

FORM-A-SQUEEZE LC Plug Reduces Losses in the U.S. Gulf of Mexico

“FORM-A-SQUEEZE* lost circulation plug was selected based on successful application in a previous interval and on the ease of mixing and spotting the material. The material built squeeze pressure, reducing the loss rate from total losses to minimal losses while drilling ahead.”

Andrew Wilde, Sr. Project Engineer

Well Information

Location	Western Gulf of Mexico
Date	March 11, 2005
Total Well Depth	22,771 ft (6,945 m)
Water Depth	6,864 ft (2,094 m)
Pay Zones	Confidential
Zone to be Sealed	Shale/sand
Casing Size	7 ⁵ / ₈ -in Solid Expandable
Casing Shoe Depth	20,995 ft (6,403 m)
Open Hole Size	7 ¹ / ₂ inches
Fluid in Hole	RHELIANT* – Synthetic-base Mud
Bottomhole Temperature	220°F (104.4°C)

The Situation

A major international operator working in the U.S. Gulf of Mexico observed a close tolerance between the mud weight and fracture gradient when drilling below a 7⁵/₈-in. expandable liner. Seepage losses at rates of 1-3 bbl/hr were observed while drilling sand sections.

Regular additions and high concentration sweeps maintained background LCM of calcium carbonate M, C and XC as well as G-SEAL* additive in the RHELIANT synthetic-base mud at 15-20 lb/bbl. The drilling team closely monitored ECD using an APWD tool. Increases in ECD were reduced by lowering ROP and controlling the flow rate. Drilling stopped so the well could be circulated when the ECD increased near an established threshold that was 0.5 lb/gal above the mud weight.

As drilling continued, however, complete returns were lost while reaming back to bottom to make a connection. Circulation was attempted at a reduced rate with minimal returns. The hole had minimal mud losses when static. Based on the drilling conditions, the losses appeared to be on bottom.

The Solution

The drilling team selected the FORM-A-SQUEEZE lost circulation plug as the circulation-loss solution because of its successful application while drilling the previous interval. Factors in selecting the FORM-A-SQUEEZE product were:

1. The speed with which the material could be mixed
2. Simplicity in spotting the pill (no spacers or surfactant/solvent pills required)
3. No restrictions on pumping time to put the pill in place. Low flow rates could be used to minimize losses to the formation that could cause ballooning issues on future connections and trips

The team developed a procedure for pumping the pill to the bit along with 15 bbl into the annulus. The remaining pill was pumped out of the drill string while pulling the bit inside the liner. This minimized the contamination of the pill and placed the bit one stand above the slurry before the squeeze operation was initiated. The entire open-hole section was filled with the FORM-A-SQUEEZE pill to cover potential loss zones.

The Results

The drilling team built 110 bbl of slurry using 200 sacks of FORM-A-SQUEEZE product (80 lb/bbl) combined with 80 bbl of synthetic-base fluid, and 400 sacks of barite. After the slurry was built, it was pumped down the drill pipe, and 15 bbl was pumped into the annulus prior to pumping and pulling the pipe to get the bit above the slurry.

Once the bit was above the slurry, the annular preventer was closed, and squeeze pressure was applied using the cementing unit at a pump rate of 0.5 bbl/min. After 4.5 bbl was pumped, the squeeze pressure built up to 284 psi. Pumping was stopped for three minutes, which allowed the pressure to drop to 160 psi. One additional barrel of mud was squeezed, and the pressure built back to 284 psi. The pumps were stopped for three additional minutes, and the pressure dropped down to 165 psi. The pumps were started again at 0.5 bbl/min.

An additional 45 bbl of fluid was squeezed into the formation, and the pressure built up to 325 psi. The pumps were stopped for six minutes, and the pressure dropped to 197 psi. The team then squeezed 1.5 bbl of mud into the well, which caused the pressure to build up to 339 psi. At this point, the pumps were shut down for another six minutes, which allowed the pressure to drop to 192 psi.

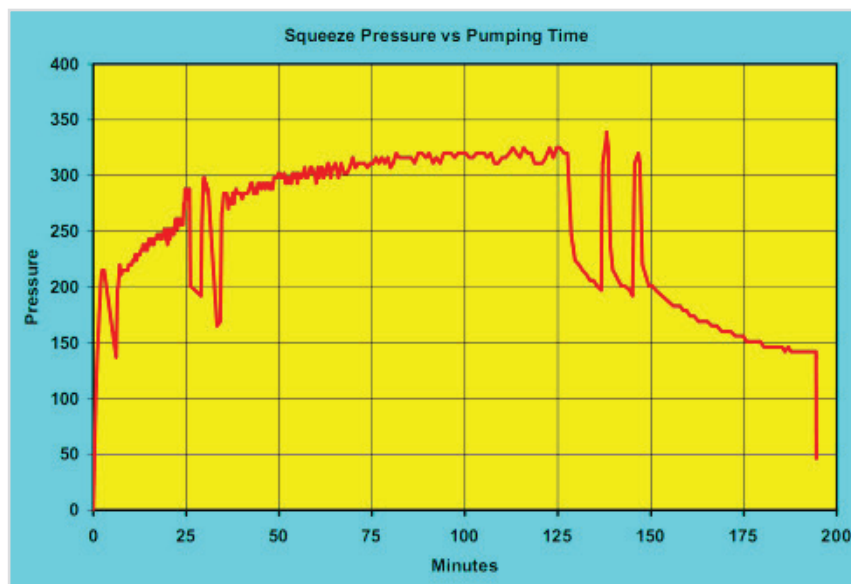
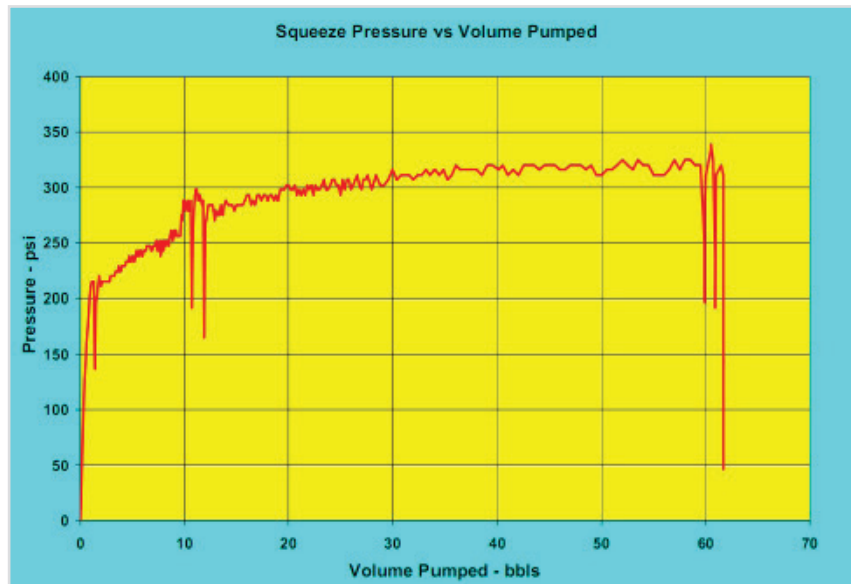
Another 0.5 bbl of mud was squeezed into the formation, which pushed the pressure back up to 330 psi. At this stage, the well was shut in for 30 minutes, which allowed the pressure to drop to 142 psi.

A total of 53.5 bbl of slurry was squeezed into the well in the course of this project. When the slurry was completely circulated, the pipe was washed and reamed to bottom. Using the FORM-A-SQUEEZE lost circulation plug reduced mud losses from total loss to a loss of 2-3 bbl/hour as drilling continued.

The Details

Hole Data	
Open-hole Volume, bbl	97
Length of Open Hole, ft	1776

Pill Formulation	
Volume of pill, bbl	110
Base synthetic, bbl	80
FORM-A-SQUEEZE, sacks	200
Pill Density, lb/gal	13.9
Volume Squeezed, bbl	53.5



Questions? We'll be glad to answer them.

If you'd like to know more about the FORM-A-SQUEEZE lost circulation plug and how it's performing for our other customers, please call the ALPINE or M-I SWACO office nearest you.



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