



Texan Stone LLC

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PRODUCT DATA SHEET

FRICITION REDUCER TS-EF EMULSION

Fresh Water / Light Brine

PRODUCT DESCRIPTION

TS-EF is a premium anionic water-soluble polyacrylamide based friction reducer (FR) that is highly effective in fresh water and light brine conditions. It has high molecular weight and is manufactured as a liquid-emulsion. Addition of small amounts, typically 0.25 – 1.00 gpt (gallons per thousand gallons), to water based frac fluids can deliver friction reduction (pressure loss) of over 70% in a short period of time. Due to its rapid hydration properties, TS-EF can be pumped continuously into the stimulation fluids as supplied or by batch mixing before treatments. TS-EF is APE (alkyl phenol ethoxylates) and NPE (nonyl phenol ethoxylates) free, thus making it environmentally friendly. It is a field tested and proven product in oil field operations.

APPLICATIONS

TS-EF has been specifically optimized for use as a fresh water-to-light brine friction reducer, which can be added as supplied due to its emulsion form and excellent hydration properties. It is compatible with common non-ionic and anionic stimulation additives such as surfactants, scale inhibitors, biocides, etc., and can be used with low to moderate salt concentrations. TS-EF can achieve optimal performance at low dosages (0.25 – 1.00 gpt), reducing overall treatment costs.

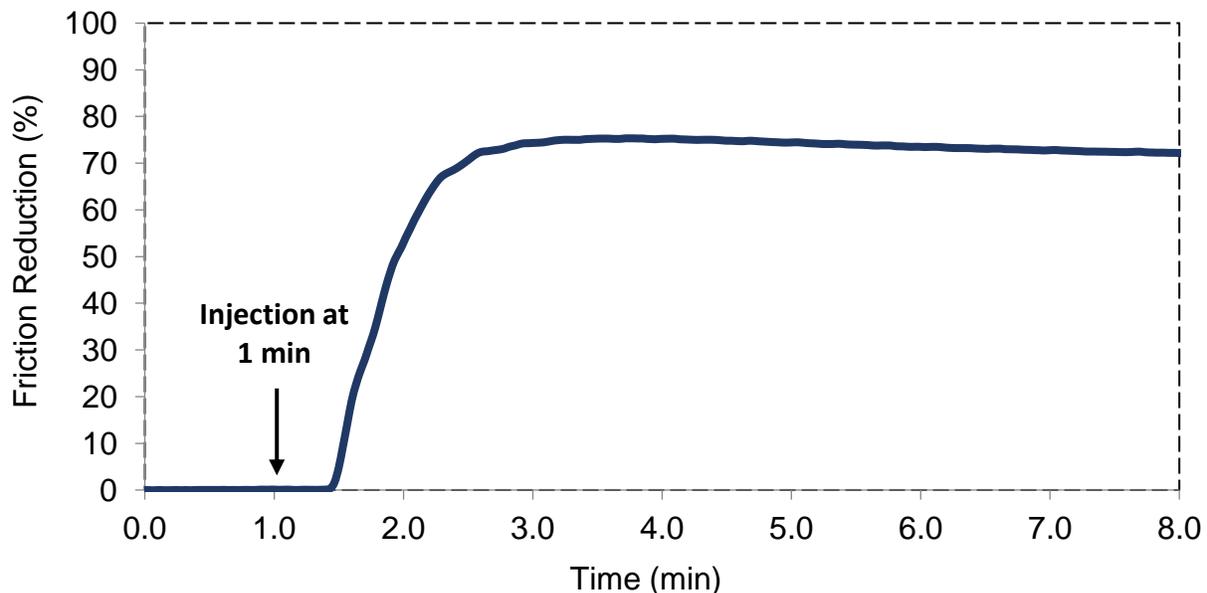
TEST METHODS

Test Method(s): Friction reduction properties were tested on a custom Flow Loop at a flow rate of 6 gpm generating 80,000 Reynold's number. The test section of the loop consisted of pipe having 3/8" O.D. Typical dosage of 0.25 gpt was used and the polymer was injected on the fly through the suction header of the mono-pump. TS-EF was tested in city tap water (fresh water) and Bakken SPF-14 (light brine) brine, having the following TDS: Na₂SO₄ (0.53 g/L), NaHCO₃ (0.62 g/L), CaCl₂ (0.89 g/L) and MgCl₂ (0.33 g/L).

PERFORMANCE & RESULTS

The following figures represent test results in the two brines.

Figure 1. FR performance of TEXAN STONE TS-EF in city Tap Water at room temperature



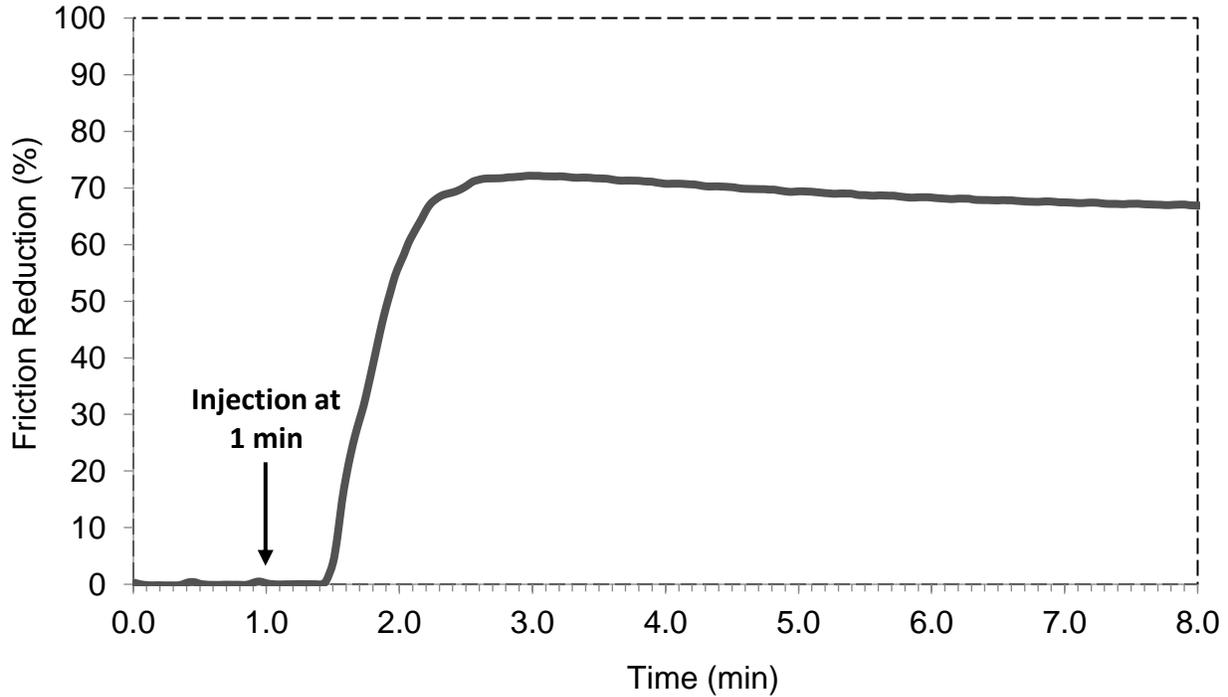


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Figure 2. FR performance of TEXAN STONE TS-EF in Bakken SPF-14 brine at room temperature



The test results illustrate that TEXAN STONE TS-EF achieves a FR value of 75% in city tap water and 72% in Bakken SPF-14 brine.

PROPERTIES

Form	Opaque Liquid
Flash Point	> 140 F (60.0 C). Method used: ASTM D Closed Cup
Freeze Point	-40 F (-40 C)
Viscosity (cps)@Temp	No data available
Color	White / Off-White
Odor	Slight petroleum oil
Density	8.8 lbs/gal
pH	5-8 (1% solution)
Solubility	Water Soluble
Shelf Life	6 Months (It is recommended to store indoors between 5 – 30 C.)

PACKAGING (customized packaging available upon request.)

Size	Packaging	Weight
55 gal.	Drum	475 lbs
275 gal.	Tote	2,300 lbs
330 gal.	Tote	2,800 lbs
5000 gal.	Bulk/ISO	45,500 lbs

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