Stimulation

pHaserFrac℠ Service

Salt Tolerant, CO₂ Compatible and Cold Temperature Capable Fluid System Helps Prevent Clay Swelling and Fines Migration

New pHaserFrac℠ service provides important benefits to help make fracturing treatments more effective:

• Good viscosity development
• Low residue CMHPG gel
• Easy to run and QC
• Crosslinked gel properties same with CO₂
• Excellent proppant transport properties
• New low temperature crosslinker for cold waters
• Industry’s best breaker system
• Salt tolerant for formation compatibility

pHaserFrac℠ fracturing service features a derivatized guar polymer that is compatible with carbon dioxide and can be used with up to 7% potassium chloride (KCl) for maximum clay protection.

The CMHPG gel in pHaserFrac fluid is crosslinked within the acidic pH range of CO₂, so there is no substantial change in gel characteristics when CO₂ is added. The addition of CO₂ to the frac fluid gives the fluid more energy (due to CO₂ expansion) to aid in flowback and formation cleanup after the fracture treatment. In addition, adding CO₂ to frac fluid provides other benefits:

• Less water is introduced into the formation matrix.
• CO₂ adds viscosity to the frac fluid.
• CO₂ is miscible with oil, leading to earlier oil production.
• CO₂ has higher density than nitrogen.

To help prevent clay swelling and fines migration, operators include KCl in fracture fluids. pHaserFrac fluid can tolerate concentrations of KCl salt up to 7% without degradation of fluid performance.

pHaserFrac service can be applied over a broad temperature range for wells with static temperatures from 75°F to 275°F. If mix-water temperature is as low as 40°F or the pipe-time of the fluid will be very brief, Halliburton crosslinker, CL-40℠, can be added to the fluid.

Figure 1 – Clay swelling can have profound effects on permeability. Note from laboratory core testing that with 2% KCl, permeability is drastically reduced and then is improved with increasing percentages of KCl. Finally, at 7% KCl, permeability actually improves. pHaserFrac fluid enables the use of 7% KCl to help control clay damage.
Breaker Systems

High-temperature breaker systems compatible with pHaserFrac service include ViCon NF and FB breakers and Optiflo III breaker.

Vicon NF has been rated the best oxidizing breaker available by Stim-Lab, a third-party laboratory engaged in impartial testing and rating of various oil- and gaswell stimulation systems.

At well temperatures above 200°F, acid hydrolysis will degrade the polymer over time, even after the breaker is spent. Consequently, hydrolysis continues to clean the proppant pack even after production has begun.

Low-temperature breaker systems applicable to pHaserFrac service are catalyzed ViCon™ NF and SP breakers, Optiflo II™ and Optiflo III™ encapsulated breakers, and OptiFlo HTE™ encapsulated, delayed enzyme breaker. Acid hydrolysis will also degrade the frac fluid over time.

For more information on pHaserFrac™ service, contact your Halliburton representative, or e-mail stimulation@halliburton.com.