Lost circulation continues to be one of the most prevalent operational issues customers face today and is a leading contributor to drilling non-productive time. The solutions used to combat these global challenges are optimized according to formation types, drilling fluid loss rates and the fluids in which the technologies are deployed. Not all lost circulation events may be prevented and often require the use of specialty applications, provided in the form of a lost circulation “pill”. Many times, loss scenarios involve a wide range of fracture widths requiring a versatile solution to effectively and quickly prevent further losses. Utilizing lost circulation materials with an optimized particle size distribution (OPSD) can allow for operators to cure this wide range of fluid losses, minimizing non-productive time and maximizing wellbore value.

DUO-SQUEEZE® H LCM works by isolating the tip of the fracture and sealing it with its unique composition designed to retain it’s granularity even under high fracture closure stress. The OPSD is designed to plug a wide range of fracture sizes which cause lost circulation. Pills with concentrations up to 80 ppb (230 kg/m3) have been successfully applied in the field and are optimized to be compatible with all fluid types (aqueous or non-aqueous).

While the formula for DUO-SQUEEZE H lost circulation material is proprietary, the components are common in the industry.

Benefits and Features
DUO-SQUEEZE® H engineered, composite lost circulation material is a unique LCM blend containing highly effective components, including both resilient and rigid particles, with an optimized particle size distribution. DUO-SQUEEZE H LCM can provide operators with a cost effective solution to lost circulation through:

Increased Sealing Performance
- Engineered, composite solution with optimized particle size distribution
- Stable in temperatures up to 400º F (205º C)
- Exact QA/QC specifications

Versatility
- Bi-modal PSD designed to seal wide range of fracture widths
- Effective as a High Fluid Loss Squeeze or conventional “pill” treatment
- Compatible with both aqueous- and non-aqueous drilling fluids

Reduced Non-Productive Time
- No reactive components allow for material to be stored and mixed on location for immediate use
- Requires no trips, specialized spacers, pumping, or mixing equipment
- Single solution for multiple fluid loss scenarios

It has been field and lab tested to provide an optimized bi-modal solution to lost circulation that is able to seal fractures and manage fluctuations of downhole pressure.

Applications
DUO-SQUEEZE® H lost circulation material is compatible with all aqueous and non-aqueous-based fluids. It can be applied as a pill treatment as high as 80 lbs/bbl (230 kg/m3) and can be pumped through drill strings equipped with PWD and mud motors. It can be used as a stand-alone treatment or in a combination with other Baroid lost circulation materials. If it is believed there is a high possibility of lost circulation, DUO-SQUEEZE H lost circulation material can be mixed ahead of time and maintained as a contingency treatment, since there are no reactive components.
**Field Application**

An operator wanted to stop losses in a severely depleted zone at 10,900 ft in order to evaluate a lower productive zone. A 16.0-ppg mud density was required to control the pressure in the lower sand. Several conventional LCM pills had been spotted, along with three high-fluid-loss squeezes provided by a competitor, and two cement squeezes.

The bit was run to 10,900 ft while two 50-bbl DUO-SQUEEZE H LCM pills were prepared. The entire 100-bbl treatment was spotted in the wellbore. The bit was pulled to the top of the pill at 6,500 ft (above the intermediate casing shoe @ 9205 ft) and the annulus closed. The pumps were brought on line slowly. Initially, the pressure came up to approximately 18.0 ppg equivalent mud weight (EMW) and then broke back to 17.2 ppg EMW while squeezing 50% of the LCM pill away (50 bbl).

The pumps were shut down and the pressure monitored for the next four hours. A slight rise in pressure was noted resulting in a 17.4 ppg EMW. The pressure was bled off and the drillstring run to approximately 10,700 ft. The well was displaced with a 16.0 ppg water-based fluid with full returns, allowing logging evaluation of the lower production zone.

**Conclusion**

Lost circulation is one of the leading contributing factors to drilling non-productive time. An effective lost circulation strategy, and the ability to respond quickly, is essential to lower the cost of lost circulation should a problem occur. DUO-SQUEEZE® H lost circulation material is an “engineered, composite” solution that is applied as a sweep or HFLS treatment to mitigate partial fluid loss rates (<50 barrels per hour; <8 cubic meters per hour), reducing non-productive time and saving money.

<table>
<thead>
<tr>
<th>1016-micron slot, g</th>
</tr>
</thead>
<tbody>
<tr>
<td>508-micron slot, g</td>
</tr>
<tr>
<td>Temperature °F</td>
</tr>
<tr>
<td>Dispersed Lignosulfonate WBM</td>
</tr>
<tr>
<td>Dispersed Lignosulfonate WBM</td>
</tr>
<tr>
<td>Low-Solids Non-Dispersed WBM</td>
</tr>
<tr>
<td>Low-Solids Non-Dispersed WBM</td>
</tr>
<tr>
<td>Clay-Free Synthetic-Based Mud</td>
</tr>
<tr>
<td>Clay-Free Synthetic-Based Mud</td>
</tr>
</tbody>
</table>

© 2012 Halliburton. All rights reserved. Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.