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PROPdrift

PROVEN PROPPANT TRANSPORT AND PRODUCTION ENHANCEMENT TECHNOLOGY

- ◆ Improved proppant transportation and more uniform proppant distribution means increased propped frac geometry and better conductivity
- ◆ Ability to increase proppant concentrations which leads to reduced water usage
- ◆ Improved screenout recovery means fewer coiled tubing interventions
- ◆ Modified sand surface improves load fluid recovery proppants
- ◆ Simple, on-the-fly, on-site application

PROPDRIFT - IMPROVED PROPPANT TRANSPORTATION FOR A MORE PRODUCTIVE WELL

This article contains highlights from papers IPTC-17806-MS, CSUG/SPE 137818, and SPE 170640-MS.

SUMMARY

Slick water hydraulic fracturing treatments are the preferred method of enhancing the complexity of fracture networks in tight shale plays, making these wells more productive and economic. Although traditional slick water treatments are effective in unconventional formations, they are limited by several factors such as poor proppant carrying capacity, inconsistent proppant pack distribution, and the need for very large volumes of water. PROPdrift is an effective proppant transport modifier (PTM) that is used to improve the proppant placement in slick water hydraulic fracturing, and also provides other economic benefits to the overall stimulation process.

HOW IT WORKS

The PROPdrift product adsorbs onto the surface of the proppant, resulting in an airphilic coating that attracts gas bubbles (air, N₂, CO₂) onto its surface to help fluidize the proppant. These gas bubbles lower the relative density of the proppant which, in turn, increases the proppants buoyancy, creating a fluid system that can transport high concentrations of proppant without depending on viscosity or turbulent flow. In energized slick water treatments, gas (typically Nitrogen at 5% - 20%) is injected to help mobilize and enhance proppant distribution into the induced fractures. This enhanced proppant flow results in better proppant distribution and placement and higher overall fracture conductivity.

FIELD RESULTS

Oil/Gas Production:

Field Studies have shown that Initial Production (IP) is significantly higher in wells treated with PROPdrift versus

wells treated with only slick water. In one 24-well study (14 wells treated with PROPdrift, 10 wells without PROPdrift), the PROPdrift-treated wells had more than 35% incremental IP than the non-PROPdrift wells. The cumulative production (BOE) over 10 months was also 35% higher in the PROPdrift wells than in the slick water only-treated wells.

Cost Reduction:

Average completion costs are significantly reduced by using PROPdrift versus slick water only treatments. Primary cost-reduction benefits include:

- Lower frac screen-out frequencies
- Reduced requirements for coiled tubing intervention
- Increased well flowback
- Improved well cleanup

In one case study, average completion costs were reduced by 23% with the PROPdrift design.

PROPDRIFT PROPERTIES

Regain Permeability:

PROPdrift was shown to significantly increase the Regain Permeability of a core sample over the baseline values of slick water only (see Figure 1). This shows that the PROPdrift product is not damaging to the formation, and actually improves the flow of fluids through the matrix.

Crush Resistance:

Treating proppant with PROPdrift reduces the amount of fines generated when hydraulic pressure is applied, effectively increasing the compressive strength of the proppant. This crush resistance was seen in both 20/40 mesh sand as well as in 40/70 mesh sand (see Figure 2).

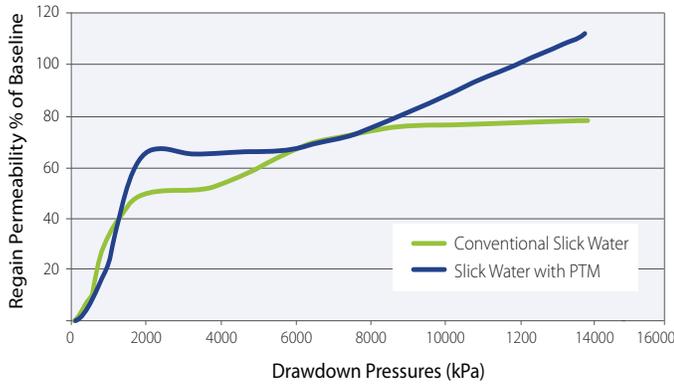


Figure 1: Comparison of Regain Permeability

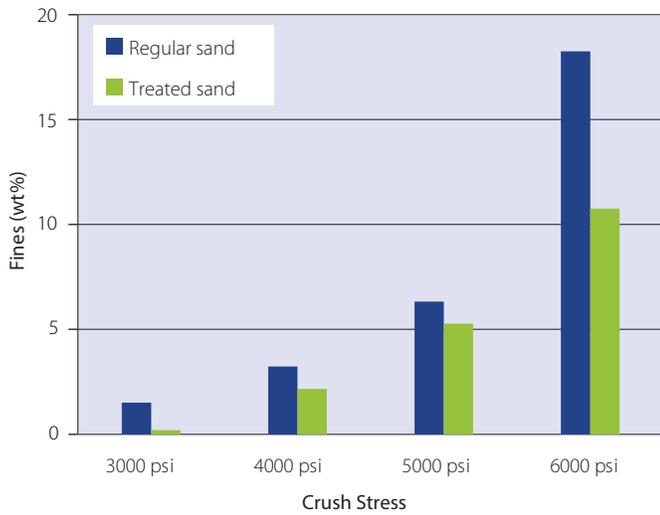


Figure 2: Percentage Fines vs. Pressure (20/40 mesh)

Polymer Adsorption:

In a lab study, proppant packs that were treated with PROPdrift showed a reduced polymer adsorption both with guar polymer and with anionic polyacrylamide (typical product used in conventional slick water applications). The average reduction in adsorption for guar and polyacrylamide was 5% and 3% respectively. This reduction in polymer adsorption may lead to increased proppant pack conductivity because of reduced proppant pack damage.

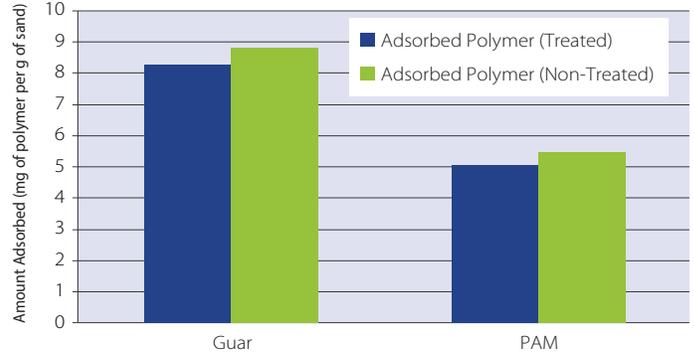


Figure 3: Polymer Adsorption (average of 5 test runs)

CONCLUSIONS

Lab results, field tests and hundreds of customer applications have proven the benefits of using PROPdrift, including:

- Demonstrated operational efficiencies using a PROPdrift pumping schedule. Average stimulation time is reduced dramatically as a result of improved fracture placement.
- Frequency of screen-outs is reduced with PROPdrift, resulting in improved cost efficiencies.
- Lab testing has shown that proppant treated with the PROPdrift additive had several additional advantages: less polymer adsorption, increased fluid recovery (improved conductivity and permeability of proppant pack) and decreased proppant crushing.
- The PROPdrift additive in slick water fracturing treatments results in better proppant distribution with higher fracture complexity, which in turn gives higher SRV (Stimulated Reservoir Volume) compared with slick water only treatments.

