

# MACRO STRENGTH<sup>†</sup> Extends Fracture Gradient by 2.9 lb/gal, Saves \$150k in Delaware Basin



## CHALLENGES

Improve intermediate casing shoe integrity

Avoid costly NPT for cement remediation, sidetrack, or well abandonment scenarios



## SOLUTION

Perform hesitation squeeze using MACRO STRENGTH at 100 lb/bbl concentration in sodium chloride brine

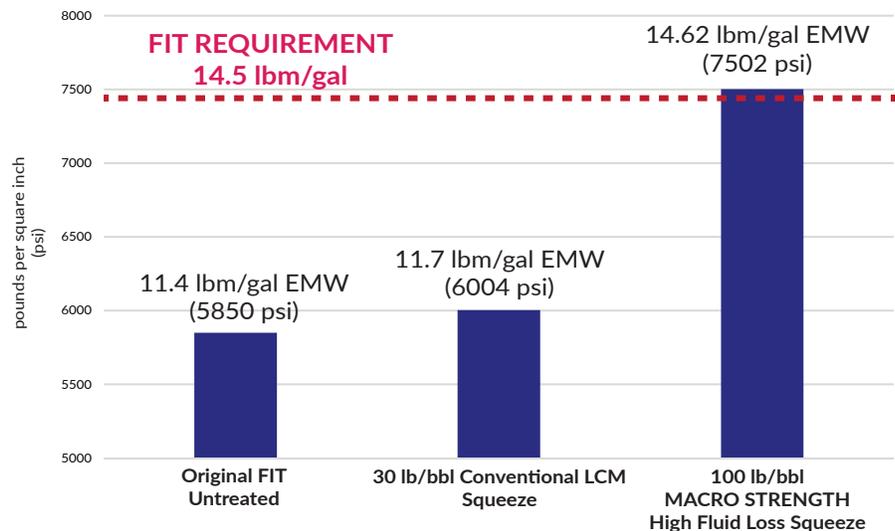


## RESULTS

Established casing shoe integrity in troublesome formation

Prevented excessive OBM losses

Prevented sidetrack/well abandonment scenarios



## OVERVIEW

While drilling out the 7-5/8" intermediate casing shoe track with NaCl brine, an operator in Culberson County, Texas observed green cement coming over the shakers - indicating a poor cement job.

A failed Formation Integrity Test (FIT) confirmed the weak casing shoe would require remediation before operations could resume on the Wolfcamp C producer well. An initial squeeze utilizing common lost circulation material (LCM) achieved an 11.7 lb/gal equivalent mud weight (EMW) - only a 0.3 lb/gal improvement over the initial FIT and well short of the 14.5 lb/bbl EMW required. A decision was made to pull the drilling BHA, trip back into the weak zone with open-ended drill pipe and apply a MACRO STRENGTH high-fluid loss squeeze remediation.

A 90-barrel pill containing 100 lb/bbl MACRO STRENGTH in NaCl brine was built at the direction of the fluid engineer on site. The pill was spotted across the weak zone and squeezed into the formation - resulting in a 14.62 lb/gal EMW. The successful application of MACRO STRENGTH improved the shoe integrity while avoiding costly contingencies such as a cement squeeze, sidetrack, or well abandonment - saving an estimated \$150,000 in further costs.

(CONTINUED)



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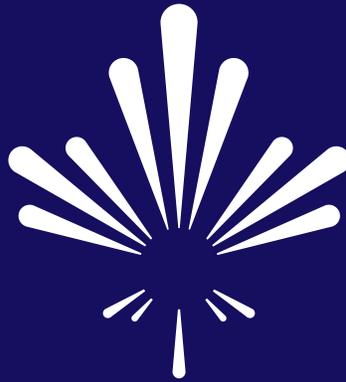
## DETAILS (Continued)

FIT testing required the weak shoe to hold 2,310 psi pressure with a 10.0 lb/gal brine fluid density (14.5 lb/gal EMW) to ensure casing integrity under expected drilling pressures for the 6-3/4" curve and production section. Due to directional BHA limitations, a max. concentration of 30 lbm/bbl 3rd party conventional LCM was pumped through directional tools and spotted across the shoe. An unsuccessful squeeze reached a maximum of only 922 psi (~11.7 lb/gal EMW). The planned 12.5 lb/gal fluid density would have induced significant losses at this point.

A 100 lb/bbl MACRO STRENGTH high fluid loss squeeze pill was built in lieu of long wait times for mobilization and remediation of a cement squeeze option. The 90 barrel pill was mixed in 10.0 lb/gal NaCl base brine while running to bottom with open-ended drill pipe. The pill was displaced out of the drill string with brine, leaving the entire pill across the shoe and inside the casing annulus. The annular preventer was shut and hesitation squeezes were performed with mud pumps lined up down the backside.

A total of 20 hesitation squeezes were performed with each stage pumped at approximately 10 strokes per minute and pressure held for approximately 15 minutes. At the final stage, a maximum of 2,370 psi (14.62 lb/gal EMW) was achieved after a total of 40 barrels of fluid was squeezed. The pressure was held for 4 hours on the final hesitation per the AES recommended procedure. After pressure was relieved, residual MACRO STRENGTH material was pumped out of hole. The well was displaced to a 12.5 lb/gal AES VERT oil-based mud before drilling the curve and lateral section to TD with no further losses.





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