

RockPerm® Fracturing Service

ADVANCED CHEMICAL TESTING FOR OPTIMAL ADDITIVE DESIGN

OVERVIEW

Hydraulic fracturing is complex. It requires a multistage process that involves numerous stimulation chemicals designed to enhance hydrocarbon production. However, there are many factors that can impact the success or failure of these fluid additives. The optimal choice for an additive depends on its interaction with frac fluids, formation water, mineralogy, oil, and the proppant being used.

The RockPerm® service is an advanced chemical testing process that improves stimulation performance by optimizing additive selection and concentrations based on reservoir characteristics and treatment fluids.



FEATURES & BENEFITS

- » Optimize fluid additive selection through extensive laboratory testing.
- » Identify optimal additives to maximize water recovery and hydrocarbon production.
- » Detect the best additives to prevent clay-based formation damage.
- » Test for compatibility with the reservoir, recommending the right treatment that will allow for better wettability and mobility.
- » Customize a package to help reduce formation damage due to clay related issues.

With the RockPerm service you can properly select fluid additives that:

- » Optimize formation wetting properties for improved fluid flow.
- » Prevent oil/water emulsions to ensure fluid mobility.
- » Decrease capillary pressure via surface-tension reduction that allows fluid to flow deeper into the reservoir and prevent water blocking.
- » Decrease capillary pressure to allow fluid to flow deeper into the reservoir.
- » Minimize clay-associated production damage that can impact production.
- » Advanced chemical testing and evaluation.

The RockPerm suite integrates specialized laboratory testing with chemical evaluation to help improve well performance. Currently there are three services in the RockPerm portfolio: RockPerm® Oil, RockPerm® Gas, and RockPerm® Clay Control.

For each service, our specialized technicians perform extensive local laboratory testing of formation fluids, cuttings and fracturing fluids. The results of these tests allow our experts to recommend the optimal fluid additive and concentration specific to your reservoir.

After extensive laboratory testing, our experts utilize well-specific reservoir information to customize recommendations for you. The results of the evaluation allow Halliburton stimulation experts to tailor the frac fluid for optimal returns.

ROCKPERM OIL SERVICE: EMULSION BREAK AND COLUMN FLOW TESTING

Halliburton's RockPerm oil service consists of multiple screening methods including emulsion break and column flow testing. Because frac water can be inconsistent, Halliburton's engineered chemistries aid in preventing problematic emulsions that negatively impact fracture performance and production. This test is designed to evaluate the mixing of a customer's oil with frac water, for compatibility.

Halliburton's proprietary column flow test is performed to identify flow-enhancing aids to improve production. To obtain the optimum permeability enhancer for the reservoir properties, the Transcend™ permeability enhancer portfolio is our premier product designed for improved permeability of fractures to transmit fluids.

With this service, Halliburton can determine optimal chemistries and concentrations based on specific well parameters. Designed to identify the best additives to improve well performance.

ROCKPERM GAS SERVICE: FLUID COMPATIBILITY & COLUMN FLOW TESTING

To avoid incompatible gas-fluid interactions, our compatibility testing assesses the safe connectivity between gases and other fluids, such as liquids or solids. This helps ensure the efficiency of the operation. Samples are selected and analyzed using various techniques and visual inspection. We look for adverse effects caused by gas-fluid interactions that include degradation, swelling, and embrittlement.

We perform a column flow test to identify a surfactant that will improve fluid flow through a customer's reservoir. We also test the proppant pack to prevent any impact on production.

This test provides valuable information about fluid behavior and displacement efficiency within a porous medium. Without this comprehensive visual test, there is no other way of measuring improvement from a lab perspective.

ROCKPERM CLAY CONTROL SERVICE: IDENTIFY ADDITIVES TO INCREASE FLOW

Clay swelling and damage can occur in the reservoir due to interactions between clay minerals and the fluids present. Using a dual protocol testing approach, we evaluate the potential for clay swelling and conductivity damage caused by clay destabilization. Our swelling and mechanical stability tests determine which additives best prevent clay-associated formation damage caused by clay fracture face destabilization.

The results of the tests are used to determine the top-performing products from Halliburton's suite of clay control technologies. The best-performing products are tested to optimize treatment dosage recommendations for maximum protection during and after the fracture treatment minimizing fracture and reservoir flow-capacity damage.

ROCKPERM CLAY CONTROL SERVICE: INCREASES PRODUCTION AT A LOWER COST PER BOE

A major operator in the Permian Basin used Halliburton's RockPerm clay control service on a multi-well field trial to decrease decline rates and improve overall well production. Through the RockPerm clay control service, chemicals for fracture face stabilization were identified and fluid design recommendations were generated to minimize fracture face failure. Wells treated with these recommendations outperformed offset wells by improving initial production rates up to 118 percent and reducing cost per BOE by 36 percent.

In a multi-well field trial, wells treated with RockPerm® Clay Control Service outperformed offset wells

↑ IMPROVED
production rates
118%

↓ REDUCED
cost per BOE
36%

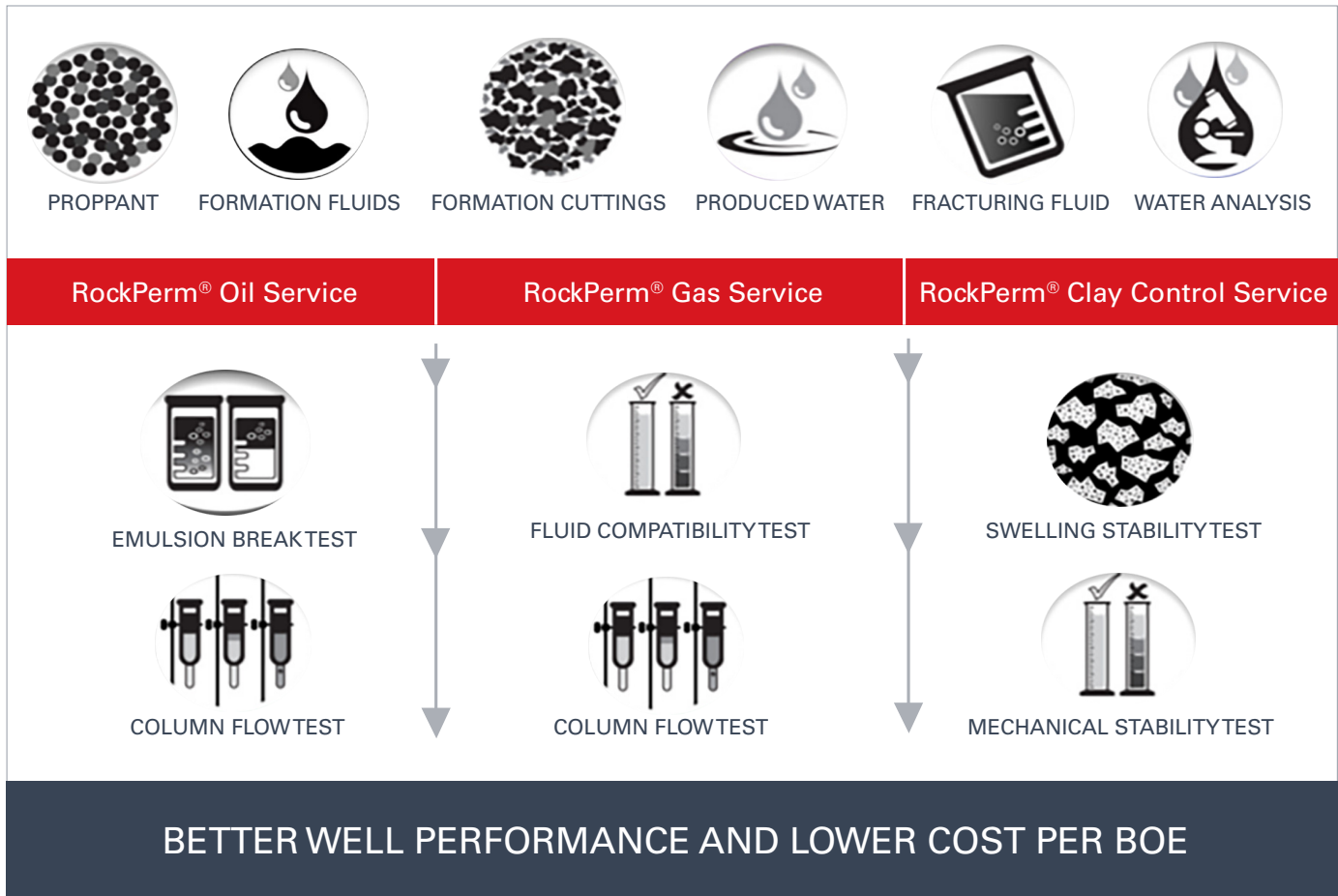


Figure 1 >> RockPerm Services Suite.

By leveraging Halliburton's RockPerm services, our in-house experts will provide you with recommendations for the best products for your specific well by leveraging Halliburton's portfolio of proprietary permeability enhancing technologies designed to improve well performance at the lowest cost per BOE.

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

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