

## Friction Reducer for Coiled Tubing Milling Operations

MC MX 927-5 lowers pressure needed to drive hydraulic motor

### BACKGROUND

“Friction Reducers” can be added to hydraulic fluids to improve performance. These are high molecular weight, water soluble polymers, suspended in a carrier oil, intended to do two things:

- 1.Reduce the resistance to high speed flow. This reduces the pressure requirement and increases the forward flow rate.
- 2.Increase the resistance to low speed flow. This allows it carry more solids to the top (they fall through it at a slower rate). It also reduces the metal-on-metal force caused by the slow movement of coil against the casing.

Additionally, the oil-dispersed friction reducer must dissolve in hydraulic workover fluid, which may contain weighting brines and clay stabilizer salts, and be easy to clean up afterward. Cationic calcium salts and clay stabilizers often precipitate anionic friction reducers.

### ISSUES

To workover wells, plugs need to be milled in well packers, done with a hydraulic motor on the end of a coiled tube. The high velocity hydraulic fluid runs through the tubing powering it, and then returning to the well head through the well tubing. Pressure losses due flow turbulence through coiled tubing reduce the driving force of the milling motor. This slows the milling and requires higher head pressure on the tubing, which weakens it. The CT company has rates which increase based on pressure placed on the coiled tubing work string.

The milling operation also produces cuttings and throws up sand from the top of the plugs, so hydraulic fluid must be viscous enough to carry the solids to the surface. Another problem is positioning coiled tubing down the tubing. Direct metal to metal contact creates resistance to movement requiring more energy to overcome.

### ANALYSIS

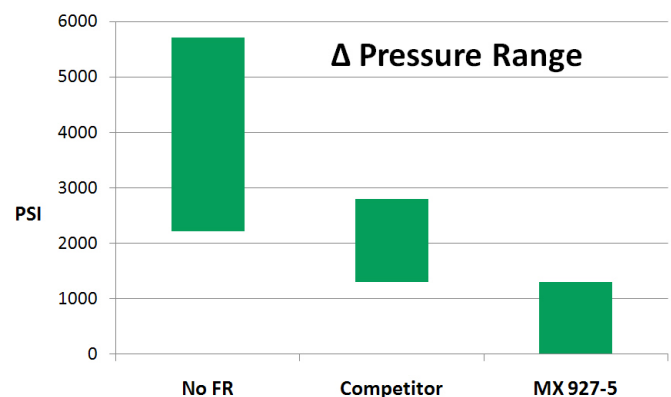
A CT company in East Texas ran 17,000 ft of 2 inch diameter coiled tubing to a 2.25 bbl/minute (bpm) milling motor. A competitor's friction reducer was maintaining a 1300 to 1500 psi differential between the coiled tubing inlet and the backpressure on the wellhead return. A better performing friction reducer was needed. The CT company was given the opportunity to test Multi-Chem's new MX 927-5 friction reducer. They tested our product against our competitors by alternating the use of the products on the same well under the same conditions, re-baselining by flushing the system between chemicals.

### RESOLUTION

Before MX 927-5 was added, the CT company was pumping the 2.25 bpm fluid at 7200 psi to hold 4500 psi back pressure at the wellhead, a 2700 psi differential. Adding 1.6 gallons per thousand gallons (gpt) of MX 927-5 to the fluid dropped the pressure requirement to 5700 psi. Adding another 1.6 gpt dropped it to 5000 psi, a 500 psi differential. Under the subsequent load of milling out plugs and lifting sand to the surface, the differential between wellhead and pumping pressure stayed between 12 and 1300 psi. The pressure on the returns varied with the fluid weight being lifted, but it was at all times less than what it had been with the competitor's friction reducer. Although this fluid contained an organic clay stabilizer equal to 2% KCl brine, MX 927-5 mixed into the hydraulic fluid quicker than the original friction reducer. This saved valuable preparation time. It also cleaned up easier, without becoming sticky. Later, a surfactant was added to the mix to reduce pipe on pipe friction. This also mixed well with MX 927-5.

### DELIVERED VALUE

- The reduced pressures MX 927-5 allowed are expected to extend the life of the tubing. This allowed the CT company to reduce the hourly coiled tubing pump rate charged to the well owner. Our customer and our customer's customer both saved money.
- The reduced hourly pump rate should allow the CT company to get more business, increasing volume, which will reduce unit overhead costs and increase profitability.



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#### Global Technology Center

World Houston International Business Center  
15865 International Plaza Drive, Suite 200  
Houston, Texas 77032 USA

(800) 805 9178  
(325) 223 6200  
(325) 942 7500 FAX

www.multichem.com