

BaraECD® Fluid System and Applied Fluids Optimization Service

BaraECD® fluid and AFO service help reduce downhole losses by more than 60% in critical well, saving \$5 million

Location: Gulf of Mexico

Overview

An operator in the Gulf of Mexico attempted to drill a narrow margin deepwater well in 2013 with a competitor’s drilling fluid. On this project, the operator had difficulty maintaining downhole mud weights and equivalent circulating density (ECD), resulting in severe lost circulation through the highly permeable formations and a stuck pipe. The fluid system also experienced barite sag. In the Lower Tertiary section of the well, severe losses were experienced, which prompted the operator to leave the bottomhole assembly (BHA) in the hole and to plug and abandon the wellbore. In 2014, during planning of the sidetrack, the operator asked Baroid to provide a mud system that could outperform the competitor’s solution and deliver the well.



BaraECD® fluid is an innovative, engineered fluid system with a unique chemistry designed to control ECD in narrow margin wells.

CHALLENGES	SOLUTIONS	RESULTS
<ul style="list-style-type: none"> Operator had difficulty maintaining downhole mud weights with competitor fluid in original wellbore ECD fluctuations previously resulted in severe downhole fluid losses and loss of the BHA in the Lower Tertiary section of the well Previous competitor mud system experienced barite sag 	<ul style="list-style-type: none"> BaraECD® fluid system for high-pressure/high-temperature (HPHT) and narrow margin drilling was applied to the new well Applied Fluids Optimization (AFO) service was implemented for real-time monitoring of drilling operations and for incident interventions to help avoid complications 	<ul style="list-style-type: none"> Total downhole losses were reduced by two-thirds, for approximate savings of \$5 million AFO service identified multiple Red and Yellow interventions to further avoid issues Operator was able to reach a TD that could not be reached with competitor fluid

The Halliburton Baroid team developed a targeted solution to meet specific operator requirements. The fluid needed to provide stable performance at bottomhole temperatures of greater than 275°F while maintaining controlled pressure transmission from static mud weight to down hole mud weight (DHMW). Additionally, narrow pressure margins dictated that the system provide smaller variations in surface mud weight (SMW), DHMW, and ECDs than the previous competitor fluid. The fluid system also needed to withstand high concentrations of background loss circulation material (LCM) treatments and contaminants associated with narrow margin drilling. The goal was to reduce downhole mud losses across highly permeable formations.

Following lab verification, the Baroid team deployed a customized formulation of the BaraECD® fluid system and utilized Applied Fluids Optimization (AFO) service for real-time monitoring of the drilling operation. The fluid demonstrated excellent stability over extended static periods (three weeks or more) during wireline and other operations. The AFO service monitored operations in real time and captured data from pressure-while-drilling (PWD) tools. In the Lower Tertiary interval, a narrow mud weight window of 0.35-ppg between pore pressure and fracture gradient was navigated successfully as shown in Figure 1 below. Additionally, the fluid demonstrated small pressure differences when comparing SMW vs. DHMW and DHMW vs. ECDs, also shown in Figure 1 below. The AFO service was also able to proactively identify multiple Yellow and Red interventions and recommend adjustments to avoid potential problems. The operator was so confident in the AFO capabilities that it was willing to drill ahead during PWD tool downtime.

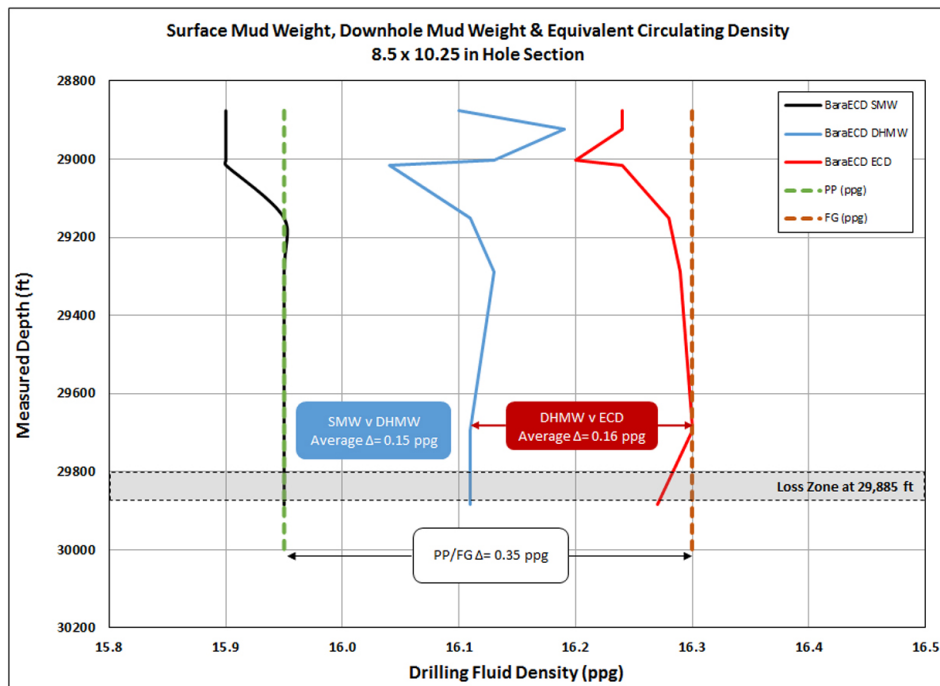


Figure 1: BaraECD® fluid performance in 8 ½" x 10 ¼" hole section

The combined solution of BaraECD fluid and AFO service helped the operator reduce fluid losses significantly throughout the project. On the original well with the competitor fluid, the operator drilled 8,732 ft through the permeable zones and lost more than 17,000 bbl of fluid. With the integrated solution from Baroid, the operator was able to decrease and better manage ECDs to successfully drill three intervals through the permeable zones for a total of 21,948 ft with less than 1,800 bbl of fluid lost. Total downhole mud losses were reduced by nearly two thirds, from 23,600 bbl on the original well to approximately 7,600 bbl on the new well, as shown in Figure 2 below. The operator had zero Non Productive Time (NPT) associated with the drilling fluid and was able to reach a total depth (TD) that the competitor fluid system could not reach. Overall savings on mud losses were estimated at \$5 million.

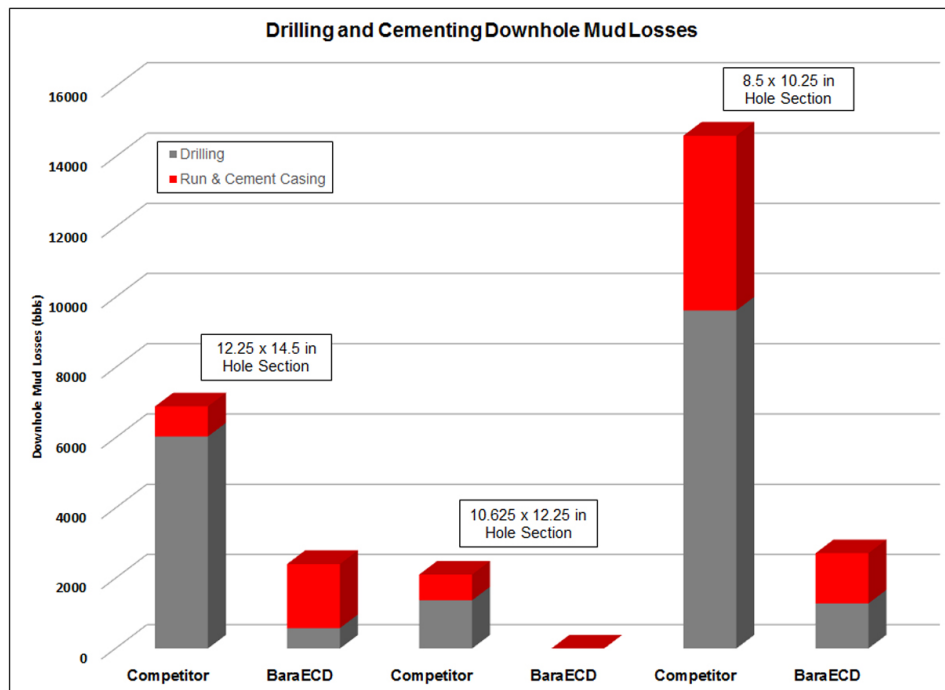


Figure 2: Downhole losses per section, comparing the competitor fluid to the BaraECD® system.