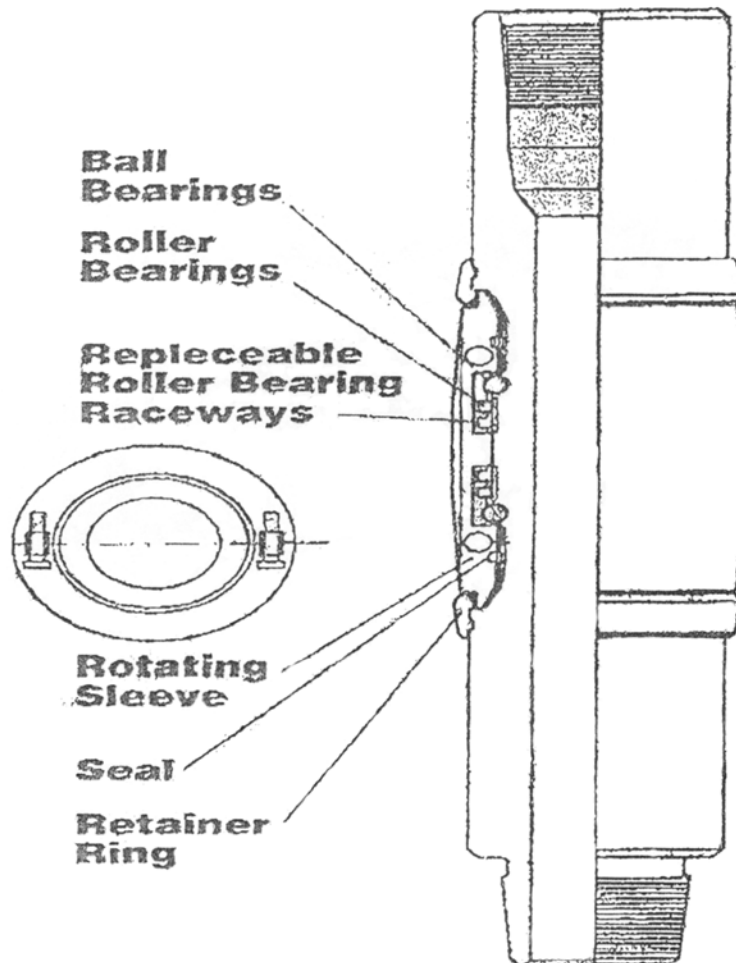




PERFORMANCE OF DRILL STRING TORQUE REDUCTION SUBS (DBS)

Well : KITINA SUD MARINE - 3



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Actual performance of Drill String Torque Reduction Subs

Well KTNSM-3 - Rig Scarabeo

This report presents how Security DBS' Drill String Torque Reduction Sub (DSTR) were able to solve a major problem of excessive torque impeding drilling string to rotate in the 12-1/4" section of the offshore Extended Reach well KTNSM-3. 33 DSTR 5" were run in the build and allowed to TD the section. This tool has been successfully used for the first time in Africa, and in Agip worldwide, by Agip Recherches Congo.

1) The context

Previous problems of high torque were addressed during the Kitina field development using Non Rotating Drill Pipe/Casing Protectors (NDPP) of WWT. Like the DSTR, the NDPP are placed from the Kick-off point (KOP) to the End of Build (EOB), where the majority of off bottom torque is generated. They consist of a rubber sleeve held in place axially by aluminum thrust collars. The system proved to be efficient with a 20-25 % torque reduction and casing wear also will be reduced significantly. The main problem with this tool is the potential for it to strip, leaving the rubber element downhole with consequential fishing problems. This happened in Kitina Sud Marine 3, where n° 71 NDPP protectors were lost in the hole during the 8 1/2" phase. The NDPP protector has to be repositioned after certain time, because significant wear can be produced on the drill pipe body due to the rotation of the tool. It is also necessary for an engineer to be on board to check the tools when tripping in/out of hole. Time spent on placing them in the string is also considerable (3 to 4 NDPP are positioned on the drill pipe joints of the area to be covered).

2) Drilling problems in the 12-1/4" of Kitina Sud Marine 3

The appraisal well KTNSM-3 was drilled from the Kitina Field template. The well profile was a slant of 61 deg with a total drilled depth of 5205 m and a total displacement of 3990 m. The KOP was at 223 m and the EOB at 1061 m. From 356 to 1061 m, the average dog-leg severity was between 1.5°/30m and 2.9°/30m.

The 13-3/8" casing was set at 2416 m.

The 12-1/4" section was drilled with OBM using 9-1/2" Steerable Turbine (SBS Neyrfor) and PDC bits. In the bottom and harder part of this section (majority of limestone interbedded with siltstone, clay and sand), the torque value was fluctuating between 1750 and 2150 kgm. The ROP between 3809 and 3929 m was around 3.7 m/h with 15% of sliding. Several pieces of black rubber were found in the shale shakers.

Pulling out of hole at 3939 m to change turbine, 152 NDPP were found badly damaged. Once removed, and after reaming with 2900-kgm torque. It was impossible to resume turbodrilling. Two other trips with attempts with 3 and then 2 NDPP/drill pipe joints covering string area from 728-557m and 842-557 m were negative (high torque of 2900 kgm). The deeper successful attempt to rotate string was at 3204 m with 2650 kgm and 100 RPM.

No-other NDPP were available, and 4 to 5 days of stand-by were required to get new **ones** from Aberdeen (UK).

3) Run of the DSTR

Security DBS was holding in Pointe Nioire a stock of sixty 5" DSTR available.

The DSTR is a drillstring tool consisting of a short mandrel fitted with a bearing supported retaining sleeve. They are positioned every second or third tool joint, following the dog leg severity, and lift the drill pipe tool joint off the side of the casing. Thus, they lower the frictional forces **by** incorporating a roller bearing contact force.

The tool was designed with mechanical properties (torsional and tensile strengths) exceeding specification of drill pipe (see attached)

N°49 DSTR were sent straight at night to the rig with a speedboat and were made up in the drill string, mixed with the remaining NDPP.

The total drill string area covered was from 1415 to 177 m 178-446 m and 816-1415 with DSTR, 448-816 with NDPP.

After a short reaming, the attempt was successful and turbodrilling started at 6 m/h with an on-bottom torque of 1700/2100 kgm at 90 RPM. The TD of the section was reached at 4226 m in 83.5 rotating hours. with on-bottom torque of 2000/2204 kgm after 4100 m and a 25-30 % torque reduction.

4) Conclusion

The DSTR proved their efficiency to extend the limit of a well design and maintain sufficient power to the bit. The tool design integrity also avoid potential fishing or drilling problems associated to the rubber devices, which created lot of problems at the end of the 8-½" section in Kitina Sub Marine-3 well.

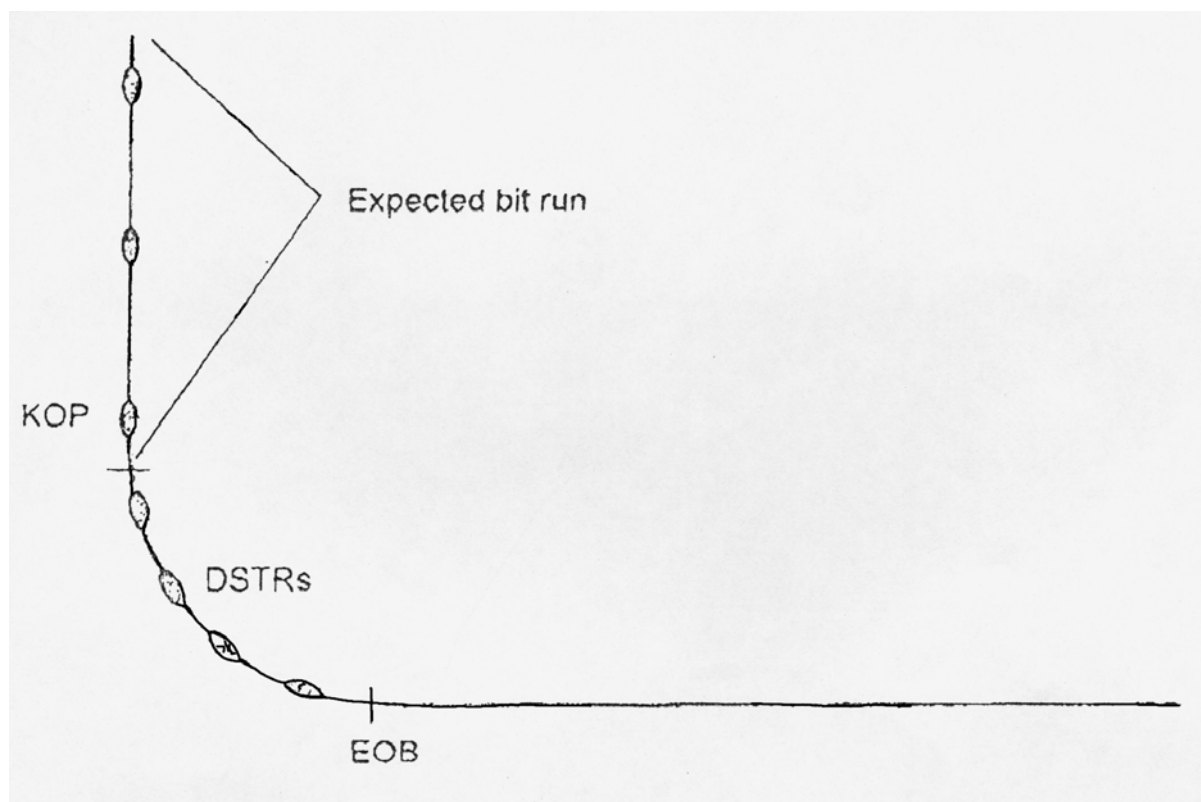
Using DSTR subs it is possible to extend the limits of a well design and still maintain sufficient power to the bit. Another benefit of this system is of course to minimize casing Wear; it is no longer necessary to over-engineer the casing in order to withstand high wear factors.

The DSTR subs are designed such that all mechanical properties are to API specifications which limits greater than those of the string in which they are connected, and were tested for durability of 200 rotating hours between services or laydown (with RPM of 120).

However, the limitation of DSTR application is the stiffness to the drill-string, due to the joint connections.

- Our recommendations for future applications of this type will be preferentially position the DSTR all along the build-up section of the well to minimize contact pipe/casing and therefore maximize their application.

DSTR – CONFIGURATION



The major of side load occurred over the build section. Therefore, by placing one DSTR sub every second or third tool joint (depending on the dog-leg rate) to cover the build section for the duration of the bit run torque could be reduced significantly.

CASE HISTORY

TOOL TYPE : DSTR 5”
CONNECTION : 4 ½” API I.F. (NC50)
COUNTRY : CONGO
RIG : Semi-sub Scarabeo IV
WELL : KTNSM-3
RUN DATE : April 97
NUMBER OUT : 49
NUMBER USED : 33
BOTTOM TOOL : 1702 m
TOOL SPACING : 60/90 ft
AVG RPM : 100
HOURS : 83.5 h
TOTAL REVOLUTIONS : 501000
CASING SIZE : 13-3/8”
TANGENT ANGLE : 60-64°
KOB : 223 m
EOB : 1061m
METERS DRILLED : 287m
AVERAGE ROP : 3.4 m/h
FORMATION : Sendji carbonates
FLOW RATE : 2300 lpm
WOB : 5/8 t
TORQUE : 1700 / 2100 m.kg then 2100/2500 m.kg
MUD TYPE : Oil Based Mud
MUD WEIGHT : 1.19

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