**High-Salinity HVFR**

**High-viscosity friction reducer**

Improves proppant transport and environmental stewardship

**Applications**
- High-rate hydraulic fracturing operations using freshwater to high-TDS brine and produced water
- Openhole or cased hole completions
- Refracturing operations
- Hydraulic fracturing operations in shale, carbonate, tight sand, and coalbed methane reservoirs
- Producers and injectors

**How it improves wells**
- Improves flexibility to design treatments that balance technical, economic, and operational goals
- Simplifies operations using a single product for hybrid friction reduction and high proppant concentration
- Reduces logistics and wellsite footprint
- Conserves freshwater sources and reduces water procurement and disposal-related costs through the recycling of produced or flowback water
- Improves proppant carrying capacity, simplifying operations and reducing screenout risks
- Delivers excellent dispersion and hydration at temperatures as low as 40 degF

**Temperature:**
40 to 350 degF [4 to 177 degC]

**Mix water:**
up to 300,000-mg/L total dissolved solids (TDS)

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**Friction reduction of 2-lbm/1,000-galUS high-salinity HVFR in 150,000-mg/l-TDS brine with 15,000-mg/L divalent cations in ¼-in pipe at 20 kg/min.**

**Viscosity of high-salinity HVFR in 150,000-mg/l-TDS brine with 15,000-mg/L divalent cations at ambient temperature.**

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By delivering viscosity, the high-salinity HVFR improves proppant transport, as demonstrated in dynamic settling tests comparing 16-lbm/1,000-galUS high-salinity HVFR (top) and ordinary friction reducer (bottom) in 150,000-mg/l-TDS brine, carrying 2-ppa 40/70-mesh sand at ambient temperature.
High-Salinity HVFR

How it works
The high-salinity HVFR is a copolymer powder that hydrates rapidly into solution on contact with water at 40 degF or above to enable hydraulic fracturing with any water source, from freshwater to very high-salinity water.

At low concentrations (1 to 3 lbm/1,000 galUS [0.12 to 0.36 g/L]), the high-salinity HVFR can be used as a friction reducer for high-rate slickwater treatments.

At high loadings, the high-salinity HVFR generates higher viscosities than conventional friction reducing agents, improving proppant transport.

What it replaces
As a replacement for conventional friction reducers and guar-based linear gel fluids, the high-salinity HVFR is more sustainable and improves production performance. It provides cost-effective and simpler operations with a single additive.

Typical Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>White or off-white powder</td>
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<tr>
<td>Bulk density at 70 degF [21 degC]</td>
<td>5.0 to 7.1 lbm/galUS [0.60 to 0.85 g/mL]</td>
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<tr>
<td>Solubility in water</td>
<td>Soluble and viscous</td>
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