WelDril Holdings, LLC

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Cement Squeeze utilizing 1/8”cut WelDril WelFiber

On July 12, 2018, our customer was contracted to squeeze off 98' of perfs @ +/- 3,300' in a depleted Mississippi Lime well in south-eastern Payne county. The perfs were in 5½" casing with 2SPF over 6 intervals extending the 98' the well had been frac'ed, produced for 26 years and was no longer commercial. The operator wanted to shut off the Miss perfs, and after drilling out cement, go down hole to the Wilcox formation. 2⅞" tubing and packer were used to convey the cement. When we started the cement operation, as we loaded the casing annulus with fresh water to pressure test for possible leaks, the volume of water reflected static fluid level @ approximately 1,400' from surface suggesting a bottom hole pressure of roughly 900#. As we switched pumping lines over to the tubing to establish an injection rate and pressure test, the tubing volume also indicated a 1,400' fluid level somewhat confirming the 900# zone pressure. We established an injection rate @ 5.75 BPM @ 750#, ISIP vacuum, we calculated the pressure was more a result of friction of the fluid passing thru 24" valves and tubing.

Upon consultation with the well owner, he agreed we could add 1# per sack of cement of WelFiber fiber 1/8" cut to our regular cement which already contained 2% Calcium Chloride in an attempt to help plug/bridge Mississippi formation as most/many depleted Mississippi zones are "thief” zones that normally result in a dual squeeze. (first squeeze over-displaced by hydrostatic pressure overburden resulting in a need to follow with a re-squeeze).

We settled on a volume of 125 sx Regular cement, 2% CaCl and 1# fiber per sack. The cement was mixed @ 15.8ppg @ 3 — 3.5 BPM, the cement was displaced at pump rate of .75 BPM. 125 sx cement created 26.5 bbl slurry, displacement to top perf was approximately 22 bbls. At completion of mixing cement, we had roughly 4+ bbls slurry past top perf creating a hydrostatic pressure @ perfs of roughly 2,700#. With a slight pressure increase and a full column of cement, we determined to switch directly into displacement without shutting down to flush lines. Upon starting displacement, we displ first 3 bbls @ 2 BPM to ensure movement, then reduced rate to .75 BPM. As reflected in the enclosed data chart, the squeeze pressure continued to increase with numerous severe pressure breaks, indicating to us the fiber was diverting the cement, much like frac ball might during an acid job. We had hoped to initially achieve a 1,000# squeeze and were going to call top pressure, but as we displaced more and more cement with fiber into perfs and with increasing pressure, our goal shifted to "clearing” the packer. We were able to pump a total of 20.5 bbls disp water which cleared the packer and left sufficient cement over perfs. After staging for 10 minutes, we released the pressure, tubing was static, the packer was released and tubing tripped out of hole. We had achieved a 3,200# squeeze on a depleted Miss well.

We believe at this point that the fiber performed as we had hoped. The expense of the fiber was greatly offset by less rig time, less tank truck time, and no need for a second squeeze.

In addition to field testing WelDril’s fiber has been tested in an independent lab for compressive and tensile strength with the following results:

Compressive Strength Testing – 220 degrees – 1,000 psi –24 hrs

No fiber – 1,211 psi
Competition’s Fiber – 1,650 psi
WelDril’s 1/8” Fiber – 1,761 psi
WelDril’s 1/4” Fiber – 1,748 psi

Tensile Strength Testing – 220 Degrees – 1,000 psi – 24 hrs

No fiber – 399 psi
Competition’s Fiber – 448 psi
WelDril’s 1/8” Fiber – 423 psi
WelDril’s 1/4” Fiber – 454 psi