Legend™ LD-2850 Cationic Liquid Friction Reducer

OIL-EXTERNAL EMULSION REDUCES PIPE FRICTION PRESSURES DURING FRACTURING WITH FRESH WATER, LIGHT AND HEAVY BRINES

OVERVIEW

Legend™ LD-2850 cationic liquid friction reducer (FR) is designed to help reduce pipe friction pressures generated during hydraulic fracturing treatments using fresh water, light and heavy brines. LD-2850 FR is a single-stream oil-external emulsion which is easily inverted with a minimal amount of shear. It is effective at concentrations between 0.25 gallons per 1,000 gallons in fresh water, and has equivalent performance with concentrations up to 1.0 gallons per 1,000 gallons in brines up to 200,000 mg/L. Higher salt and TDS level waters sometimes will require higher loadings of LD-2850 FR, as seen with other FRs.

APPLICATIONS

LD-2850 is a single-stream cationic friction reducer specially designed to rapidly hydrate and maintain friction reduction throughout the treatment. This feature of LD-2850 friction reducer is maintained in brackish or high TDS waters, which can interfere with hydration of FRs. Oxidizing breakers, such as LD-4550, are recommended to break FR polymer chains and aid in fracturing treatment cleanup. Core regained permeability studies showed an increase of 59% on average in regained permeability of fluids containing 1 gal/Mgal FR and 1 lb/Mgal LD-4550 oxidizing breaker as compared to FR fluids with no breaker.

FEATURES

» Cationic liquid friction reducer
» Oil-external emulsion single-stream friction reducer
» Used with low to high TDS water
» Compatible with many stimulation chemicals

BENEFITS

» Reduces pipe friction pressure while pumping during hydraulic fracturing
» Effective at low concentrations (0.25 to 1.0 gallons per 1,000 gallons) in fresh water
» Works in brines with TDS up to 200,000 mg/L
» Mixes on-the-fly without lumping associated with dry powder materials
» Can be foamed using nitrogen
COMPATIBILITIES

LD-2850 friction reducer is compatible with most stimulation chemicals. Because compatibility depends on chemical concentrations, LD-2850 friction reducer should always be tested for compatibility when used with other materials, and particularly, with anionic materials.

Product Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td><strong>Form</strong></td>
<td>White to off-white emulsion</td>
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<tr>
<td><strong>Specific Gravity</strong></td>
<td>1.06 - 1.08</td>
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<tr>
<td><strong>Density</strong></td>
<td>8.34 - 9.17 lb/gal</td>
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<tr>
<td><strong>Freeze Point</strong></td>
<td>&lt; 5°F (&lt; -15°C)</td>
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<tr>
<td><strong>Flash Point</strong></td>
<td>&gt; 200°F (&gt; 93.3°C)</td>
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<tr>
<td><strong>Ionic Charge</strong></td>
<td>Cationic</td>
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