

STRESS-SHIELD™ Engineering Method

Drilling a Depleted Formation

Customer Challenge

While drilling in the depleted Rival formation of approximately 500 ft in the Bakken field of North Dakota, a major operator encountered a severe lost circulation challenge. This challenge resulted in the abandonment of one well although many LCM pills were pumped in attempts to cure the losses. The same challenge also caused two other wells severe well control issues. The company drilling engineers were then forced to drill elsewhere, leaving the area untapped despite geological assessments that the area was expected to be much more lucrative.

STRESS-SHIELD Engineering Method and Solution

STRESS-SHIELD Engineering Method provides an engineering process for strengthening a wellbore by converting mud or cement slurry to a non-fracturing fluid. This technology promotes the timely formation of a tight particulate seal for an incipient fracture to prevent its further growth. The design is quantified by integrating rock hydraulic fracturing behavior and controlling mud spurt into the fracture. The needed robust control on spurt loss is implemented with our premium granular LCM products, BaraShield™-663 or BaraShield™-664. These products are designed and manufactured for a quantified low spurt loss at a certain concentration. With a rock mechanics analysis of a weak wellbore, a maximum allowed spurt loss and its corresponding minimum concentration of one of these products in the mud or cement slurry can then be predefined. After treatment with the products above this minimum concentration, the fluid can control the spurt well and form a tight seal before the fracture opens too wide and therefore become a non-fracturing fluid.

After communicating with the operator's drilling engineer, drilling superintendent, mud specialist, and geomechanics specialist, it was understood that the Rival formation is highly depleted. On the basis of this understanding, an application of STRESS-SHIELD Engineering Method was proposed as the preventive solution. BaraBlend™-665, a premium reticulated foam enhanced high fluid loss LCM, was also proposed to be at the rigsite as the remedial solution in the event of lost circulation. The rock mechanical properties were reviewed with the geomechanics specialist; a maximum allowed spurt loss and its corresponding minimum concentration of BaraShield-664 were defined on the basis of the rock properties. Because of the high Young's modulus values of the rock in the area, the defined BaraShield-664 concentration was low. Only 10 ppb BaraShield-664 was added to the oil-based mud before drilling into Rival; the shale shakers were by-passed to retain the particulates. The spurt loss was tested as quality control to ensure its timely seal formation capability. After drilling through the Rival, the shale shakers were reimplemented, the mud was cleaned, and drilling continued for the remainder of the hole section without the need for BaraShield-664.

Benefiting from the STRESS-SHIELD Engineering Method, the operator successfully drilled all four wells planned for this pad through Rival with no mud loss during drilling, running casing, and cementing. The BaraBlend-665 was not needed.

Contact

For additional information about STRESS-SHIELD Engineering Method or other products, contact Max Wang by phone at 281-450-4944 or by email at max.wang@sharp-rock.com or go to www.sharp-rock.us.

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