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Sub-based Roller Tools Enable Effective Extended-Reach Completions Operations: Offshore Angola

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Abstract

This paper describes the factors contributing to drag that required sub-based mechanical friction-reduction roller tools in an offshore extended-reach well (ERW). The information required for successful prediction of frictional forces and the preparatory torque and drag modeling are also covered. The paper describes how the tools were run and how they work. Finally, the paper presents the results in drag reduction and the effectiveness of the gravel-pack and perforating operations.

Applications related to this paper include any well with torque or drag challenges limiting the options for completion engineers, especially in extended-reach wells; and any drilling, fishing, or other operation restricted by torque or drag challenges.

Effective planning and running of specialized tools are required for success. In the subject well, drag was reduced sufficiently to take advantage of an otherwise unavailable well-completion method, resulting in increased production and earlier financial recovery of drilling and completion costs.

This paper helps familiarize the reader with the modeling techniques and information required to run torque and drag reduction tools and the axial drag benefits of roller tools that enable optimal completions in difficult or extended-reach wells. The paper also familiarizes the reader with the technology that the mechanical friction-reduction subs provide for drag reduction.

Introduction

Advances in technology, environmental and cost considerations, development of increasingly isolated and inaccessible reservoirs, and other factors have made ERWs fairly commonplace in recent years. Frictional torque and drag losses in ERWs are often a limiting factor or significant challenge in drilling, casing-running, and completion operations.

Description of Well

The subject well was an S-shaped ERW located offshore. The step-out was 2-¼, with a measured depth (MD) of 15,536 ft and a true vertical depth (TVD) of 6,919 ft in 1,727 ft of water. The hold angle of 76° was reached by approximately 4,400 ft MD and held to approximately 13,400 ft, where the angle dropped to a final 57.9°. As the lateral was being drilled, an unplanned increase in inclination, from approximately 76° to a maximum recorded angle of 86.36°, occurred, leading to elevated drag **(Fig. 1).**

To successfully fracture the well and run the gravel pack, 80,000 lb of force was needed at the bottom of the string. During the fracturing job, 50,000 lb of upforce was expected and 30,000 lb of additional weight was required to ensure that the string did not unseat. Unfortunately, with the elevated drag, modeling showed that, at expected friction factors, helical buckling would be present in the completion string **(Fig. 2 and 3).**