RockPerm℠ Service

RockPerm℠ service is a laboratory testing process performed by specially trained technicians in local area labs. This process selects optimized OilPerm℠ Formation Fluid Mobility Modifiers (FMMs) which maximize water recovery and hydrocarbon production from fracture stimulated shale reservoirs using Halliburton's suite of unconventional-focused technologies.

**RockPerm℠ Service Input Parameters**
- Formation cuttings from the reservoir
- Formation water from the reservoir
- Oil from the reservoir
- Water to be used in the frac treatment
- Proppant to be used in the frac treatment
- Fracturing fluid formulations
- Interfacial properties (IFT, contact angle, adsorption, and physical properties) for each of Halliburton's OilPerm FMM modifiers

**RockPerm℠ Service Output Parameters**
- Emulsion tendency
- Fluid compatibility
- Water recovery efficiency
- Water recovery rate
- Hydrocarbon productivity
- Relative OilPerm FMM modifier performance
- Optimized fracturing fluid

**Well specific solutions to optimize results**
Standard fracturing operations demand the performance of many computer simulations to achieve optimum fracture design to maximize reservoir drainage and productivity. In a similar fashion, fracturing fluid selection is carefully done and tailored through the use of laboratory testing to ensure its ability to achieve the optimized fracture design. Yet, little to no effort is directed to the selection and optimization of fracturing fluid recovery additives which play a major role in the outcome of fracture stimulation treatments.

Every vendor has one or two products to enhance fluid recovery, usually supported by sophisticated surface chemistry information determined in a technology laboratory. While this data can be useful as a guide, it has been found often not to be a good predictor of performance. It is well-known that even minor changes in oil, water or rock composition can have a major impact on the performance of surface active materials.

RockPerm service provides optimization of additive formulations tailored to the needs of individual reservoirs. This unique service takes advantage of Halliburton's suite (OilPerm FMM modifiers) of unconventional-focused technologies including wetting agents, solvents and demulsifiers integrated into the reservoir-tailored treatment fluid formulation. RockPerm service can provide a large benefit in terms of improved fracturing fluid recovery and hydrocarbon fluids production from your reservoirs.

*Figure 1 - Part of the RockPerm℠ service is column flow testing. Each column contains actual formation material, proppant, broken fracturing fluid and reservoir oil. The column on the left demonstrates the effectiveness of an OilPerm℠ FMM. The OilPerm FMM treated column recovered more total water and oil breakthrough occurs earlier.*
Case Study: RockPermSM service selects optimized OilPerm™ FMM modifier based on reservoir and fluid properties

RockPerm service was used on two wells in the same basin to determine the optimal OilPerm FMM. Individual reservoir characteristics (formation oil and formation cuttings) coupled with the scheduled stimulation treatment (broken frac fluid, proppant, and frac water) were incorporated into the testing process to select the optimal OilPerm FMM modifier. Scenario A is an optimization for a well in the Atoka formation which planned to use a borate crosslinked guar gel as the frac fluid. From the column flow tests, a specific OilPerm FMM X modifier was recommended due to the highest percentage of fluid recovered and quickest oil breakthrough (Figure 2). Scenario B is a fluid evaluation for a well in the Wolfcamp formation where a slickwater fracturing treatment was planned. Clearly, OilPerm FMM Y modifier is the preferred formation fluid mobility modifier for this set of well and fluid characteristics (Figure 3). Even though the two reservoirs are located in the same basin, different OilPerm FMM modifiers were recommended. These tests demonstrate the value of the RockPerm service through its ability to select an optimized OilPerm FMM modifier based on reservoir and fluid characteristics, while under the ‘one-solution-fits-all’ approach the optimal OilPerm FMM modifier would not have been recommended.

The OilPerm FMM suite of modifiers combined with the ability of the RockPerm service to identify the optimal product for each reservoir and stimulation fluid provides the completion design engineer with a new tool to enhance fluid recovery and ultimately oil production.

For more information about how RockPermSM service process can help reduce your cost per BOE, please call your local Halliburton representative or email us at stimulation@halliburton.com.