CASE STUDY

FORM-A-SQUEEZE LC Plug Minimizes Mud Losses

"Using the FORM-A-SQUEEZE* product now allows us to drill these formations without having to lose so much volume and calling in the cementers, saving time and money – Get a truckload of the stuff!"

Drilling Superintendent, Operator

Well Information

Location	Berland River 10-18-57-25 W5
Date	January 13-19, 2005
Total Well Depth	9,813 ft (2,993 m), 10,479 ft (3,196 m)
Zone to be Sealed	Spirit River Group
Casing Size	7-in. (178 mm)
Casing Shoe Depth	7,692 ft (2,346 m)
Open Hole Size	6-in. (156 mm)
Fluid in Hole	TRUDRIL* mineral oil base
Bottomhole Temperature	203°F (95°C)

The Situation

A drilling break was recorded at 9,666 ft (2,948 m) at the top of the Spirit River formation resulting in 50 bbl of mud losses. At 9,705 ft (2,960 m), flow-back rapidly increased, and a kick was recorded, requiring well shut-in. Density was raised to 10.9 lb/gal (1,305 kg/m^3) to handle the kick, which aggravated the losses. A conventional LCM pill was pumped unsuccessfully in an attempt to cure the mud losses.

The Solution

FORM-A-SQUEEZE product was available on location and had worked with encouraging results on the previous section, while conventional LCM had not provided a great reduction in losses. So the decision was made at 9,813 ft (2,993 m) to initially mix a 19 bbl pill (12.5 bbl pumpable) covering 328 ft (100 m) of hole at 9,666 ft (2,948 m). The slurry was weighted at 50:50 ratio by volume with barite and calcium carbonate to 10.8 lb/gal (1,300 kg/m^3) and spotted on bottom.

The annular preventer was closed after pulling up to 9,010 ft (2,748 m) and slowly breaking circulation. Then, the well was pressured to 217-290 psi (1,500-2,000 kPa). The annular pressure decreased to 0 after 30 seconds. The process was repeated over 1.25 hr, with the pressure eventually holding at 123 psi (850 kPa) each time. Approximately 6.3 bbl (1 m^3) was lost during this time, after which the pill was left static for 1.25 hr.

The drilling team tagged the plug at 9,554 ft (2,914 m) and pumped another FORM-A-SQUEEZE pill of 25 bbl. This pill was weighted to 11.1 lb/gal (1,330 kg/m^3) with barite and calcium carbonate. The drilling team tripped out of the hole to 9,656 ft (2,765 m) and performed a flow check, then closed the annular preventer and increased the pressure to 522 psi (3,600 kPa) over 30 seconds.

Pressure began to hold at 72.5 psi (500 kPa) by the time the process was repeated two or three times. Over 45 minutes, the maximum pressure reached 522 psi (3,600 kPa), with a mud loss of 11.5 bbl. This time tagged the plug at 9,348 ft (2,851 m), and it was necessary to ream through the plugs from 9,348-9,813 ft (2,851-2,993 m). Approximately 9.5 bbl of FORM-A-SQUEEZE slurry was maintained in reserve, in the event that an additional pill was required.

The Results

Mud losses were initially cured while drilling ahead to 9,280 ft (2,900 m). As the remainder of the section was drilled, levels of connection gas increased as did mud losses. Therefore, while tripping out for a new bit, the remaining 9.5 bbl (1.5 m^3) Form-A-Squeeze slurry was pumped at 9,459 ft (2,956 m) to cover from 9,443 to 9,672 ft (2,880 to 2,950 m). The density of the pill was 12.1 lb/gal (1,450 kg/m^3) compared to the active system density of 11.5 lb/gal (1,375 kg/m^3).

The drilling team pulled out of the hole three stands and squeezed the pill through the bit as in previous applications. Pressure was increased to 145 psi (1,000 kPa) for 30 seconds, then bled back to zero as on the first two trials. On the third trial, pressure held at 80 psi (550 kPa). The pressure bled back to this level on subsequent squeezes, allowing the operation to continue to trip for a bit change.

The bit was run back in slowly. Reaming started at 9,562 ft (2,918 m) and continued to wash to bottom. The well was drilled to TD with minor seepage losses.

Casing was then successfully run without losses despite intermittent stops to circulate fluid.

The Details

- Calculated volume of open hole with string in: 52 bbl (8.2 m^3)
- Calculated volume from 7-in. (178 mm) casing shoe to assumed LC zone: 48 bbl (7.6 m^3)
- Calculated volume of pill: +/- 56 bbl (9.0 m^3)
- Pill formulation: 50 bbl HT 40 base oil and 100 sacks Form-A-Squeeze product
- LC pill densities: 10.8/11.1/12.1 lb/gal (1,300/1,330/1,450 kg/m^3)

Questions? We'll be glad to answer them.

If you'd like to know more about the Form-A-Squeeze product and how it's performing for our other customers, please call the Alpine or M-I SWACO office nearest you.

Alpine, a business unit of M-I L.L.C.

P.O. Box 42842
Houston, Texas 77242-2842
Tel: 281·561·1544
Fax: 281·561·1548
www.alpinemud.com

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