P19

Drilling Optimization in the World's Largest Offshore Gas Field by Optimizing the BHA Design

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SUMMARY

Drilling is an expensive industry these days which consist of tools, services, rig and etc. so it's important for drilling engineers to optimum drilling parameters to reduce costs and avoid problems. In this paper an integrated drilling system with specific focus on BHA design which has been used to improve drilling performance in the world's largest offshore gas field will be discussed. The effect of this optimization was reduction of actual drilling time to more than half of the budget time.

This paper will focus on how this exceptional performance was achieved with specific focus on BHA design especially the new-generation positive displacement motor (PDM) and PDC bit combination and the "performance directional drilling" techniques employed.

Also the most famous drilling problems will be discussed that how they happened and what is the optimum solution for them. Each section of the well will be evaluated individually according to drilling problems, well trajectory, BHA design and mud specification and introduce the optimum parameters. At the end, compare the results with offset wells (phases).

This paper will cover the drilling optimization implemented in South Pars field; which has resulted in more than two years of saved rig time compared to budgeted time. The previous best drilling time by other operators in the field have all been surpassed.

The South Pars gas field / North field lies mainly offshore Iran and Qatar. The field, which accounts for 10% of the world's and 60% of Iran's known gas reservoirs covers an area of approximately 1300 square kilometers and is being developed by both countries in a series of "phases". Each phase comprises of one or more wellhead platform which one vertical appraisal / producer followed by nine to twelve typically J-profile development wells at inclination of up to 60 degrees.

The planning for provision of directional drilling services on south pars phases 6, 7&8 was conducted in 2003 utilizing an extensive drilling knowledge-base acquired during drilling of the three vertical appraisal wells plus the offset directional development wells on south pars phase 2&3. phase 6, 7 &8 were to be developed with nine J-shape directional wells in a radial pattern from 3 well head platforms. Each platform was located above the original appraisal well drilled in 2002 which would be re-completed as a producer. Reservoir drainage requirements dictated that the directional development wells attained a horizontal displacement of +/- 2000m at the 9 5/8" casing shoe set above the Kangan - Dalan Khuff gas reservoir at 2700m TVD.

A primary focus on the development drilling planning phase was to significantly reduce well delivery time through optimized drilling performance.