



## CASE STUDY

OISD/CS/2021-22/E&P/02

Dt.: 30.09.2021

### **INTRODUCTION**

Title: Fall of The Telescopic Mast  
Location: On-land Drilling Location  
Loss/ Outcome: Major Loss of Asset

### **BRIEF OF INCIDENT**

After conducting Pre Job Safety Meeting, shift crew started rig mast down process. Mechanical l/c operated lever meant for raising telescopic mast 3 to 4" up, so that mechanical lock can be removed and telescopic mast may slide down. Subsequently, driller on derrick floor observed some vibrations in the mast and after few seconds a loud metallic sound was heard by everyone. All crew escaped and no injury occurred; complete mast fell down towards left of the rig damaging the Shift in charge/ Store bunk house completely.

### **OBSERVATIONS/ SHORTCOMINGS**

Following observations were found during investigative inquiry carried out by visit of the incident site, interaction with the related officials, their written statements thereof and available documents:

- There was no documented 'Standard Operating Procedure' (SOP) available related to rig mast up / down.
- Checklist followed was found not satisfactory for lowering of mast, keeping in view the type of rig associated. It is not covering some of the points mentioned in Clause 3.4.2 of OISD-GDN-218. viz. sub-structure removal, functioning of non-return valves of the telescopic rams and so on.
- Circulation of hydraulic oil as per rig OEM manual before commencing mast down was not done.
- Residual of hydraulic oil in the tank level found milky in colour. Probably due to contamination with water.
- Job Safety Analysis was not carried out before the commencement of the job. Crew members may be unaware about the hazard associated with the operation they were carrying out.
- Tool box talk/ Pre Job Safety Meeting was held on that day, but it was not as defined in Clause 8.2 of OISD-STD-190, it was not covering different types of hazards involved in the operation rather a piece of document for record only. There was no record of Tool Box Talk/ Pre Job Safety Meeting in the last mast down/ up operation.
- SIMOPS procedure in accordance with OISD-GDN-186 was not followed. There were three wells on this drill site. They were not protected with sand bags/ iron cage prior to lowering/ raising the mast.

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- TPI was conducted. The purpose of the verification is to certify that the rig and associated equipment/ components are as per the contract specifications. The verification was carried out as per relevant OISD, API standards and technical scope of the operator specified in subject contract and covered the following:
  - a) Physical verification
  - b) Checking whether the rig and associated equipment are complete in all respects
  - c) Witnessing functionality tests of the main components
  - d) Review of documentation/ records.

But, it was found that verification of Hydraulic functioning/ operating system of Telescopic Ram/ Cylinder was not clear from the scope mentioned above.

And apparently, in the report of TPI, there was nothing mentioned about hydraulically operated telescopic system; which is one of the major part for lowering/ retracting of telescopic mast to the carrier/ unit.

- Level-I of mast and substructure checking which should be done by top man and other key persons was not done on weekly basis. Refer: Clause 4.1 of OISD-GDN-202.
- Level-II checklist for detailed visual inspection not carried out and Annexure – I as per Clause 4.2 of OISD-GDN-202 not followed.
- In Equipment servicing & lubricating schedule, no time frame is given to change hydraulic oil & hydraulic oil filter.
- Complete bleeding of air is mandatory as per rig manual before doing any mast up/ down process. Possibility of not bleeding air from both the ram cylinders cannot be ruled out.

## **ROOT CAUSE OF THE INCIDENT**

### **A. Improper Maintenance & Inspection**

Hydraulic oil, associated filters were not changed periodically resulting in jamming of system. Due to this piston of the hydraulic ram on right side of rig got stuck/ not moved while applying pressure to raise the upper part of the telescopic mast. During investigation, milky colour residual was observed in the tank level, which confirms probable water contamination.

As the telescopic ram (right side) couldn't move up, stress generated in the right side of the structure got transferred to the weakest joint (in this case, it was the joint between lower part of the mast and 'Y' frame). This resulted in snapping of bolt and hinge I-pad fitted at the top of 'Y' frame (right side); subsequently damaged left side of the 'Y' frame joint too and rig mast toppled to left side of the carrier.

### **B. Non-adherence of SOP / competency gap**

- Prior to mast down, circulation of hydraulic oil is required to elevate the hydraulic oil temperature up to normal operating range as per rig (OEM) manual. On investigation, it was found that circulation was not done moreover no one was aware of it too. As per rig manual, if circulation and the air bleeding are not done properly, may lead to accident/ rig damage.
- Condition of I-pad of mast ('Y' frame) were rusty and corroded. While checking documents, it was found:
  - a) Level-III category of inspection was done for some parts only and detailed MPI and PT test of critical equipment's was not found. Refer: Clause 4.3 of OISD-GDN-202.
  - b) NDT of welding joints of critical areas during inspection were not done in accordance with Section 6 of AWS D1.1, Level-IV inspection. Refer: Clause 4.4 of OISD-GDN-202.

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### **C. Improper Auditing**

- Internal Audit didn't review different levels of NDT inspections as per OISD-GDN-202.
- Third party inspection didn't lay emphasis on verification of Hydraulic functioning / operating system of Telescopic Ram/ Cylinder.

### **D. Inadequate supervision**

- Only one person was present at the hydraulic control unit to operate lever. Possibility of exceeding pressure & operating wrong lever can be avoided if at least 2 responsible person present for critical operation.

### **RECOMMENDATIONS**

- Rig specific detailed sequence of operations (for all type of rigs) for rigging up and dismantling operation shall be prepared and strictly adhered to avoid such recurrences in future (Refer: Clause 3.4 of OISD-GDN-218).
- Oil strainer and filter should be checked & cleaned regularly and sufficient recommended hydraulic oil should be used while maintaining level in tank (Refer: Clause 3.4.2 (a) of OISD-GDN-218).
- Recommended pressure limits prescribed by the manufacturer should not be exceeded while disengaging the mast locks (Refer: Clause 3.4.2 (b) of OISD-GDN-218).
- For retracting telescopic part & tilting down of mast, all Checks and Procedures (whichever applicable) mentioned in Clause 3.4.2 of OISD-GDN-218 should be followed.
- Job Safety Analysis (JSA) should be carried out in more focused manner & new hazards should be brought into the notice so that personnel are aware of the associated hazards and accordingly specific safety instructions to be rendered to working personnel. Refer: Clause 8.1 of OISD-STD-190.
- Standard Operating Procedure (SOP) and JSA should be used as basis for discussion during Tool Box Talk (TBT) so that the crew understands the hazard involved in each operation (Refer: Clause 8.2 of OISD-STD-190).
- Weekly Safety Meeting should be held on all rigs and record be maintained.
- All Activities of rig dismantling should be supervised by competent person(s) as per clause 3.4(i) of OISD-GDN-218.
- Each team involved in rigging up or dismantling operation should be led by a leader who shall possess experience of carrying out that operation.
- There should be at least two experienced persons while operating levers to lower/ up telescopic mast.
- Each levers of Hydraulic unit Control panel should have safety lock pin installed while not in use. Idea is that while operating any one lever, person should not engage some other lever accidentally.
- Every crew member involved in the job should have clear knowledge about his role and responsibility to execute the job complying OEM manual.
- Refresher training programs should be planned for shift crew to minimize such incident.
- Audits shall be conducted during rig building/ rig dismantling period.
- Bunk houses at site should be placed at such a distance which is more than the height of total mast. If this is not feasible, in such case during mast raising/ lowering, no one should stay inside the bunk house. This should be included in SOP too.

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- SIMOPS checklist/ program in accordance with OISD-GDN-186 should be followed strictly. Existing well and Cluster Well, if any shall be properly protected with sand bags/ iron cage prior to lowering/ raising the mast.
- Mines Manager and Deputy Mines Manager should carry out inspection of all rigs under their jurisdiction periodically as per Regulation-27(9), 28 (2e) of OMR, 2017.
- Incident to be taken up with OEM for detailed discussions and their recommendations to avoid any similar incident in future.
- In the Contract copy of the existing clause of TPI under technical scope, it should be added to conform the “Functionality of Hydraulic system of Telescopic Ram/ cylinder” and its status (where ever applicable).

### After the incident



View of fallen mast from bunk house side



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