SPE 124238

Low-Rheology RDF Successfully Drills Troublesome Qannik ERD Wells in the Alpine Field, North Slope, Alaska

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This paper was prepared for presentation at the 2009 SPE Annual Technical Conference and Exhibition held in New Orleans, Louisiana, USA, 4–7 October 2009.

Abstract

A proactive approach was undertaken to successfully drill and complete wells at the beginning of the Qannik development drilling program in the Alpine field on the North Slope of Alaska. Due to economics and logistics of the remote Alpine field, the well design req-uired drilling relatively small diameter, long horizontal intervals in the shallow Qannik formation at 4,000-ft true vertical depth (TVD). This paper describes the comprehensive approach, extensive testing and field implementation that led to a successful drilling program using a low-rheology reservoir drill-in fluid (RDF).

The goal was to successfully drill within a narrow hydraulic window bounded by the Equivalent Static Density (ESD) for wellbore stability and Equivalent Circulating Density (ECD) to stay below the fracture gradient. The first test well, drilled with a conventional mineral-oil-based drilling fluid or "mud" (MOBM), experienced massive lost circulation due to wide fluctuations between ESD and ECD while drilling the 6,000-ft (1,830-m) horizontal production section. This necessitated another approach to economically drill the 9,000-ft (2,740-m) horizontal production intervals planned for the development wells.

A low-rheology mineral-oil-based RDF utilizing a dry micronized weighting material was selected to help eliminate sag potential, allow the ECDs to stay below the fracture gradient, maintain wellbore stability, minimize fluid losses and minimize formation damage. Actual field data showed an approximate 1.0 lb/gal decrease in ECD over the conventional fluid. The final results of the drilling program were all eight wells being successfully drilled. The first well's lateral planned section for 9,000 ft (2,740 m) was cut short by 3,000 ft (910 m) due to severe lost circulation but adjustments to fluid weight and properties, drilling practices and careful geo-steering delivered the seven other wells as planned. The deepest well reached over 18,000 ft (5,490 m) in measured depth (MD) with over 8,400 ft (2,560 m) of horizontal lateral. One of the main drivers in the success of the Qannik drilling program was the use of micronized weighting material in the specially designed low-rheology MOBM.

Introduction

The Alpine field anchors the western most oil production and processing facility on Alaska's North Slope (Fig. 1).

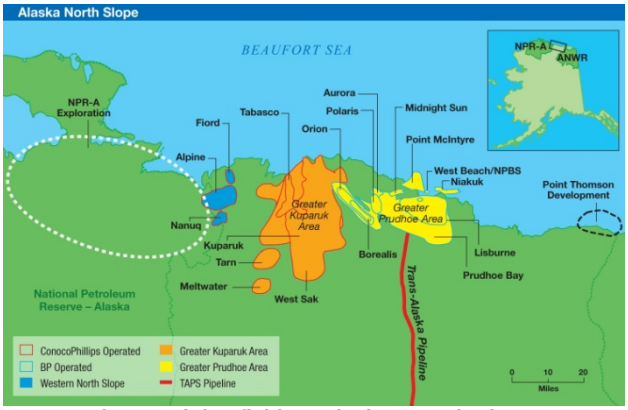

Fig. 1 – Alpine field on Alaska's North Slope.