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Efficiency of Time Comparing with Modular Rigs for Workover Operation

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***Abstract*— In the past - 300ft Leg Jack-Up Rig predominantly used to Drill and Complete wells. In depleted phase currently, MH field is witnessing dominantly well work-over / repair scope to sustain production. Seabed inconsistencies caused by pug marks left by previous Jack-Up rigs and sea-bed pipe line network hinder Jack-Ups to approach platform and rework wells. Specificity of Jack-Up Rigs to approach Specific Platforms due to signature pug-marks left behind Increase in market demand for large Jack-Up rigs, increased day rates to very high levels. Above technical and economic compulsions drove decision making and acceptability to consider modular rigs over other alternatives.**

In order to ensure optimum performance of your rig, reduce downtime and maintain safety of your personnel, planned maintenance and accurate inspections are essential. Drilling's Rig Inspection Workshop (RIW) teaches the inspection and maintenance procedures required to ensure equipment integrity onland rigs, platform rigs and jack-up rigs. Candidates learn to implement the relevant standards and understand industry requirements so that they can verify the condition of a rig's equipment and improve safety, thus reducing the number of accidents and protecting the asset.

I. INTRODUCTION

The time data's are collected for different activities of Modular Work-over Rigs like Rig Up/Down, Drilling, Reaming, Coring, Circulate and Condition, Tripping, Service rig, Downtime, Slip/Cut Drilling Line, Wireline Surveys, Logging, Run Casing/Cement, Wait on Cement, Nipple Up/Down BOP's, Test BOP's, Drill Stem Test, Plug Back, Squeeze Cement, Fishing, Directional Work, Miscellaneous Time, Meetings, Well Control, Completion and Standby. The best three wells from each Rig is selected. The data's are entered in the Excel sheet and Pie-Charts are plotted for the activities of Rigs. The explanation for the pie-charts plotted is found out by the well operation report. The efficiency of total time activity for Modular Rigs is compared.

II. MODULAR RIG

Modular drilling rigs *(Figure 8)* are normally installed on offshore wellhead and production platforms that require drilling operation during part of the design life.

A modular drilling rig can be configured in one of two designs:

• Large Module design that requires a lifting barge but will result in minimal offshore installation and hook-up time.

• Small Module design with each module weight less than 40MT therefore does not require a lifting barge to install.

A. Main Features of a Modular Drilling Rig Include

• It is configured to be easy to install and relocate from platform to platform. Because of this self-erecting bootstrap type mast is used, and all modules are designed for easy transportation, installation, and hook-up.

• It is a complete system that includes all necessary components to perform drilling operation. These components are drilling equipment set (DES), drilling support module (DSM), power module, and living quarters. This is important so that the drilling rig will need minimal support from the platform.

• Due to the weight limit of some existing platforms, modular drilling rigs are required to be light in weight while maintaining the drilling capacity.

• This type of drilling rigs can be used on fixed platform, tension leg platform, and tender drilling barge. They are used for drilling production wells at the beginning of the field development, performing side track drilling and workover operation during production.

B. Modular Rig Advantages

o***Technical –***

• Uses very less fuel compared to other platforms.

• No Constraints of Seabed Limitations (Pug Marks; Punch Throughs) and Sea-bed Pipeline.

• With Minimal Footprint can achieve same Objectives of a Large High Cost Jack-up.

• Can be configured on Platform to any Customer Suitability.

o***Economical –***

• Fuel Cost Savings

• High Uptime - 24x7 Operations Window as Rig Package Erected on Platform.

• Low, Steady And Stable Day rate as Compared To High Cyclical JU Rig Day rates Reducing Total Lift Cost of Oil and Gas.

• Though Safety Standards are the Same, Applicability of Costly Maritime Regulations Is Eliminated.

C. Productive Time

Time during which useful work is performed in an operation or process.

Here the Productive Time activities are Rig Up/Down, Drilling, Coring, Circulate and Condition, Tripping, Service Rig, Slip/Cut Drilling Line, Wireline Surveys, Logging, Run Casing/Cement, Wait on Cement, Nipple Up/Down BOP's, Test BOP's, Drill Stem Test, Plug Back, Squeeze Cement, Directional Work, Meetings, Completion.

D. Non-Productive Time (NPT)

Time that is not directly associated with manufacturing operations or performance of a job or task. Here the Non-Productive time (NPT) caused by preventable tool failures in offshore drilling and completion can cost tens of millions of dollars per year.

Here Non-productive Time activities are Reaming, Downtime, Fishing, Miscellaneous Time, Standby.

E. Results

Here in this report, three rigs are compared on the basis of the time consumed for each operation. Critical analysis shows that mainly tripping, circulation & conditioning of hole, downhole problems are major contributors in consuming rig time.

• Rig S5 *(Figure 2 & 3)* spent 34.8% *(table 1)* of it's time on just tripping operations. It can be clearly concluded that this is due to more downhole problems. This conclusion is proved on observing 11.5% of time, the rig spent on fishing operations and same amount of time spent on circulation and conditioning of hole.

• Discussing about Rig S6 *(Figure 4 & 5)*, here the results obtained are slightly different. Here, rig spent 15.7% of time in tripping operation which is comparatively quite less than Rig S5. Tripping is reduced drastically (compare to Rig S5) due to no fishing operations. Here rig spent 7.3% of time in combating with well control issues. 13.1% on waiting time because of waiting on boat and waiting on weather. Reduction on waiting time can reduce the cost of overall project. The well has gone under long completion period which took 27.6% of rig time.

• Discussing about Rig S7 *(Figure 6 & 7)*, it took 18.7% of tripping time. 6.8% of time spent on controlling the well. This well too shows long completion history as it spent 34.8% of time on completion.

At last very common in all the rigs is downtime due to repair jobs is very less. This shows rig condition was excellent during drilling of all three wells.

F. Acknowledgements

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TABLE I

Activities	S5	S6	S7
Rig Up/Down	1.8	0.4	0.8
Drilling	4.4	5.9	9.4
Reaming	1.4	1.1	1.3
Coring	0.0	0.0	0.0
Circulate &Condition	11.5	6.8	8.3
Tripping	34.8	15.7	18.2
Service Rig	0.0	0.0	0.0
Downtime	0.7	1.1	6.2
Slip/Cut Drilling Line	1.0	0.4	0.3
Wireline Surveys	0.1	0.0	0.0
Logging	7.0	3.3	7.0
Run Casing/Cement	0.3	3.6	0.5
Wait on Cement	0.6	2.8	1.0
Nipple Up/Down BOP's	3.6	2.4	3.7
Test BOP's	0.7	0.5	0.9
Drill Stem Test	0.0	0.0	0.0
Plug Back	0.0	0.1	0.0
Squeeze Cement	0.4	1.1	0.5
Fishing	11.5	3.7	0.0
Directional Work	0.0	0.1	0.5
Miscellaneous/Waiting Time	2.4	13.1	0.4
Meetings	0.0	3.0	0.0
Well Control	0.0	7.3	6.1
Completion	17.9	27.6	34.8
Standby	0.0	0.0	0.0

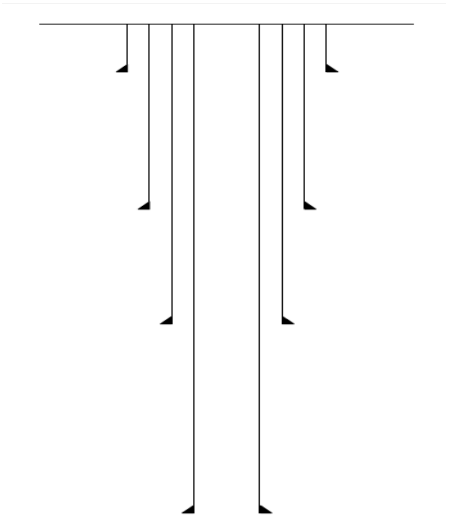

Figure 1

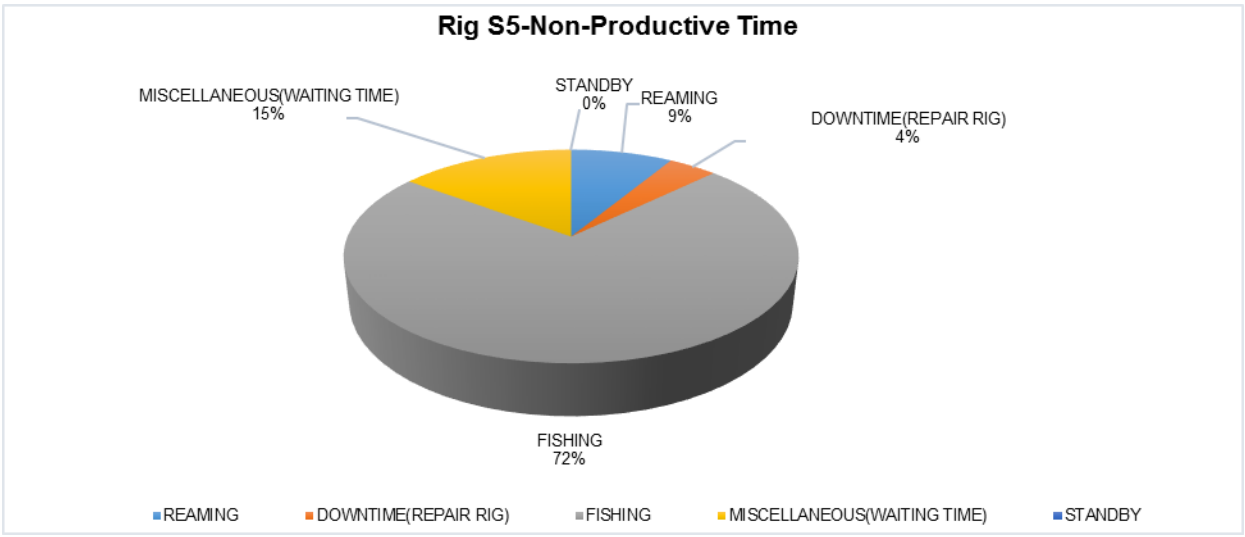

Figure 2

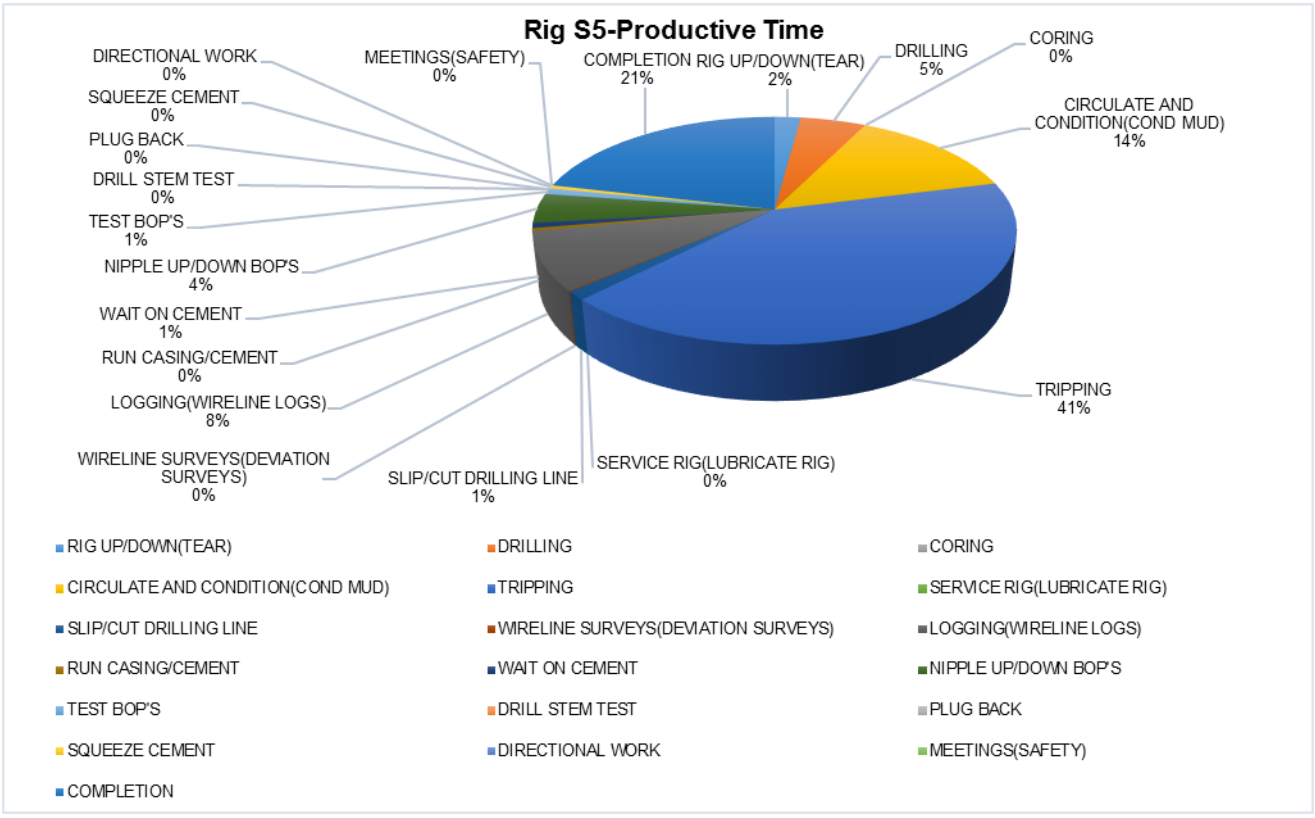

Figure 3

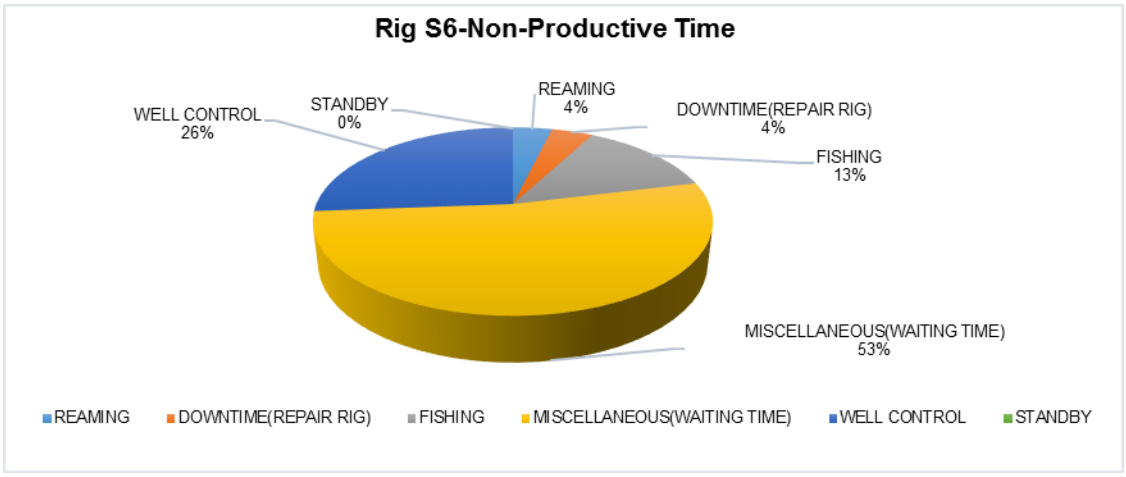

Figure 4

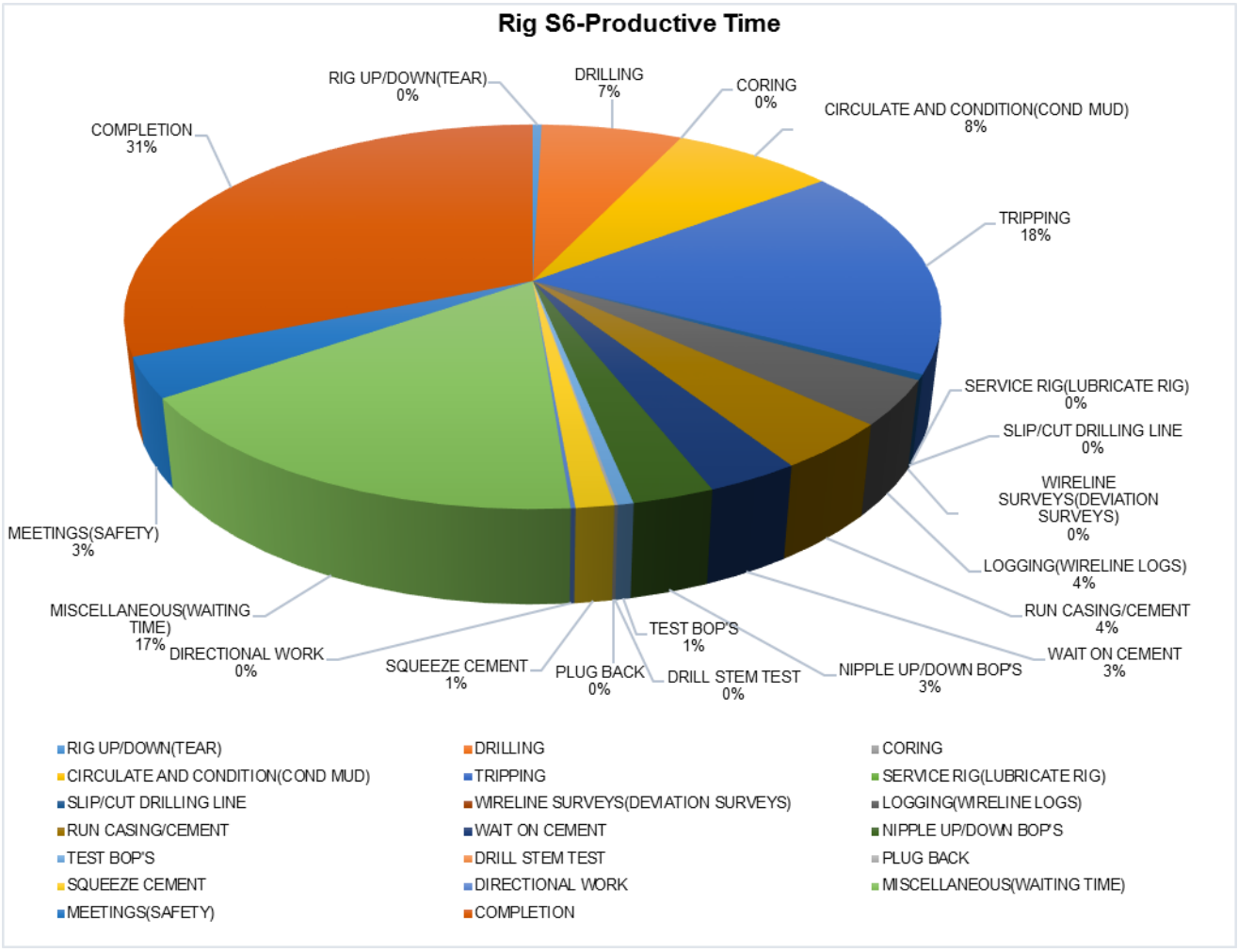

Figure 5

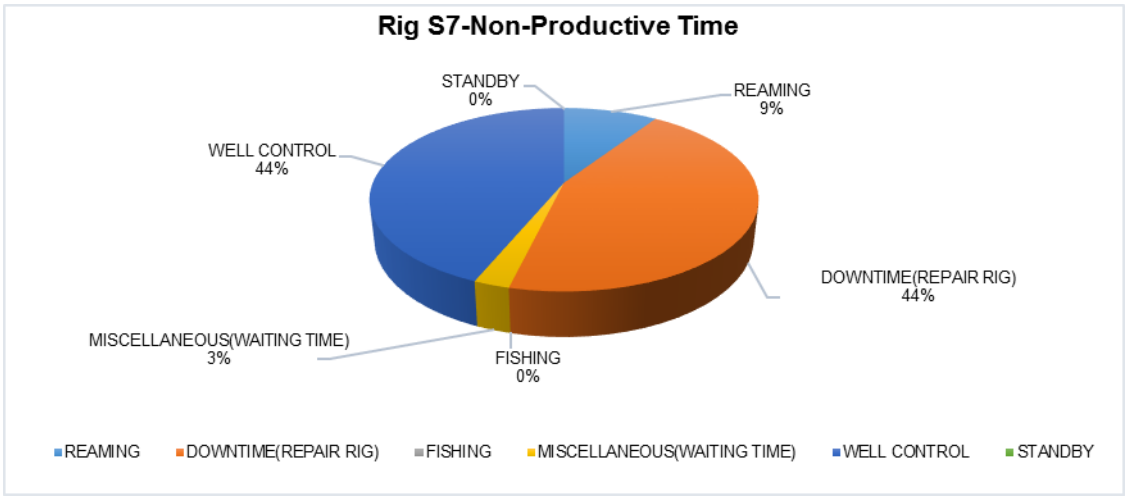

Figure 6

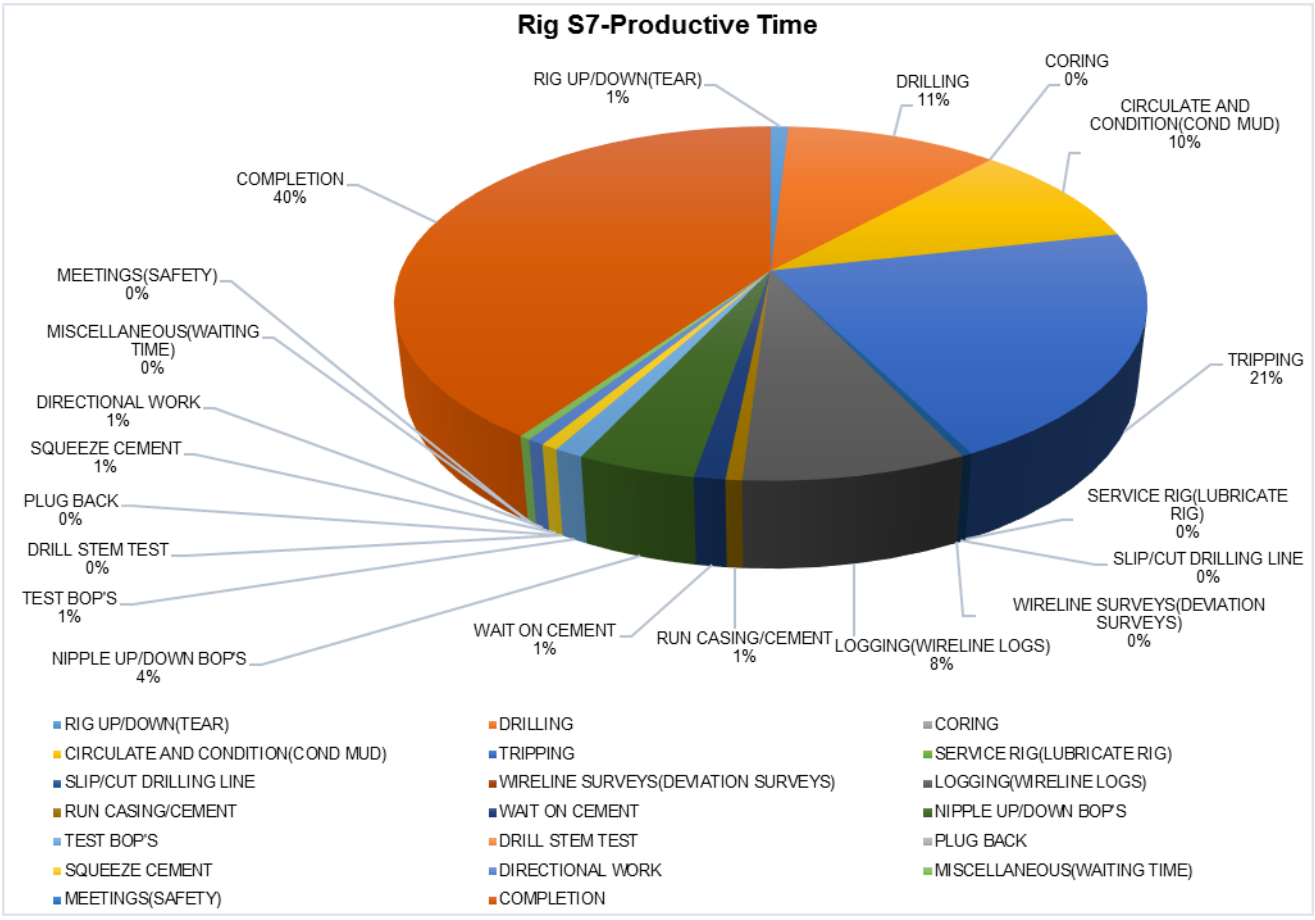

Figure 7

Figure 8

III. CONCLUSION

- Downhole problems are major cause of rig time consumption. Avoiding of downhole problems can reduce the overall rig time hence the overall project cost.
- Downhole problems positively affect the tripping time and circulating & conditioning time. Mainly fishing increase the tripping time and well control issues increases circulation and conditioning time.
- Waiting time can be reduced by efficient supply chain management.

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