QMAXPLUG, the solution for Severe Losses

Problem

Starting to drill the 8 ½" hole section in a well in Colombia for SK Innovation Co., with the 9 5/8" casing shoe at 7512 ft, a LOT was run at 19.28 ppg. Continued drilling with 18.0 ppg mud, required mud density to control the well. Drilling at 7540 ft, a mud loss to the formation of 160 bbl is observed. Pumped and spotted a conventional LCM and pulled out of hole for BHA change. Experienced mud density to 17.5 ppg and continued drilling. Experienced mud losses again at 80 bbl/hr. Mud returns are observed, well is shut-in with a casing pressure of 350 psi, evidencing a “ballooning” effect.

Proposed solution

Decided to pump QMAXPLUG pill in order to seal the potential fracture and be able to continue drilling. Started tank cleaning where the pill was going to be prepared. Following instructions from QMax in Bogotá started mixing 50 bbl of QMAXPLUG pill as follows:

- Added 30 bbl of water, observed suction problems with the pump and added 10 bbl more.
- Added 3 cans of QMAXPLUG R (retarder).
- Mixed for 30 min. Added 0.1% QDRILL UP to reduce foam.
- Added 2 sxs bentonite. Mixed for 15 min.
- Added 0.5 ppb xanthan gum and densified with barite up to 13.4 ppg.
- Added 40 sx QMAXPLUG. Finished adding barit to 17.6 ppg.
- Homogenize the fluid agitating for 2 hours after QMAXPLUG was added.
- Pumped 40 bbl and displaced fluid to loss zone leaving 4 bbl inside the pipe.
- Pulled out of hole 12 stands to leave the bit above the pill.
- Circulated for 10 min.
- Squeezed the pill up to 1,000 psi. Forced a total of 40 bbl.
- After 6 hours of squeezing the fluid, the well was opened, and drilling operation resumed with no difficulties.

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Pilot Tests

In order to guarantee that the problem was successfully solved, pilot tests were run both at the rig site and at our Regional Technology Center located in Cota, Colombia. These tests took into consideration temperature information to design the QMAXPLUG slurry.

Before this problem was encountered, QMax in Colombia had tested the product in the lab with the Permeability Plugging Tester (PPT) using slotted discs to simulate fracture openings. After performing the tests, the consistency of the material was as expected; a rigid gel.

<table>
<thead>
<tr>
<th>Product</th>
<th>Concentration</th>
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<tbody>
<tr>
<td>Water</td>
<td>30 bbl</td>
</tr>
<tr>
<td>QMAXPLUG R</td>
<td>1%</td>
</tr>
<tr>
<td>Bentonite</td>
<td>5 ppb</td>
</tr>
<tr>
<td>Xanthan Gum</td>
<td>0.3 ppb</td>
</tr>
<tr>
<td>QMAXPLUG</td>
<td>40 ppb</td>
</tr>
<tr>
<td>Barite</td>
<td>770 ppb</td>
</tr>
</tbody>
</table>

Results

After pumping and squeezing the QMAXPLUG pill, waited for 6 hours, washed the bottom of the hole and resumed drilling operation normally. Finished drilling 8 ½" hole section, pulled out of hole for a wiper trip, conditioned hole, ran casing and cemented it with no mud losses or “ballooning” incidents.