

The Mimic™ Device Indicates Fluid Performance Based on Proppant Transport at Formation Conditions

Historically, the ability of a fracturing fluid to transport proppant has been implied based on fluid viscosity. That method does not completely represent a fluid's ability to place proppant since the elasticity of the fluid is not considered. For example, OmegaFrac fluid provides excellent proppant transport at relatively low viscosities.

The recently developed Mimic proppant transport measurement device directly measures the ability of a fluid to transport proppant (Figures 6 and 7). Measurements across a wide range of proppant concentrations and fluid systems are possible. Figures 3 and 4 are examples of Mimic device measurements.

The Mimic device provides significant advantages over the industry-standard viscosity measuring process:

- Proppant is present in the fluid being tested. The proppant may have both physical and chemical influences on fluid properties that are not observed in conventional tests performed only on the fracturing gel.
- Conventional viscometers measure only viscous properties; the Mimic device measures both viscous and elastic properties. Elastic transport cannot be accurately predicted by measuring only the viscous component of a viscoelastic fluid.

The Mimic device is capable of measuring the transport capabilities of virtually any gelled fracturing fluid containing a wide range of proppant particles. By measuring various types of fracturing fluids, it is possible to classify the transport properties of each fluid type. By adding breaker chemicals to fluids it is possible to determine the length of time a fluid maintains its transport capability.

Case History

In a recent fracturing treatment, operations were interrupted by an early screenout. Proppant-transport testing had been conducted by conventional means, using concentric-cylinder viscometers to evaluate frac fluids. The frac fluid was a borate-crosslinked guar transporting ceramic proppant into a 200°F formation.

The operator elected to use the Mimic proppant transport measuring device to test proppant-laden frac fluid. Test results led frac designers to alter the fluid pH and crosslinker concentration. Fracture operations proceeded without further incident.

The successful frac fluid would not have been considered appropriate using previous parameters but the Mimic device proved its capabilities.

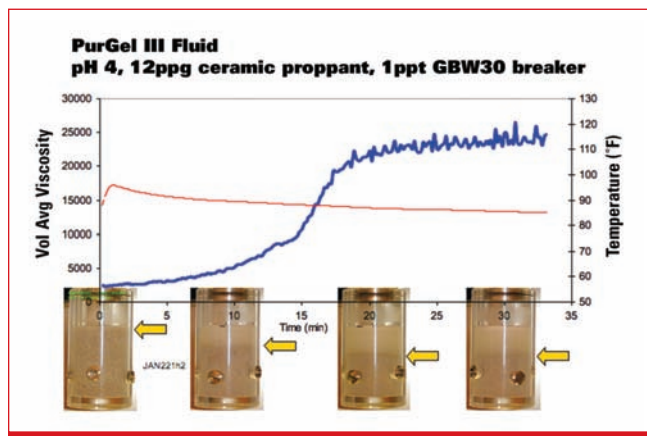


Figure 6 — Settling stages witnessed in laboratory experiments. Illustrations of four stages of settling are correlated to the graph showing proppant settling vs. time. The Mimic device uses specially engineered components to accurately measure increasing torque as an indicator of proppant settling.



Figure 7 – The patented Mimic device components are designed to work with a conventional viscometer. The Mimic device enables measurement of the elastic transport properties of a viscoelastic fluid.