onland Production Installation

Loss/ Outcome: Fatal Injury

BRIEF OF INCIDENT

The replacement job of the 2.5" diameter feed pipes to the foam chamber of the Tank no. 3 was taken up by opening the flanges below the foam chamber and cutting the pipe at the tank pad. It may be pertinent to mention here that the pipes for Tanks nos. 2 and 4 as well as the pipe on the south side of the tank 3 were earlier removed by this very method. It was when, after opening the flanges on the north side foam chamber, the cut was made on one pipe that fatal accident occurred due to blast and the tank fire subsequently. The body of deceased had fallen into dyke of Tank no.2.

OBSERVATIONS/ SHORTCOMINGS

Status of accident site:

Tank no.3 was the affected tank in a separate dyke having two dyke walls shared by two other storage tanks. There were four storage tanks together – out of which Tank no. 1, was not in use for a long period due to damage and repairs of the damaged tank were not undertaken as remaining tanks were adequate to meet the process requirements in view of lesser production from the field.

Tank no.3 was found to be with roof shifted and tilted into the tank. Paint of the top of tank and roof had peeled off but paint on the bottom was found to be intact. There was water level of about half the height inside the tank till which level paint was found to be intact from outside. Staircase had also tilted at the top but was serviceable and climbing to the top was possible.

Rise in level of tank due to possible Passing of inlet gate valve of Tank no.3:

The tank was de-blinded and its inlet isolation valve was kept closed. Draining of the fire water used for hydro testing of the tank was stopped. Minimum & maximum Level Transmitter readings after de-blinding of the tank & prior to the incident were 1606.94 mm & 1664.95 mm respectively suggesting accumulation of about 7 m³ of emulsion in 26 days due to passing of inlet valve of the tank.

OBSERVATIONS

- Tool-box talk was carried out in which safety briefing was given.
- Hot permit had already been issued and was renewed.
- Work was resumed. Gas test was done around the hot job point, found nil. Absence of hydrocarbon inside the tank & foam pourer lines was not ensured.
- Flanges on both the foam pourer lines below the foam chamber were opened.

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- Rope was strung up on one pipe line to hold it. The helper (deceased person-DP) was sent on top of the tank to hold the pipeline with the rope.
- Cut was made at point by gas torch on same line.
- A blast was heard from the tank after which there was fire. Also, DP fell from the roof.

Fire fighting continued for 22 minutes after which it was extinguished.

- Foam pourer lines below the foam chamber on the south side of the tank were removed by cutting. The incident did not happen while cutting on this side of the foam pourer lines as HC mixture was not combustible (concentration of HC was above upper explosive limit).
- Paint/ HC vapours inside the tank & foam pourer lines on north side formed a combustible mixture due to opening of flanges below the foam chamber on the south side.

REASONS OF FAILURE/ ROOT CAUSE

The following emerge as root-cause of the accident:

- a) Absence of hydrocarbon in the tank and foam pourer lines was not ensured prior to taking up the hot job.
- b) Flushing/ purging of foam pourer lines was not carried out.

RECOMMENDATIONS

- a) The job should be carried out through valid work order. The contractor for executing a job/ work should be selected based on his expertise in the relevant field.
- b) Qualification & competency level of contractor's supervisor and key personnel needs to be checked/ evaluated.
- c) Job safety analysis should be carried out prior to all critical and non-routine job and the same should be linked with the work permit.
- d) SOP needs to be developed & followed religiously for different operational and repair activities. These should be reviewed periodically and approved.
- e) Hot job on any pipeline connected to the tank should be undertaken only after positive isolation of the tank and pipeline.
- f) Hot work on the pipeline should only be performed after the pipeline is made gas free and suitable testing is done to ensure such operation.
- g) All the requirements of the work permit system should be complied prior to the job.
- h) Inspection of firefighting equipment & systems should be carried out in line with OISD-STD-142 viz:
 - Visual inspection of the foam chamber once in four months and pressure testing as and when tank is taken out of service for M&I.
 - Pressure testing of normally dry piping during M&I of the tank or earlier in case visual inspection indicate questionable strength due to corrosion or mechanical damage.
 - Vapour seals checking visually once in a year.
- i) All defects identified during M&I should be complied in a time bound manner.
- j) Foam lines should have provision to drain accumulated foam water.
- k) Systematic improvement actions should be taken including training to avoid number of errors attributed to the incident such as:
 - Analysing & identifying the potential hazards (Job safety Analysis)

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- Knowledge on work permit system
- Inadequate supervision
- Non-availability of SOP
- Qualification & competency level of contractor's employees

Photographs of Storage tank no. 3 after incident (a) Overall view (b) Backside of tank (c) Roof of tank (d) & (e) Foam pourer feed pipe end



(b)



(a)



(c)



(d)



(e)

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