INNOVERT® Invert Emulsion Fluid System Optimizes Drilling Phases in Main and Lateral Hole Sections of Montney Wells

MONTNEY SHALE FORMATION, CANADA

OVERVIEW

In 2009, while drilling horizontal wells in the Pouce Coupe field to produce gas from the Montney shale formation, Talisman Energy challenged Halliburton to eliminate the use of two different fluid systems in the main and lateral hole sections and to reduce drilling costs by realizing the benefits of a single system.

HIGH-PERFORMANCE INNOVERT® FLUID SYSTEM ENABLES OPERATOR TO SUCCESSFULLY DRILL MAIN AND LATERAL HOLE SECTIONS

Baroid suggested that the operator use the high-performance INNOVERT® fragile-gel invert emulsion fluid system, given its proven track record for maximizing hole cleaning and rates of penetration (ROPs). Historically, the Montney lateral sections were drilled with either a base oil, a water-based mud (WBM), or an invert emulsion fluid containing a 90/10 oil/water ratio (OWR). The goal of using one single system through the main and horizontal sections were to minimize downtime due to swapping systems and displacement operations, achieve ROPs in the lateral sections, and reduce logistical needs.

The fourth horizontal well – Well “D” – was a pace setter in the area, with an average of 17.3 m/hr ROP achieved on the main horizontal hole. There were significant cost savings achieved, as presented in the estimates below.

<table>
<thead>
<tr>
<th></th>
<th>Well “A”</th>
<th>Well “B”</th>
<th>Well “C”</th>
<th>Well “D”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depth of intermediate casing, meters</strong></td>
<td>2719</td>
<td>2499</td>
<td>No Intermediate</td>
<td>No Intermediate</td>
</tr>
<tr>
<td><strong>Total mud cost (less surface hole)</strong></td>
<td>$276,420</td>
<td>$271,293</td>
<td>$157,258</td>
<td>$120,500</td>
</tr>
<tr>
<td><strong>Mud cost per m$^2$ of hole drilled</strong></td>
<td>$2,490</td>
<td>$2,238</td>
<td>$2,353</td>
<td>$1,991</td>
</tr>
<tr>
<td><strong>Mud cost per m of hole drilled</strong></td>
<td>$65</td>
<td>$59</td>
<td>$44</td>
<td>$34</td>
</tr>
<tr>
<td><strong>Volume of INNOVERT®/BO lost</strong></td>
<td>53/50</td>
<td>100/30</td>
<td>70/20</td>
<td>58/14</td>
</tr>
<tr>
<td><strong>Amount of mud products (without barite) delivered, MT</strong></td>
<td>83.73</td>
<td>58.1</td>
<td>40.62</td>
<td>31.86</td>
</tr>
</tbody>
</table>

CHALLENGE

Eliminate the use of two different fluid systems on the main and lateral hole sections of operator’s Montney wells

SOLUTION

High-performance INNOVERT® invert emulsion fluid system for maximizing hole cleaning and ROPs in the main and lateral hole sections

» Maximize hole cleaning and ROP

RESULTS

» Successful delivery of single fluid system for the drilling of each well
» Technical objectives achieved with INNOVERT fluid system
» Confirmed opportunity for enabling more challenging well profiles and greater cost savings, as this system saved the operator approximately USD 32,873 per well
Talisman Energy acknowledged the stability of the rheological properties and the superior hole cleaning capacity of the INNOVERT fluid. Switching to the INNOVERT system enabled the operator to decrease torque and drag effects, and to also realize a 40 percent increase in ROP values during the drilling operations for the Montney lateral section.

**INNOVERT SYSTEM OPTIMIZES DRILLING PHASES, ENABLING OPERATOR TO REALIZE SIGNIFICANT SAVINGS**

Talisman Energy reported that it was very pleased with the level of service and technical support received from Baroid on this project. The transition from a WBM system in the horizontal section showed significant benefits: 1) by using one system, the need for two separate storage units was avoided; 2) during the winter months, the challenge of keeping the WBM system from freezing in the tank farm or hauling it to a landfill for disposal was avoided; and 3) the time it would have taken to displace to the WBM prior to drilling the lateral section was also avoided.

Baroid successfully delivered this solution, which was designed to optimize drilling phases of the main and lateral sections, ultimately saving Talisman Energy approximately USD 32,873 per well.