Carboxylmethyl Hydroxypropyl Guar Gum
Oil and Gas Field Applications

improved viscosity
reduced friction
substantial savings
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© 2013 Harlan International Limited
Harlan International Limited (Harlan) was incorporated for the sole purpose of delivering a reliable and consistent fast hydrating pure high-quality gaur gum derivative to the oil and gas industry.

Today, Harlan has contractually secured supply rights with the world’s leading manufacturer of high-quality Carboxymethyl Hydroxypropyl Guar gum (CMHPG) for fracturing and drilling fluids.

With delivery logistics having been solved through an established and successful relationship with one of the largest shipping fleets in the world today, HI is poised to fulfill our customer expectations for timely and efficient delivery with confidence.

Background

Hydraulic fracturing has helped to expand natural gas production in the United States, unlocking large natural gas supplies in shale and other unconventional formations across the country. As a result of hydraulic fracturing and advances in horizontal drilling technology, natural gas production in 2010 reached the highest level in decades. According to new estimates by the Energy Information Administration (EIA), the United States possesses natural gas resources sufficient to supply the United States for approximately 110 years.

As the use of hydraulic fracturing has grown, so have concerns about its environmental and public health impacts. One concern is that hydraulic fracturing fluids used to fracture rock formations contain numerous chemicals that could harm human health and the environment, especially if they enter drinking water supplies. The opposition of many oil and gas companies to public disclosure of the chemicals they use has compounded this concern.

Last Congress, the Committee on Energy and Commerce launched an investigation to examine the practice of hydraulic fracturing in the United States. As part of that inquiry, the Committee asked the 14 leading oil and gas service companies to disclose the types and volumes of the hydraulic fracturing products they used in their fluids between 2005 and 2009 and the chemical contents of those products.

Safety

Material Safety Data Sheets indicate that there are no significant health hazards expected. Further, HGPP is not expected to have significant environmental effects or effects on aquatic organisms.
History

Guar Gum is derived from the ground endosperm of the guar plant, Cyanmopsis tetragonolobus belonging to the family Leguminosae.

Guar gum and guar gum derivative products are widely used throughout the world by operators and service companies who demand cost-effective performance in a competitive oil and gas industry.

Guar gum was introduced to the petroleum industry in the early 1960s as a drilling fluid additive because of its viscous and friction reducing properties. Guar soon became a primary component of water-based fracturing fluids in which guar provides cost-effective performance through, among other reasons, cost of energy savings.

The most significant use of guar has been in petroleum production, specifically, the area of hydraulic fracturing. Hydraulic fracturing involves the use of high pressure to crack open hydrocarbon bearing zones.

Guar is specifically used to thicken the fracturing fluid in order that it may carry graded sand into the fractured rock area.

The sand then better serves as a proppant designed to keep an induced hydraulic fracture open, creating a route for oil or gas to flow.

The ever increasing demand and need to stimulate oil and gas production has resulted in the extensive research of guar derivatives.

The result has been the development of derivatives such as CMHPG.

Product Description

Harlan’s CMHPG is a fast hydrating high purity, non-ionic guar gum that can be used as a gelling agent in oil field stimulation (fracking) or drilling fluids.

A new type of low-damage fracturing fluid thickener, CMHPG produced through chemical modification of guar gum. It boasts high viscosity, low residue, good water solubility, low moisture and water insolubles. CMHPG is produced from an advanced process technology by hydroxypropylation of...
Guar Gum. It is an almost odorless dry powder that is white to yellowish in color. When added to an aqueous medium the particles absorb and swell.

CMHPG has excellent physio-chemical properties, viz. rapid hydration, thermal stability and very low residue content, desirable properties for gelling agents in oil field applications and productivity enhancement.

CMHPG has excellent solution rheology, solubility, stability and compatibility with various other auxiliaries uses in oil fields.

CMHPG has added advantages in that it can be made to disperse at elevated temperatures (100°F) and at high polymer concentrations.

The products available include specified, maximum moisture levels (designated by “xx”) and minimum viscosity levels (designated by “yyyy”). Available specifications range from 2% to 10% moisture with CPS viscosity values of 7,000 to CPS 7,500.

"CMHPG has excellent physio-chemical properties viz. rapid hydration, thermal stability and very low residue content”

Application

- For proppant carrying capacity in fracturing fluids.
- As a general viscosifier for drilling.
- Rheology modifier in Sand Control.
- Thickener for pad fluids in fracture acidizing.

Harlan’s CMHPG is uniquely stable, easily handled and useful in both oilfield and oilfield fracking applications.

It is a must for thickening in fracturing of deep wells with high temperature and low permeability.

The product usage is dependent on the specifics of the application but is usually in the range of 0.24% to 0.96% by weight. Ending viscosity and time to develop this viscosity are determined by solution temperature and the amount of mechanical shear. Other additives are compatible with the CMHPG. Biological degradation by aerobic and/or sulfate reducing bacteria can be prevented by the use of biocides. Depolymerization of the guar can be accomplished with the use of oxidizers such as persulfates or the use of enzymes such as hemicellulose.
**Features**

- Customized moisture content, 2%-10% range
- Low fines levels, <1%
- Excellent carrying capacity
- Can be used with other additives, such as organo-clays.
- Can be dispersed at high temperatures (100°F)
- Customized viscosity, 7,000-7,500 cps range
- Can be cross-linked with metal ions.
- Non-Ionic
- Marginally affected by high concentrations of monovalent salts.
- Dispersible at high concentrations, up to 1.8%.

**Typical Physical Properties**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Powder</td>
</tr>
<tr>
<td>Color</td>
<td>Off-White to Yellow</td>
</tr>
<tr>
<td>Fines</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Viscosity, Diluted</td>
<td>7,000 – 7,500 cps, customized</td>
</tr>
<tr>
<td>Solubility</td>
<td>Soluble in hot and cold water, brines</td>
</tr>
<tr>
<td>pH</td>
<td>6.5-7.5</td>
</tr>
<tr>
<td>Bulk density, lb/ft³</td>
<td>45-49 (loose), 47-51 (packed)</td>
</tr>
<tr>
<td>Moisture</td>
<td>2% - 10%, customized</td>
</tr>
</tbody>
</table>
Packaging & Handling

Guar Gum is shipped from the manufacturing facility and regional distribution centers in standard 900 Kg tote bags.

Custom packaging is available upon request.

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