

POWERPRO CT

Coiled tubing debris-removal fluid



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Many of the economic and logistical benefits of using coiled tubing in the postfracturing cleanup of high-angle, multistage unconventional wells are offset by conventional fluids' inability to lift debris out of the wellbore.

For efficient cleanup, circulating fluids need to enhance hole cleaning as well as limit pump pressure—all while withstanding downhole temperature and contamination.

The solids-free POWERPRO CT[†] coiled tubing debris-removal fluid from M-I SWACO introduces an advanced circulating system formulated to meet the unique demands of coiled tubing operations in unconventional wellbore cleanups without compromising HSE or AFE.

Engineered with the POWERVIS[†] linear biopolymer viscosifier, POWERPRO CT fluid offers superb suspension characteristics with demonstrated carrying capacity to remove large volumes of debris from the wellbore at low flow rates.

Clear the way for maximum production at lower costs

Applications

- Coiled tubing cleanup operations
- Coiled tubing drilling operations

Benefits

- Withstands shear, contaminants, and high-temperature environments
- Delivers exceptional solids suspension and hole cleaning
- Reduces coiled tubing circulating pressures
- Decreases equivalent circulating density (ECD) and pressure losses
- Enhances cleanout at low flow rates
- Extends coil life
- Reduces cleanout times of high-angle horizontal sections
- Minimizes consumption of freshwater and other fluids
- Decreases cleanup costs
- Minimizes logistical requirements
- Promotes maximum production

Features

- Durable biopolymer
- Elevated low shear rate viscosity (LSRV)
- Low plastic-viscosity (PV) and yield-point (YP) values
- Lower effective product concentration compared with xanthan gum
- High thermal stability
- Solids-free fluid
- Biopolymer viscosifier available in dry or liquid form
- Simplified on-location mixing
- Excellent drag-reduction characteristics

Conventional coiled tubing circulating fluids have zero suspension or carrying properties, and viscous sweeps are often used in an attempt to improve hole cleaning. These characteristics, coupled with the lack of workstring rotation, allow only a small portion of the cumulative debris to be extracted from the wellbore. The debris that remains typically accumulates in low places, restricting production and leading to costly problems during reentry.

The POWERPRO CT fluid generates the rheological properties required to extract large volumes of debris in coiled tubing cleanout applications. Along with superb fluid and debris separation, the POWERPRO CT fluid also considerably reduces mechanical drag and pump pressure, thereby extending coil fatigue life and allowing the operation to progress for longer periods without interruptions. Especially effective when formulated in a low-salinity system, the POWERPRO CT fluid is also tolerant of cement and other contaminants encountered during coiled tubing operations.

Put wells online faster with efficient, thorough debris removal

Drilling with the POWERPRO CT fluid means operators can complete a coiled tubing wellbore cleanout without the downtime and costs associated with conventional operations. Engineered for optimal fluid functionality in poststimulation cleanouts of unconventional wells, the POWERPRO CT fluid provides

- reduced circulating pressure losses
- increased carrying capacity, even under low annular flow rates
- optimized available hydraulic horsepower
- contamination resistance
- stability at high temperatures.

Additionally, the POWERPRO CT fluid reduces the volumes of freshwater, potassium chloride, and other fluids consumed during conventional interventions, enabling lower costs with elevated HSE profiles.

Optimize rheology with POWERVIS viscifier

The foundation of POWERPRO CT fluid is the long-lasting POWERVIS viscifier that delivers the LSRV necessary to provide excellent hole cleaning and suspension characteristics. The durable POWERVIS viscifier maintains its rheological profile longer—and at a lower concentration—compared with conventional xanthan biopolymers. Consequently, it provides more effective debris removal and extends coil life so that operations can continue without having to stop for coil repairs or replacement.

The molecular structure of the POWERVIS viscifier allows maintaining rheological properties in downhole temperatures up to 325 degF [163 degC]—even in freshwater, where standard xanthan biopolymers fail at less than 300 degF [149 degC].

POWERPRO CT fluid requires POWERVIS viscifier concentrations of only 0.875–1.25 lbm/bbl [2.4–3.6 kg/m³]. Additionally, the viscifier is available in both dry and liquid forms, enabling more flexible mixing options.



The POWERVIS viscifier is available in dry or liquid form, enhancing operational flexibility.



Further streamline debris removal by integrating fluid, tools, and equipment

All-inclusive service for CT wellbore cleanups

The POWERPRO CT fluid is one component of the impaCT[†] integrated wellbore preparation service, the industry's only all-inclusive circulating system designed solely for coiled tubing wellbore cleanups. This high-performance system uses a fraction of the fluid required in a conventional coiled tubing cleanout operation.

The **POWERPRO CT fluid** eliminates the need for sweeps by effectively and quickly circulating debris out of the wellbore at the low flow rates typical of coiled tubing operations. The low circulating rates help extend the operational life of frequently used small-diameter coils, while the liquid polymer is easily mixed on location using a single tank.

One or more **CT MAGNOSTAR[†] coiled tubing magnets** can be attached to the workstring if smaller ferrous debris—such as teeth or the small blocks left behind after milling up the packer slips—is expected during cleanout.

Once debris is circulated to surface, the **PRESSURE & FLUID MANAGEMENT SYSTEM[†]** coiled tubing application technology takes over. Its gas separation and shale shaker components remove any entrained gas and solids, respectively, and its dual AUTOCHOKE[†] pressure-balanced drilling chokes hold backpressure.

Reduced water requirements

Unlike conventional systems that continually require significant volumes of newly sourced water, the capacity of impaCT service to remove solids and other contaminants allows for recycling of the circulating fluid. The service also eliminates the numerous frac tanks, where settlement requires continual cleaning, demanding even more water and increasing time and costs.

A conventional approach can require approximately 1,500 bbl of water whereas the impaCT service requires only a 200-bbl system and features full recycling and reuse capabilities.



POWERPRO CT fluid proves itself in the field

Proppant extraction clears the way for production of two wells, South Texas

Challenge

Proppant had to be removed from a pair of previously fractured horizontal wells before production could be initiated across the fractured intervals. The two wells were located on a single pad with wellheads only 20 ft [6 m] apart. During slickline operations, nonferrous debris was encountered in the production tubing above TD in both wells. The frac sand was collected with downhole bailers.

Solution

Coiled tubing with a 1¼-in OD was required to circulate the debris from the wells while washing through the 2¾-in tubing and into the low points of the 5½-in cased interval.

Potassium chloride–base POWERPRO CT fluid was formulated to provide the required carrying capacity and debris suspension, while the PRESSURE & FLUID MANAGEMENT SYSTEM technology was included to separate the solids at surface and hold backpressure during the cleanout.

Results

After the coiled tubing, surface-mixing, and solids-control equipment was rigged up, the POWERPRO CT fluid was mixed on location. The wells were displaced to POWERPRO CT fluid, and coiled tubing was washed down through the debris, circulating at rates less than 1.0 bbl/min.

Between 5 and 6 bbl of proppant was removed from each well and separated from the POWERPRO CT fluid with 170-mesh shaker screens. More than 5,000 ft [1,524 m] of hole was washed through on the two wells at angles from vertical to greater than 90°. Upon completion of the washing operation, the wells were displaced with the completion fluid prior to being jetted with nitrogen.

No problems with drag or debris settling during the washing or tripping operations were observed, even with a minimal to zero circulation rate.

Formation solids identified as production barrier, South Texas

Challenge

Debris of unknown origin was found to be blocking production of a previously fractured horizontal unconventional well. Coiled tubing was selected to remove what was suspected to be a significantly large amount of debris.

Solution

A POWERPRO CT fluid was formulated with potassium chloride–base brine. The fluid was designed to deliver superior hole cleaning, minimize circulating pressures, and withstand expected high downhole pressures. For this job, 1½-in coiled tubing would be used to circulate debris from approximately 11,000-ft [3,353-m] MD.

Results

Only 100 ft [30 m] of hole was washed before the returning cuttings load plugged surface circulating lines, demonstrating the tremendous hole-cleaning capabilities of the POWERPRO CT fluid. After more than 3 hours of attempting to unplug the lines while not circulating, it was decided to extract the coil and cease operations.

The coil was slowly extracted over 9 hours without circulation or any overpull from settling debris. The debris was later determined to be formation solids.



POWERPRO CT fluid serves as drill-in fluid, Alaska

Challenge

An operator was planning a high-angle extended-reach slimhole coiled tubing sidetrack drilling program that would pose more technical demands than any of the wells drilled in the semidepleted target zones. The program called for a mechanical whipstock to be set with a dual-exit window to be milled through the existing 3½-in and 7-in liners. Afterward, a 3-in openhole section would be drilled to TD, where the production liner would be run, cemented, and perforated. Previous long-reach wells in the area experienced high ECD and system pressure losses of up to 4,000 psi [27.6 MPa]. Consequently, owing to lower than sufficient rheology to both reduce and accommodate the coiled tubing system's pressure loss, hole cleaning would be compromised.

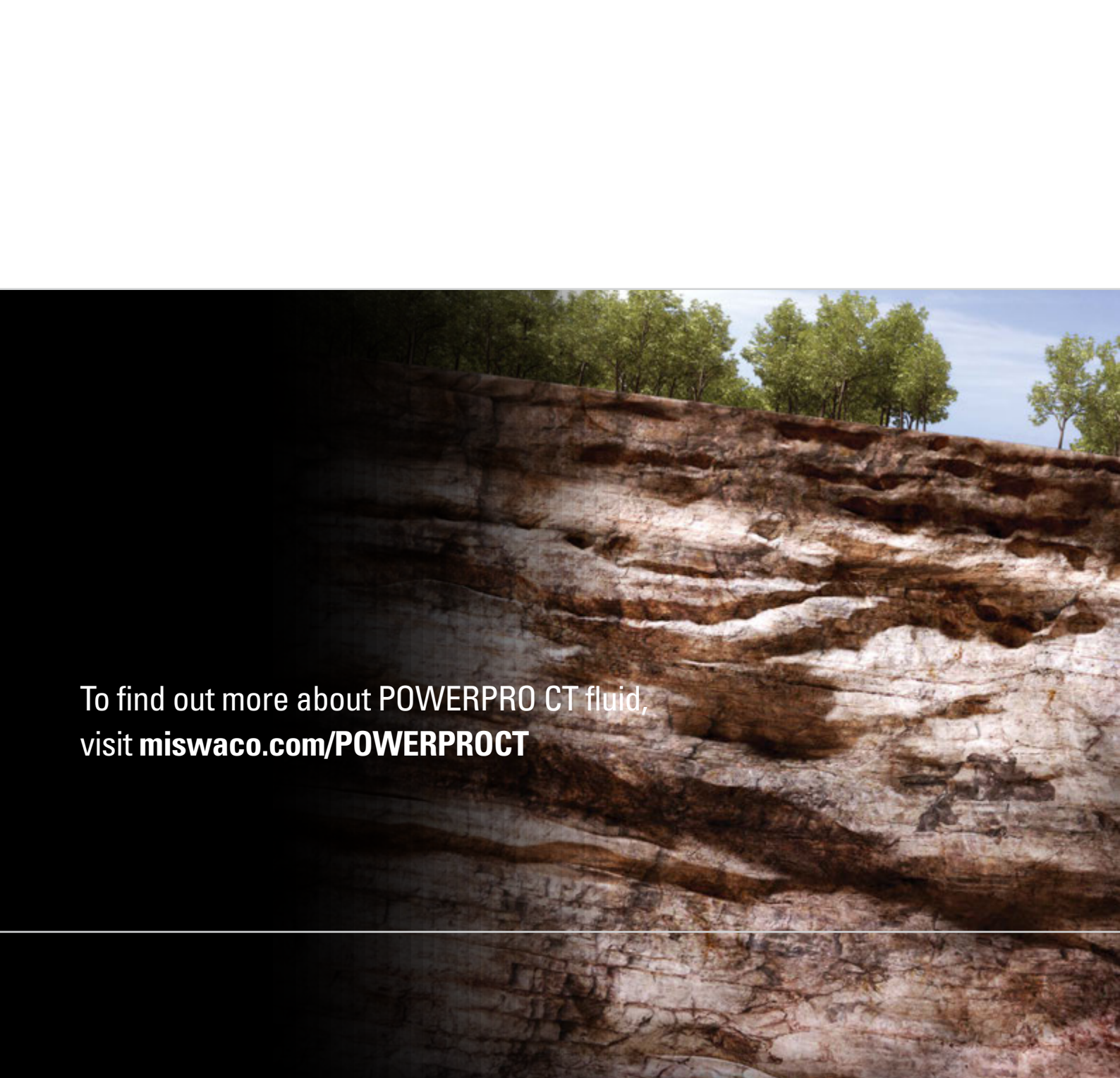
Solution

Previous coiled tubing drilling operations in this area used a reservoir drill-in fluid with a xanthan gum biopolymer as the primary system viscosifier. A standard reservoir drill-in fluid was recommended for the milling process, which would be followed with drilling of the build section and the first part of the lateral section. The novel POWERPRO CT fluid was selected as an alternative system for the remainder of the lateral reservoir section.

Results

The incorporation of POWERVIS viscosifier in the POWERPRO CT fluid generated nearly identical LSRV levels to those developed by xanthan gum biopolymer, but did so at 10%–22% lower operating pressures. The initial comparative free-spin pressure loss was 650 psi [4.5 MPa] lower compared with the system using xanthan gum as the viscosifier. When the agitator tool was added to drill the remaining 500 ft [152 m] of the lateral section, the initial free-spin pump pressure with POWERPRO CT fluid was 2,800 psi [19.3 MPa], approximately 700 psi [4.8 MPa] lower than that of the standard solids-free reservoir drill-in fluid. When it is employed, the agitator tool alone adds approximately 500 psi [3.4 MPa] to the overall system pressure loss. POWERPRO CT fluid has since become the operator's standard fluid for drilling horizontal wells with coiled tubing in Alaska.





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