Well Stimulation Materials

US Industry Study with Forecasts for 2016 & 2021

Study #2867 | March 2012 | $5100 | 329 pages
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Growing demand for well stimulation materials is projected to increase more than 10 percent annually to nearly $12 billion in 2016. Growth will be sustained by continued advances in hydraulic fracturing technology designed to increase the productivity of both new and existing wells. Ongoing growth in horizontal drilling activity and development of shale resources will boost demand for proppants and the fluids used to deliver them into formation fractures. In the early portion of the forecast period, use in oil well drilling will provide most of the impetus for growth, as oil prices are high by historical standards and natural gas prices are not. However, shale gas development activity was strong in 2009, 2010, and 2011, despite low prices.

**Shale gas producers to use more well stimulation**

Growth in shale plays has been supported by companies looking to establish a shale gas presence and the desire of existing producers to develop already acquired leases, as well as by hedges on production made when prices were high. Through the forecast period, shale gas producers will continue to embrace innovations such as multiple-well drilling pad systems and advanced hydraulic fracturing materials in order to improve drilling efficiencies and increase per-well output, all of which will benefit well stimulation material demand.

**Well stimulation to grow at a decelerating pace**

Well stimulation technologies have had a commercial presence for more than 60 years, but for much of that time these techniques were used fairly selectively. A number of factors have combined to transform well stimulation in the US from a niche technology to one of the most common oilfield activities. Technological advances have improved well stimulation techniques to the point that their use -- and cost -- is nearly always justified by increased well productivity. Going forward, gains for well stimulation materials will remain strong, despite some deceleration in growth. A decade or two ago, most wells drilled in the US were not fractured. That is no longer the case. Moreover, much of the recent growth in demand for well stimulation materials has been attributable to the emergence of horizontal drilling and multistage fracturing. Horizontal drilling allows for greater reservoir contact, and therefore faster and fuller well productivity. Multistage fracturing allows for a larger number of fractures to be created at specific locations within a single wellbore. Where fracturing jobs usually included two or three stages, they can now include up to a few dozen stages. Although it is expected that the number of stages per fracturing job will continue to grow, it is anticipated that this growth will be slower than the pace seen in the past several years.
Coated Sand Proppants -- Demand for coated sand proppants in US well stimulations is projected to increase more than 10 percent per year to nearly $2 billion in 2016. Volume is projected to grow 6.6 percent per year to 8.0 billion pounds during the same period. Demand for coated materials will be boosted by its use in unconventional production environments. As has been the case for some time, many frac jobs will use both coated and uncoated proppants.

Raw sand is capable of performing in closure stresses of up to about 4,000 to 5,000 pounds per square inch, with Ottawa sands offering the best performance among raw frac sands. At higher stresses, coated sand or uncoated clay-based ceramics are required. As with coated ceramic proppants, coated sand proppants are often used to tail in behind the uncoated frac sand making up the main bulk of the proppant pack. This tailed-in coated sand proppant provides a barrier which reduces proppant backflow when the transport pumping pressure is released and cleanout begins. It continues to help with flowback control after the well is put back into operation.

Coated sand proppants are also used for the entire proppant placement in well stimulations taking place at depths too great for uncoated sand but where cost considerations make coated sand more attractive than ceramic proppants, which are generally used in the most strenuous conditions. The issue of whether resin coated sand is stronger than raw sand is debatable, but resin coated proppants offer a number of attributes that make it a valuable product.

Shale formations such as the Haynesville, Barnett and Marcellus Shales are also suitable applications for coated sand proppants. These proppants are generally more suitable for deeper wells with greater pressures and higher temperatures, such as the Haynesville Shale.
Mineração Curimbaba Limitada
Av. Joao Pinheiro, 3665
Pocos de Caldas 37704
Brazil
55-35-3729-7600
http://www.curimbaba.com.br

Annual Sales: $150 million (estimated)
Employment: 860 (estimated)
Key Products: bauxite proppants

Mineração Curimbaba is a privately held producer of bauxite ores for the oil and gas, petrochemical, refractory, ceramic, agriculture, smelting, jet-blasting, welding and other markets. The Company exports most of its production, mainly to other South American countries, North America, Europe and Asia. Mineração Curimbaba is part of Curimbaba Grupo (Brazil).

The Company competes in US well stimulation materials industry primarily via the manufacture and sale of SINTERLITE, SINTERLITE LOCK, SINTERBALL and SINTERBLAST bauxite proppants for use during the fracturing of deep gas and oil wells. SINTERLITE low density, spherical-grained products are designed for use in high-temperature, high-closure stress conditions. These proppants are designed to provide thermal stability, and high chemical and crush resistance. It produces SINTERLITE LOCK bauxite low density proppants using a mixture of angular bauxite grains with spherical SINTERLITE bauxite grains. These proppants are engineered to prevent proppant flowback in high-temperature, high-closure stress environments.

TABLE V-7
SOUTHERN REGION:
WELL STIMULATION MATERIAL DEMAND BY STATE
(million dollars)

<table>
<thead>
<tr>
<th>Item</th>
<th>2001</th>
<th>2006</th>
<th>2011</th>
<th>2016</th>
<th>2021</th>
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<td>Wells Drilled</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>000$ material/well</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Well Stimulation Material Demand</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Arkansas</td>
<td>5</td>
<td>27</td>
<td>130</td>
<td>210</td>
<td>335</td>
</tr>
<tr>
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<td>35</td>
<td>79</td>
<td>110</td>
<td>160</td>
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<td>176</td>
<td>561</td>
<td>2565</td>
<td>4235</td>
<td>6245</td>
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<tr>
<td>Other Southern Areas</td>
<td>4</td>
<td>24</td>
<td>71</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>% Southern Region</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Well Stimulation Material Demand</td>
<td>43.8</td>
<td>42.1</td>
<td>48.9</td>
<td>47.0</td>
<td>45.4</td>
</tr>
</tbody>
</table>

“Demand for well stimulation materials in the Southern Region is forecast to increase 9.3 percent per year to $5.6 billion in 2016. Growth in the region will be due in part to increased drilling activity in the Fayetteville Shale in Arkansas and the Haynesville Shale in Louisiana and Texas (despite a recent downturn due to low natural gas prices), as well as ongoing drilling activity in the Barnett Shale in Texas.”

--Section V, pg. 187
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World Fuel Additives

The world fuel additives market will rise 8.0 percent yearly to $59.4 billion in 2016. The rapidly growing fuel market in China will drive gains, especially as China’s fuel standards become stricter and additive treat rates rise. Deposit control additives will see the greatest gains globally, while cold flow improvers grow at the fastest rate. This study analyzes the $40.5 billion world specialty fuel additives industry, with forecasts for 2016 and 2021 by product, application and region and for 44 countries. The study also evaluates company market share and profiles industry participants.

World Oilfield Chemicals

World demand for oilfield chemicals is expected to increase 8.9 percent annually to $28 billion in 2016. The US will remain the largest market based on its many mature wells and rapid growth in horizontal drilling and hydraulic fracturing. Brazil will be the fastest growing market. Drilling fluids and completion and workover fluids will lead gains. This study analyzes the $16 billion world oilfield chemical industry, with forecasts for 2016 and 2021 by product, world region and for 44 countries. The study also evaluates company market share and profiles industry players.

Specialty Fuel Additives

US demand for specialty fuel additives will grow 4.8 percent yearly to $1.6 billion in 2016. Cold flow improvers will lead gains due to the mandated use of more biodiesel, while deposit control agents will remain the most common type. Gasoline will remain the largest application. Blenders and terminals will continue as the largest market. This study analyzes the $1.3 billion US specialty fuel additives industry, with forecasts for 2016 and 2021 by additive type, application and market. The study also evaluates company market shares and profiles industry players.

Well Stimulation Materials

US demand for well stimulation materials is forecast to rise 10.2 percent annually to nearly $12 billion in 2016. Growth will be driven by continued advances in hydraulic fracturing technology designed to increase the productivity of both new and existing wells. Propants, gases, and base fluid materials will be among the fastest growing products. This study analyzes the $7.4 billion US well stimulation material industry, with forecasts for 2016 and 2021 by product and regional market. The study also evaluates company market shares and profiles industry players.

Oilfield Chemicals

US oilfield chemical demand will rise 8.3 percent yearly through 2015, driven by the recovery of oil prices and the development of shale gas resources. Stimulation and cementing chemicals will be the fastest growing products, followed by drilling fluids. Natural gums, polymers, acids and surfactants will be among the best prospects in raw materials. This study analyzes the $9.1 billion US oilfield chemical industry, with forecasts for 2015 and 2020 by product and raw material. The study also evaluates company market share and profiles industry players.