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Exploratory Well Hits Target Successfully on the 8th Attempts in the Binak Oilfield, North of Persian Gulf

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Abstract

In the Binak oilfield, located in the north of the “Persian Gulf”, seven exploratory wells were attempted to drill to the target, which is the Khami reservoir at a depth of 5600 m. Due to special conditions and problems, drilling through the formations in this oilfield was unsuccessful. The main drilling challenges include selecting correct casing depth, borehole instability due to shale sloughing and severe fluid loss and flow during drilling. These problems resulted in the unsuccessful drilling of seven exploratory wells. Therefore, the following factors were considered in designing the new exploratory well number eight.

- Proper selection of drilling fluids for the different hole sections by performing fluid absorption experiments on shale samples.
- New design of the casing and liner string.
- Setting casing at the right depths.
- Correct selection of mud weight in order to minimize severe loss and flow.
- Precise determination and cure of loss zones.
- Minimize shale sloughing by increasing mud weight

This paper shares and discusses the experience of NIOC (National Iranian Oil Company) in drilling the 8th exploratory well. It covers the successful well design as well as the methods and procedures adapted to drill this 8th well.

Introduction

The Binak oilfield is located in the north of the Persian Gulf and was discovered in 1957. This oilfield is surrounded by other oilfields such as Bibi-Hakimeh, Rag-E-Sefid, Hendijan, Bahregan SAR, and Golkhari which is shown in **Figure 1**. The Binak oilfield formations are the Agha Jari, Mishan, Asmari, Pabdeh, Gurpi, Bnagestan group formations, the Kazhdumi and the Khami group formations. **Table 1** shows a brief description of the formations in Binak oilfield.

The present path in the drilling industry is to drill more complex wells in as cost effective way as possible. Therefore, well planning and drilling operation has to continuously improve. All technical information related to drilling wells should be considered in the well design. Major considerations must be taken for both safety and economic reasons. Two of the main considerations are that the well is drilled with an optimum mud weight and proper casing setting depth. Factors such as shale layers and abnormal/subnormal pressure formations can also greatly affect the well design.

History of Binak oilfield

In 1957 the Binak anticline was discovered by seismic interpretation. Seven exploratory wells were drilled. Only well BK4 reached to part of Khami group using two sidetracks. It still required a perfectly designed well to pass through all Khami group formations to evaluate this reservoir.

The first well, BK1 proved the existence of oil in Asmari and Sarvak formations. This well never reached to Khami reservoir. The second well BK2 penetrated the Sarvak formation showing productivity of this entire reservoir thickness. The third well was stopped due to severe fluid losses and flow in Gachsaran formation. The fourth well drilled to a depth of 3991m in the Kazhdumi formation. At this depth a high pressure flow of gas and oil reached the surface and eventually resulted in stuck pipe. This well sidetracked twice and finally reached a small part of Khami reservoir. The wells BK5, BK6 and BK7