Texan Stone LLC
DBA Texan Minerals and Chemicals
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PRODUCT DATA SHEET

TEXAN DRY-BRINE ANIONIC

High Brine Friction Reducer in Powder & Slurry Form

PRODUCT DESCRIPTION

TEXAN DRY-BRINE is a premium anionic water-soluble polyacrylamide friction reducer (FR) in powder form, which is suitable for use in a Dry Hydration Unit on the fly as 2% concentrate. The product can also be custom blended using suitable Mineral Oil, Surfactant, Clay Stabilizer to be used in Slurry form**.** It offers excellent performance in high salinity brines and can be effective at small dosages. TEXAN DRY-BRINE ANIONIC has a very high molecular weight and is manufactured as dry powder with 60-100 mesh size for optimal hydration. 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. TEXAN DRY-BRINE 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 DRY-BRINE ANIONIC has been specifically optimized for use as a high brine friction reducer, which can be used directly in fine powder form, concentrate form or dispersed in oil with excellent hydration properties. Due to its anionic nature, it is compatible with conventional non-ionic and anionic stimulation additives, and its compatibility range is wide ranging.

The particle size distribution of the product ranges from 60-100 Mesh making the product suitable to use in Slurry form with fast hydration properties and also be efficiently used in a 2% concentrate form without the Polymer Slicing unit saving operational costs.

In order to achieve a thorough and homogeneous mixing without impairing the flock formation. Recommended operating concentration is 1.25 to 2.5 lbs of powder per thousand gallons.

TEST METHOD BY INDEPENDENT LABORATORY

DRY BRINE POWDER TESTING METHOD:

Friction reduction properties of TEXAN DRY-BRINE (Powder form) were tested in a custom Flow Loop at a flow rate of 6 gpm, generating 89,000 Reynolds number. The test section of the loop consisted of pipe having 3/8" O.D. A dosage of 0.25 gpt (via 2% solution, which is equivalent to 0.65 lbs powder per thousand gallons), was injected on the fly through the suction header of the mono-pump. Total test time was 8 minutes. TEXAN DRY-BRINE (Powder form) was tested in API brine (**108K TDS**) with composition: NaCl (95.5 g/L), $CaCl_2$ (28.10 g/L), and Marcellus brine (**150K TDS**) with composition: NaCl (96.47 g/L), KCl (1.54 g/L), $CaCl_2$ (59.38 g/L), $BaCl_2$ (7.47 g/L), $NaHCO_3$ (0.07 g/L), $MgCl_2$ (11.43 g/L) and $SrCl_2$ (17.52 g/L).

DRY BRINE SLURRY, 3 LB. LOADING TESTING METHOD:

The Dry Brine Slurry, 3 lb. loading contained around 34% Active content suspended in suitable Mineral Oil, Surfactant and Clay Stabilizer. Friction reduction properties of TS-HBS were tested on a custom Flow Loop at a flow rate of 6 gpm, generating 89,000 Reynolds number. The test section of the loop consisted of pipe having 3/8" O.D. Typical dosage of 0.25 gpt or 0.75 lbs of powder was used and the polymer was injected through the hopper. Total test time was 8 minutes. The product was tested in API brine (**108K TDS**) with composition: NaCl (95.5 g/L), $CaCl_2$ (28.10 g/L); Marcellus Brine (**150K** TDS) with composition: NaCl (96.47 g/L), KCl (1.54 g/L), $CaCl_2$ (59.38 g/L), $BaCl_2$ (7.47 g/L), $NaHCO_3$ (0.07 g/L), $MgCl_2$ (11.43 g/L) and $SrCl_2$ (17.52 g/L) and **231K** Ultra high brine with composition: Nacl (189.123 g/L), KCl (2.511 g/L), $MgCl_2$ (5.702 g/L), $CaCl_2$ (25.392 g/L), $BaCl_2$ (0.003 g/L), $SrCl_2$ (1.420 g/L), Na_2SO_4 (0.762 g/L), $NaHCO_3$ (0.945 g/L), LiCl (0.110 g/L), KH_2PO_4 (0.053 g/L), H_3BO_3 (0.172 g/L).

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DRY BRINE SLURRY, 2.5 LB. LOADING WITH PRODUCED WATER:

Friction reduction properties of Dry Brine 2.5 lb. loading were tested in a custom Flow Loop at a flow rate of 5.75 gpm, generating 87,000 Reynolds number. The test section of the loop consisted of pipe having 3/8" O.D. **Typical dosage of 0.5 gpt** or 1.25 lb. powder was used, and injected through the hopper with 7 Gallons of Water. Total test time was 8 minutes. The product was tested with produced water in harsh environment with a **pH of 5.38, S.G. of 1.17 with Total Dissolved Solid level of 251,000. The appearance of the water was orange in color due to the presence of Iron precipitate**. The Elemental composition of water in mg/l (ppm): Boron (B): 32.93, Barium (Ba2+): 3.146, **Calcium (Ca2+): 22018.7**, Iron **(Fe2+): 8.09**, Potassium (K): 2629, Magnesium (Mg2+):6.08, Sodium (Na): 62196.7, Strontium (Sr2+): 1319.42, Zinc (Zn): 0.118, Chlorides (Cl-): 158950.71.

Form	**Free Flowing, White granular powder**
Flash Point	Not applicable
Freeze Point	Not determined
Mesh Size	60-100 Mesh
Molecular Weight (Million)	12-14 (Medium)
Anionic Charge	25-30
Solid Content (%)	≥ 90
Viscosity (cps)@Temp	No data available
Odor	Little odor or odorless
Density (g/cm^3)	0.73g/cm^3
pH	6-8 (0.5% solution)
Solubility	Completely and Rapidly
Insoluble Content (%)	≤0.2
Shelf Life	24 Months (It should be *kept in a dry place and the storage temperature is 0℃ to 35℃, away from direct sunlight and moisture.)*

PACKED IN JUMBO BAGS WEIGHING 1650 LBS

Texan DRY-BRINE tested in the two brines performance and Results

0.25 gpt via 2% solution, which is equivalent to 0.65 lbs powder per thousand gallons.

Figure 1. FR performance of TEXAN DRY-BRINE in 108K TDS API Brine.

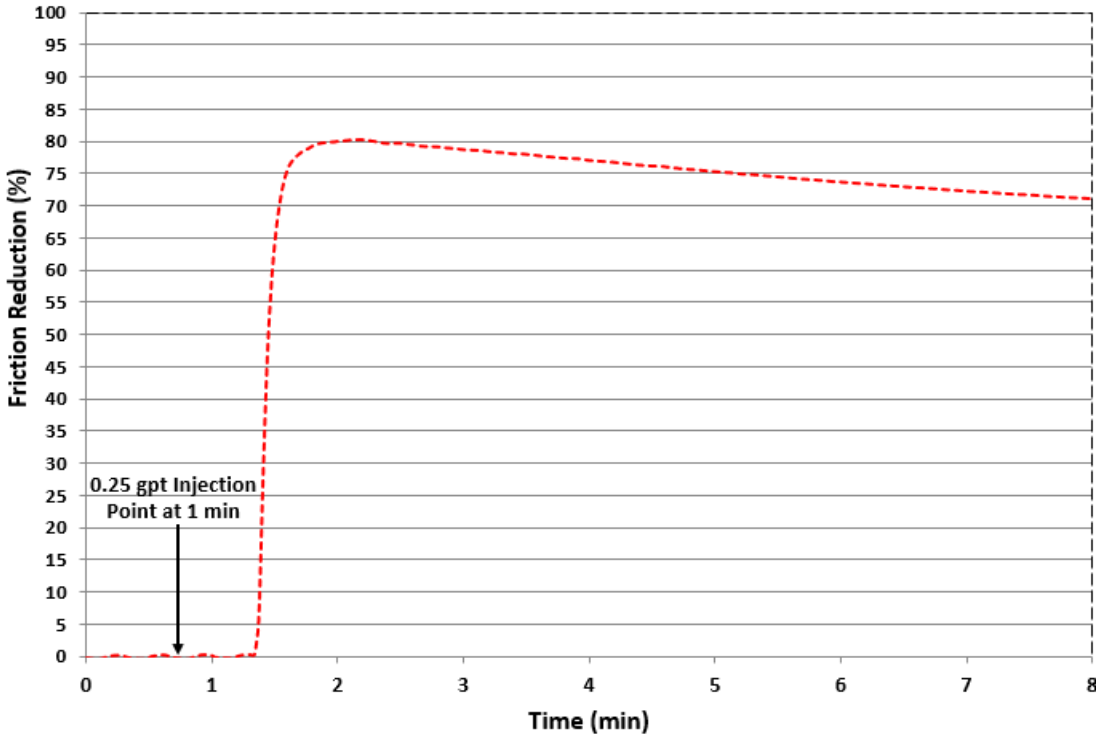

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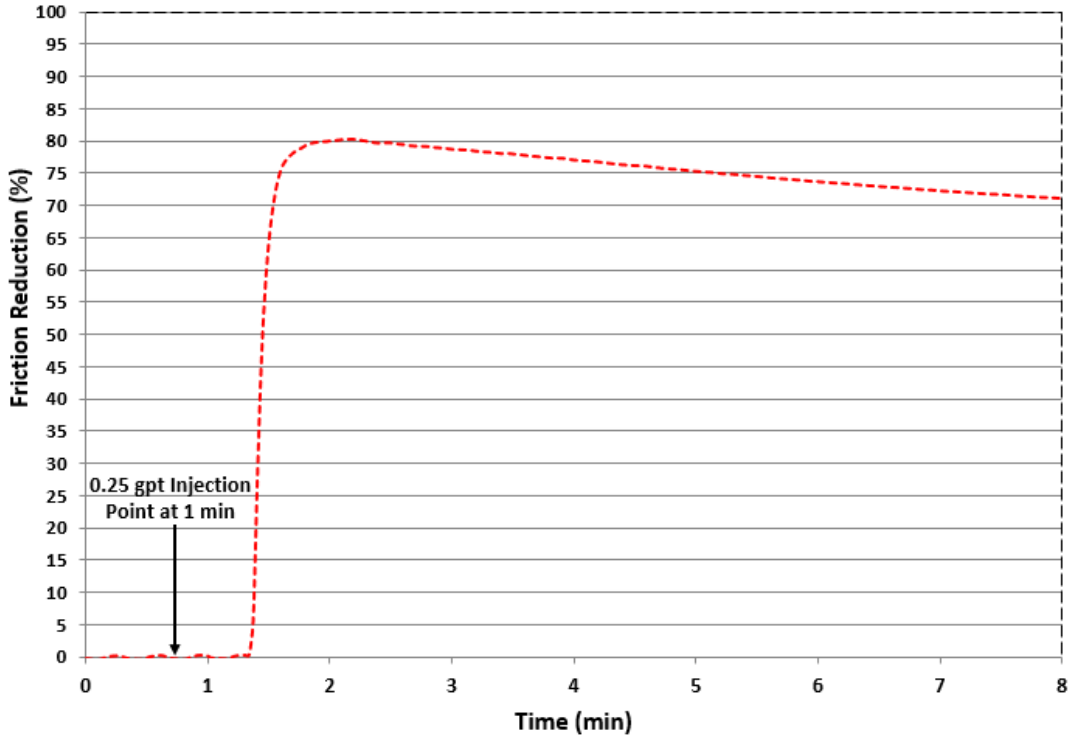
Figure 2. FR performance of TEXAN DRY-BRINE in 150K TDS Marcellus Brine.



The test results show that TEXAN DRY-BRINE achieves a FR value of 80.33% in API brine and 78.74% in Marcellus brine.

TEXAN DRY BRINE SLURRY 3 lb. LOADING PERFORMANCE & RESULTS:

0.25 gpt via hopper, which is equivalent to 0.65 lbs powder per thousand gallons.

Figure 1. Performance of Dry Brine 3 # in 108K in 3/8" OD

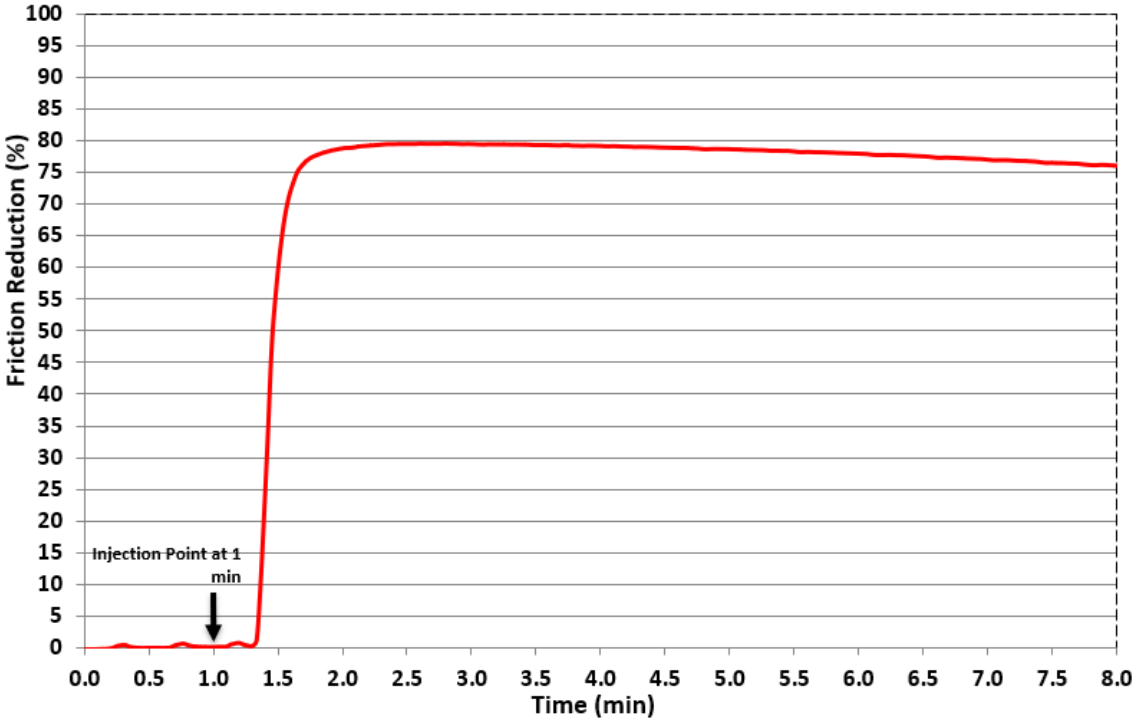


Figure 2. Performance of Dry Brine 3 lb. in 150K in 3/8" OD

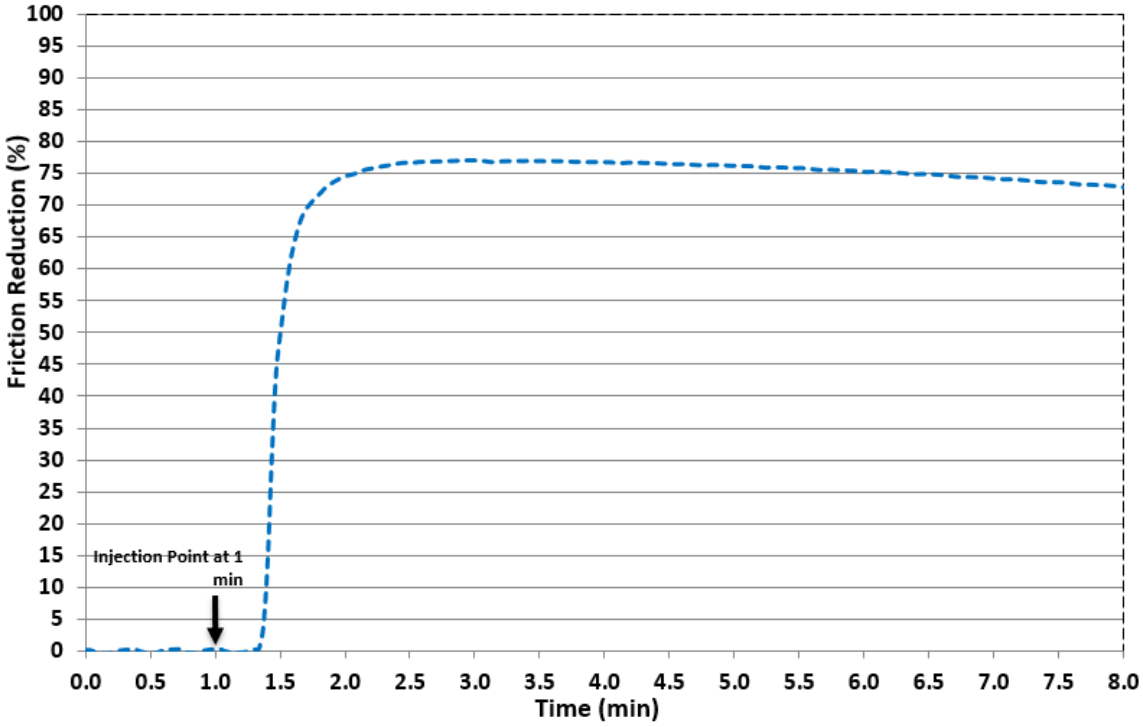
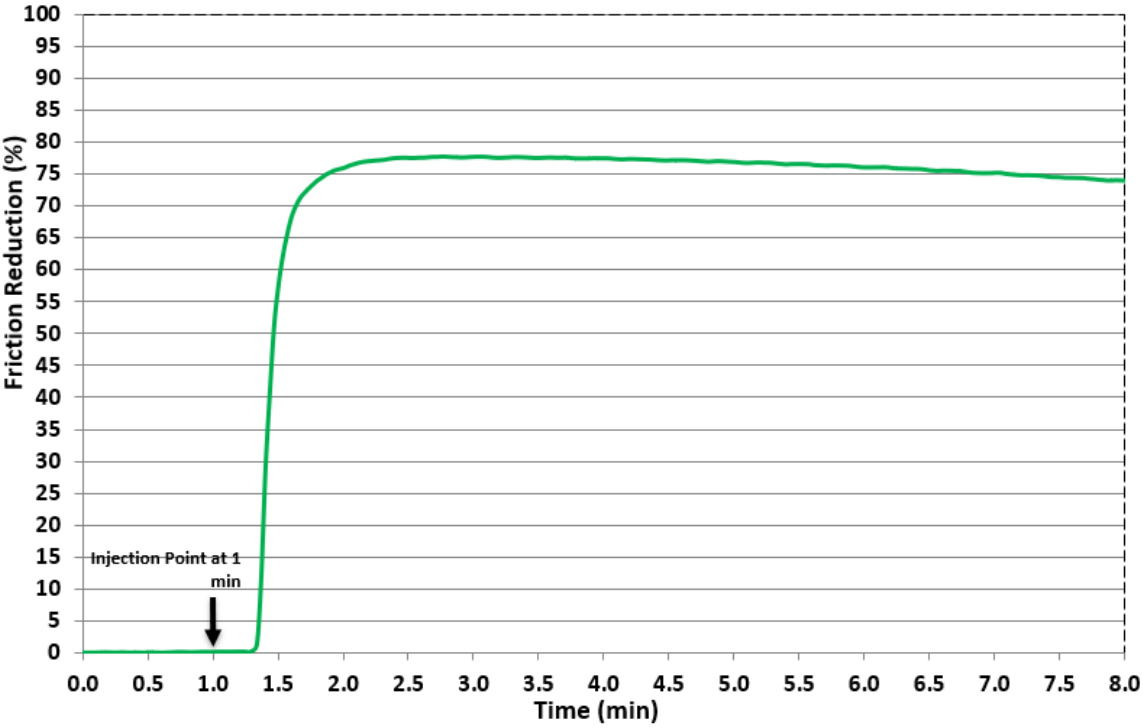


Figure 3. Performance of Dry Brine 3 lb. in 231K in 3/8" OD



The test results show that Dry Brine 3 # achieves a FR value of 79.44% in Synthetic 108K Brine, 77.12% in Synthetic 150k Brine and 77.80% in Synthetic 231k Brine.

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TEXAN DRY BRINE SLURRY 2.5 # LOADING PERFORMANCE & RESULTS

0. 5 gpt via hopper, which is equivalent to 1.25 lbs powder per thousand gallons.

Figure 1. Performance of TS-HBS 2.5 lb. slurry in 250 K PW in 3/8" OD at 0.5 GPT

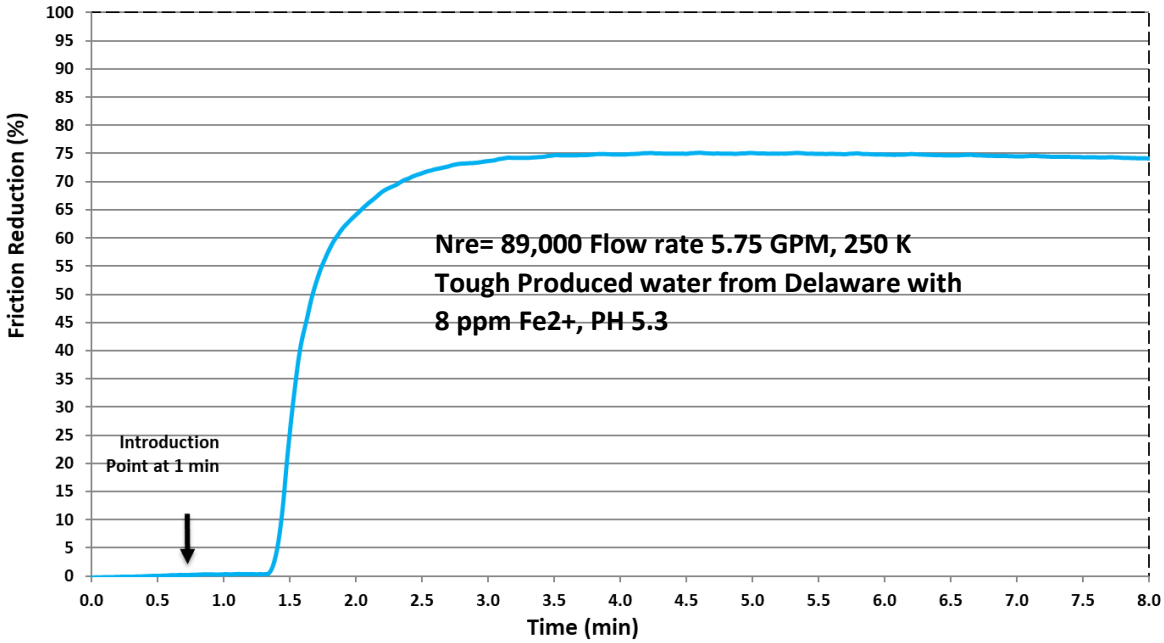
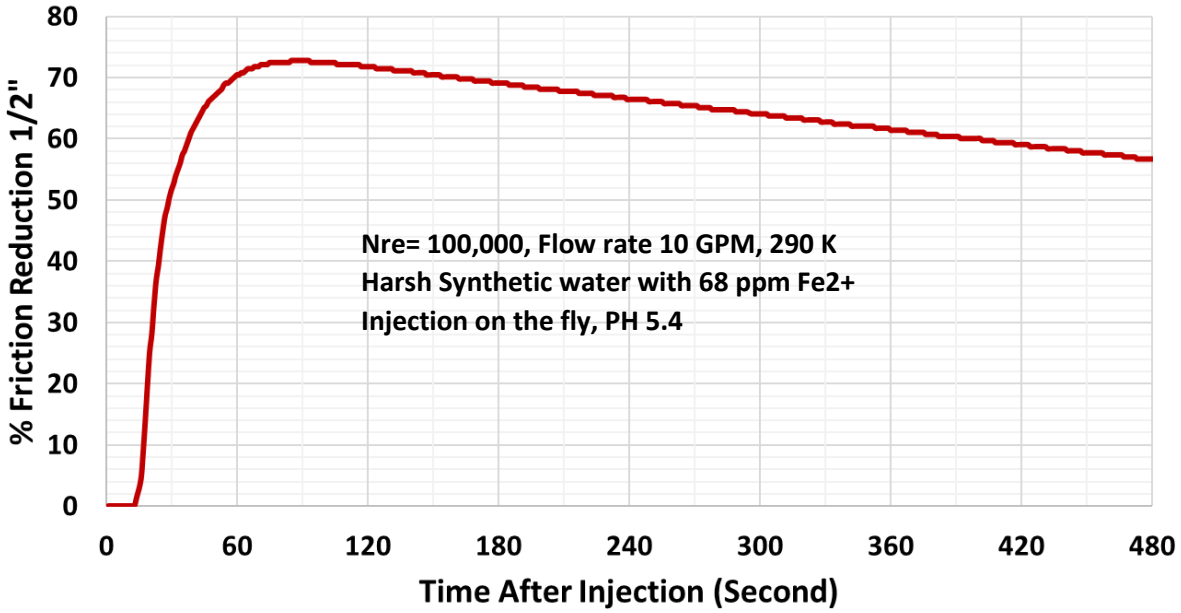


Figure 2. Performance of TS-HBS 2.5 lb. slurry in 290 K SYNTHETIC WATER in 1/2" OD at 1 GPT



The test results show that TS-HBS achieves a FR value of 73% in the 290 K synthetic water and hydrating in less than 60 seconds after injecting the FR into the system suggesting that TS-HBS can be used in Heavy TDS HARSH WATER conditions in both Dry and Slurry Form.