

## CleanStim™ Hydraulic Fracturing Fluid System

Provides Breakthrough Environmental Benefits and Excellent Retained Conductivity

CleanStim<sup>SM</sup> fracturing service uses a new fracturing fluid formulation made with ingredients sourced from the food industry.\*

The CleanStim fluid system components include a gelling agent, crosslinker/buffer, breakers and a surfactant. Before use, the CleanStim formulation is mixed on-the-fly at the job site with the water provided by the operator.

### Excellent Fracturing Performance and Reduced Environmental Risk

CleanStim service is a major advance in fracturing fluid technology. In addition to environmental benefits, the CleanStim fluid system provides excellent performance in terms of pumpability, proppant transport and retained conductivity. Laboratory tests showed over 90% retained conductivity after 24 hr of flow. The system is applicable over a broad temperature range providing up to 30 minutes pumping time at 225°F (107°C).

### Applicable to Gelled Fracs and Water Fracs

The CleanStim fluid system can be crosslinked and used for conventional gelled fracturing treatments that require a significant amount of proppant.

In addition, the components can be used to create a linear fluid system to provide friction reduction for water frac treatments commonly used in shale reservoirs.

### Field Results

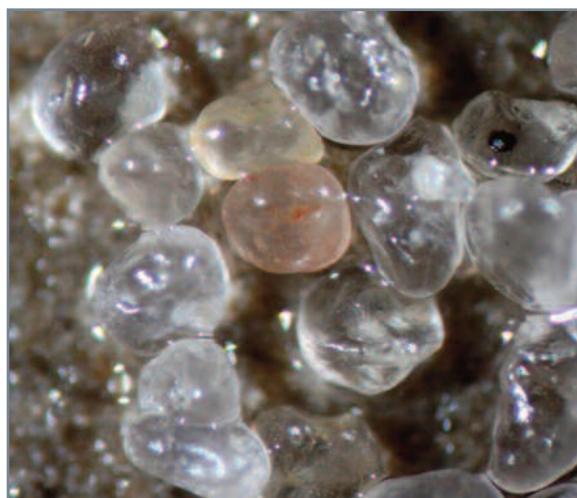
The CleanStim formulation is currently undergoing field trials. The system has been used successfully in a Midcontinent well, a Permian Basin well, and a Southeast Texas well over a temperature range of 120 to 225°F. In all three cases, it provided excellent proppant transport, a clean break and better-than-expected fluid recovery. Initial production from all three wells was equivalent to (one well) or better than (two wells) expected.

\*Intended Use - The CleanStim formulation is designed for use in hydraulic fracturing. Even though all the ingredients are acquired from food suppliers, the CleanStim fluid system should not be considered edible.



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*Figure 1 - The CleanStim fracturing fluid components are sourced from the food industry and can provide an extremely clean fracturing fluid with excellent proppant transport and cleanup.*



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*Figure 2 - Photomicrograph taken by a third party lab following testing shows virtually total cleanup of fluid composed of clean water and the CleanStim fluid system components. The small spot in the upper right is the only evidence of any polymer residue remaining in the proppant pack.*

### Other Significant Environmental Advancements

#### The Halliburton ADP™ Blender

The Halliburton advanced dry polymer blender mixes the powdered gelling agent directly with water eliminating the need for carrier fluids. In addition, this means no more fluid is mixed than required for the treatment.

#### Microseismic Fracture Monitoring

Halliburton microseismic specialists can monitor exactly where and how far created fractures are extending. This capability enables operators to validate that the fracturing operation achieves the desired results and that the created fracture has stayed within the formation, eliminating the possibility of connecting to aquifers.

Microseismic monitoring not only helps optimize fracturing treatment results but also helps identify the best ways to increase reservoir productivity and optimize asset development.

#### CleanStream® Service

If any bacteria are present in the water provided to us at the well site, Halliburton can treat it with ultraviolet light instead of biocides commonly used. The UV light reacts on the DNA of the bacteria rendering the bacteria unable to reproduce. In many cases, the CleanStream process can be 99.9% effective, eliminating the need for chemical biocides.

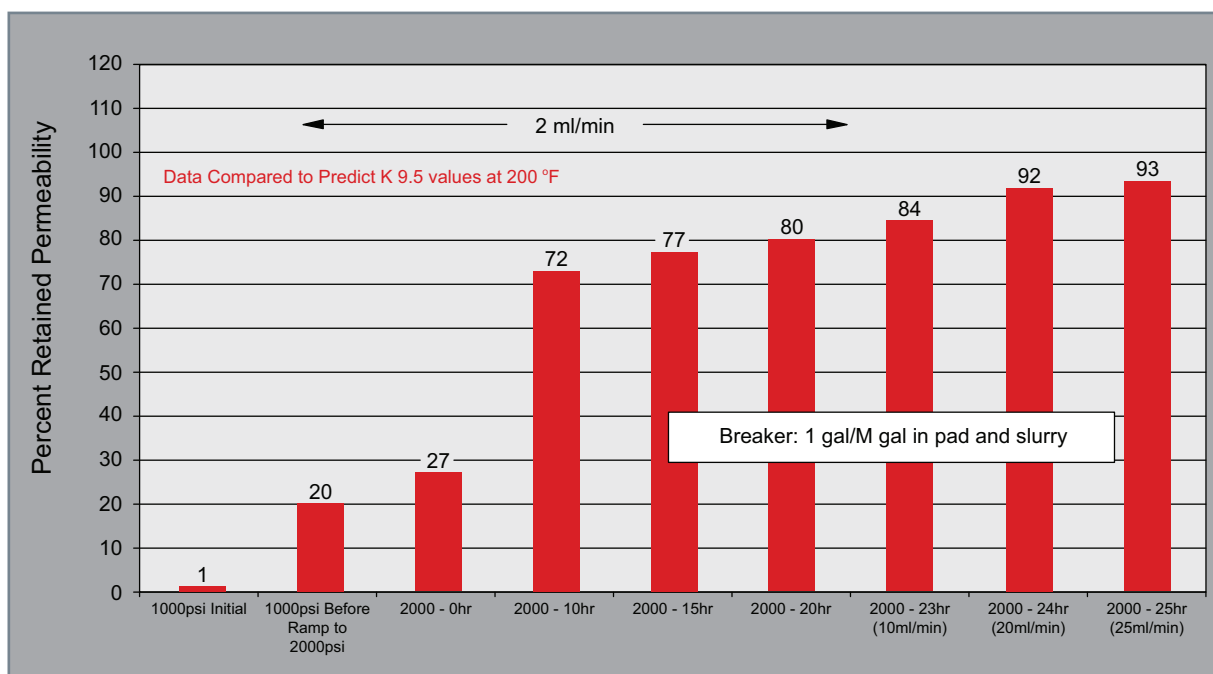


Figure 3 - Retained conductivity data from the 2 lb/ft<sup>2</sup> Badger (Ottawa) sand proppant pack between Ohio sandstone cores using the CleanStim fluid system at 60 lb/M gal in fresh water at 2,000 psi and 200 °F. Note that after flowing for 24 hr with KCl water, retained conductivity was over 90%. Results are from third-party testing.

**For more information about how CleanStim<sup>SM</sup> fracturing service can help improve your fracturing results and reduce your environmental footprint, contact your local Halliburton representative or email [stimulation@halliburton.com](mailto:stimulation@halliburton.com).**