



Texan Stone LLC

11806 Wilcrest Drive, Suite 202, Houston, TX 77031
Phone: 713-294-4180 Email : Mani@Texanstone.com



PRODUCT DATA SHEET

FRICITION REDUCER TS-EH EMULSION

High Brine

PRODUCT DESCRIPTION

TS-EH is a premium non-ionic water-soluble polyacrylamide friction reducer (FR). It offers good performance in high salinity brines and can be effective at small dosages. TS-EH has a very 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 high brine frac fluids can deliver friction reduction (pressure loss) of over 70% in a short period of time. Due to its rapid hydration properties, it can be pumped continuously into stimulation fluids as supplied or by batch mixing before treatment. TS-EH 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

TEXAN STONE TS-EH has been specifically optimized for use as a high brine friction reducer, which can be added as supplied due to its emulsion form and excellent hydration properties. Due to its non-ionic nature, it is compatible with conventional non-ionic and anionic stimulation additives, and its' compatibility range is wide ranging. TS-EH is also designed to handle divalent cations such as calcium, iron and barium. It can achieve optimal performance at low dosages (0.25 – 1.00 gpt), reducing overall treatment costs.

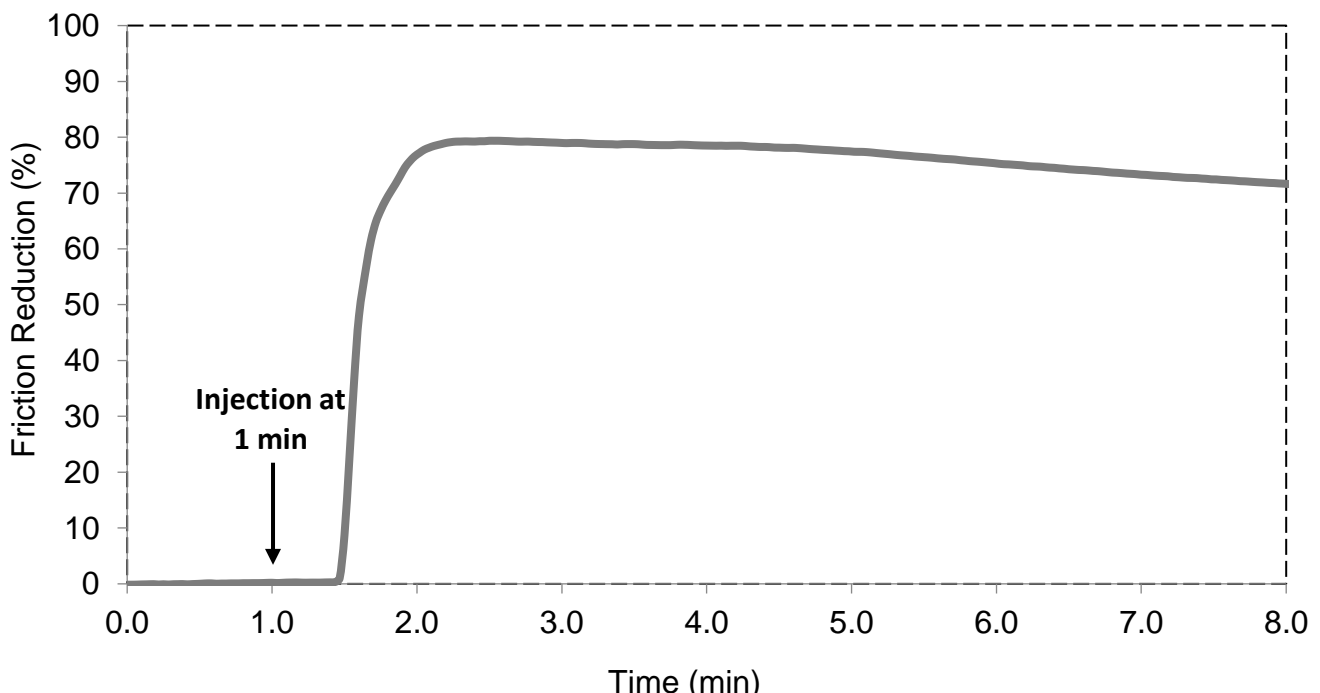
TEST METHODS

Test Method(s): Friction reduction properties of TS-EH 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. Total test time was 10 minutes. TEXAN STONE TS-EH was tested in API brine (108K TDS) with composition: NaCl (95.5 g/L), CaCl₂ (28.10 g/L); and Marcellus (150K TDS) with composition NaCl (96.47 g/L), KCl (1.54 g/L), CaCl₂ (59.38 g/L), BaCl₂ (7.47 g/L), FeCl₃ (0.55 g/L), NaHCO₃ (0.07 g/L), MgCl₂ (11.43 g/L) and SrCl₂ (17.52 g/L).

PERFORMANCE & RESULTS

The following figures represent the test results in the two brines.

Figure 1. FR performance of TS-EH in 108K TDS API Brine



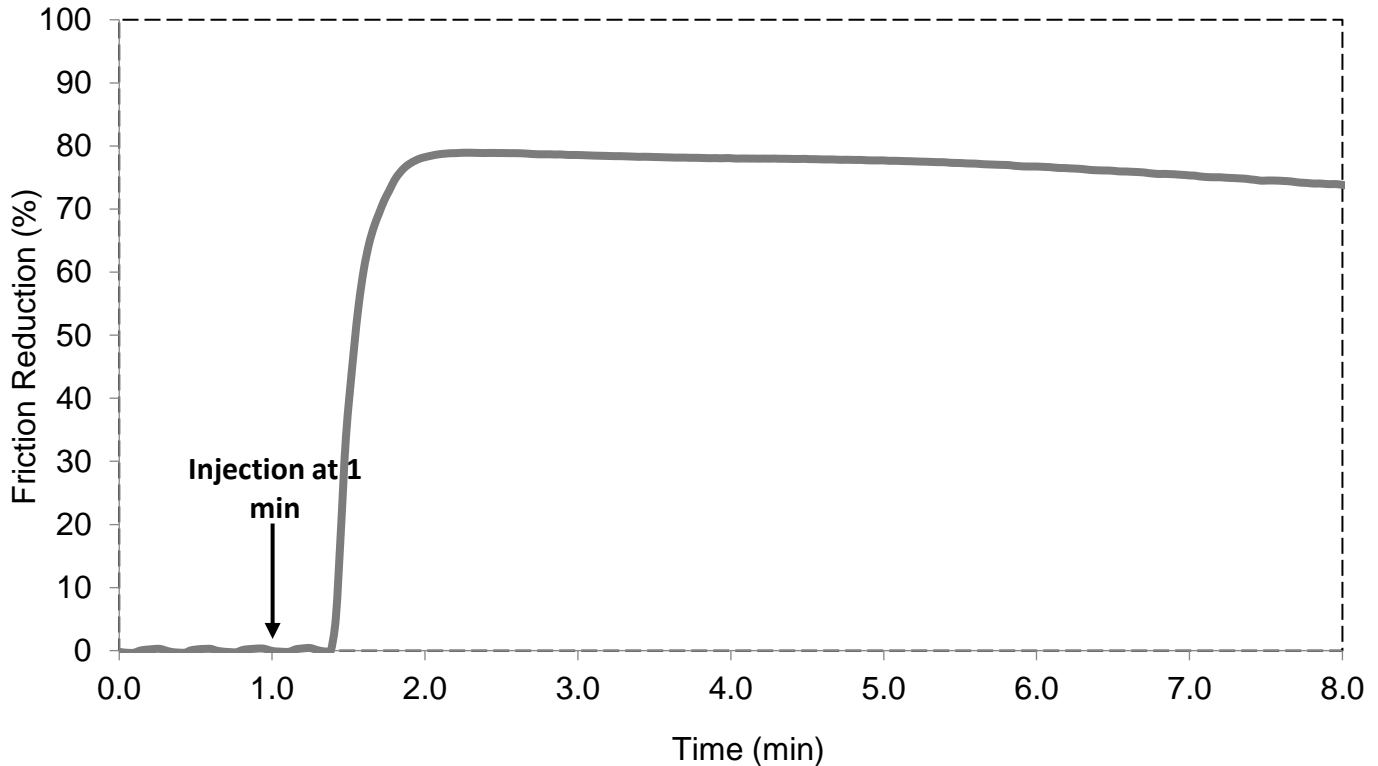


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Figure 2. FR performance of TS-EH in 150K TDS Marcellus Brine.



The test results show that TS-EH achieves a FR value of 79.4% in API brine and 78.9% in Marcellus brine.

PROPERTIES

Form	Opaque Liquid
Flash Point	> 200 F (93.0 C). Method Used: Pensky-Martens Closed Cup
Freeze Point	- 30 C (-22 F)
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 (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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