

FR-4

Multi-Purpose Friction Reducer



LIBERTY



Applications:

FR-4 is an anionic friction reducer created for use with water based fracturing fluids. It is a high molecular weight polyacrylamide, which has been partially hydrated and emulsified in mineral oil to ensure rapid hydration and viscosification upon addition to water. FR-4 is used in order to reduce the friction pressures experienced when pumping low viscosity fluids at high rates by altering the fluid flow regime from turbulent to laminar flow. These friction pressures can increase the amount of energy required to successfully pump the fluid, thereby increasing job costs. Through the addition of friction reducing chemicals, this friction pressure is reduced, thereby lowering the horsepower required.

FR-4 has been specially designed to be used in conjunction with waters containing high amounts of total dissolved solids, which can include the use of KCl water, as well as re-used frac water and formation brines. FR-4 demonstrates good relative friction reduction values in fresh water, and exceptionally rapid hydration and effective friction reduction in brine solutions.

Properties:

Appearance White Viscous Liquid
Dispersible.....in aqueous solutions
Specific Gravity 1.04
Pour Point..... -26°F
Ionic Charge Anionic



This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty or guarantee is made as to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use. We do not accept liability for any loss or damage that may occur from the use of this information.

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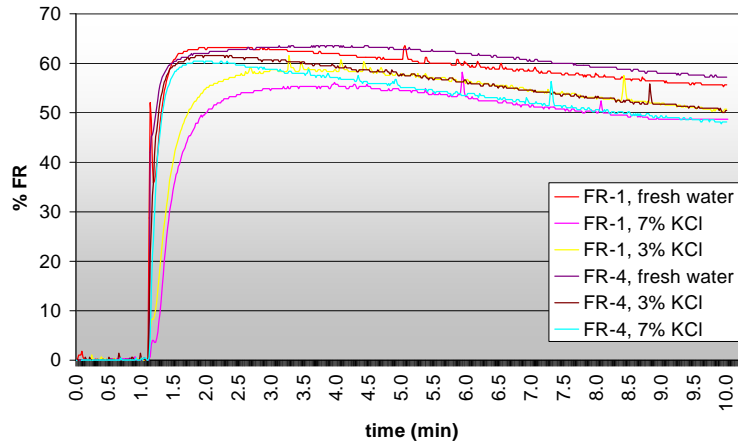
Advantages:

- Reduces Friction Pressure by as much as 70%.
- Lowers pumping pressure.
- Extremely rapid hydration in brine and high total dissolved solids fluids.
- Total Dissolved Salt tolerance allows for an expanded range of usable fluids.
- Compatible with Anionic and Non-Ionic Additives.
- Effective with low concentrations (0.5-1.0 GPT).

Limitations:

- Incompatible with strongly cationic additives.
- Must not be stored at temperatures exceeding 100 degrees Fahrenheit with acid.
- Must be used within 24 hours of batch mixing with acid.

Comparison of FR-1 Versus FR-4, Variable KCl Concentrations, 1L/m3 Friction



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