Refinery Chemicals

US Industry Study with Forecasts for 2014 & 2019

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The Freedonia Group

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Higher value products that offer better performance, as well as more stringent chemical treatment to remove more impurities, are factors which will benefit demand for refinery chemicals.

US demand to expand 5% annually through 2014

US demand for refinery chemicals is forecast to expand 5.0 percent annually to $7.1 billion in 2014. The US possesses an advanced refining industry and is among the world’s most intensive users of refinery chemicals relative to refinery output. The refinery chemical industry will benefit as the economy eventually recovers from the recession that began in late 2007. Although refined products output is expected to decline through 2014, demand for refinery chemicals will be supported by the use of new, higher-value products that offer enhanced performance. Additionally, refiners will continue to subject their products to higher levels of chemical treatment in order to remove more impurities, thus supporting chemical demand in refinery applications.

Merchant hydrogen to post above-average gains

Market gains will primarily result from above-average increases in the large merchant hydrogen segment, due to rising use by refiners seeking to supplement their captive hydrogen production. Merchant hydrogen will remain the largest and fastest growing product in the US refinery chemical market. Environmental regulations limiting the sulfur content in fuels will continue to promote the use of hydrotreating -- the largest application for merchant hydrogen -- as a means of removing sulfur and other contaminants. Hydrocracking represents another growth application for merchant hydrogen, as US refineries continue to expand their hydrocracking capacity in efforts to boost gasoline and diesel fuel yields.

Metal catalysts to remain largest, fastest growing

Catalysts also account for a significant share of the market and are commonly used in the petroleum refining industry to improve energy efficiency and process productivity. Metal catalysts will maintain their position as the largest refinery catalyst type. Through 2014, these catalysts are expected to provide the fastest gains in the catalyst segment. Advances will be based on rising use in hydrotreating applications due to efforts to reduce sulfur content in refined products. Zeolites represent another leading type of catalyst used in the refining industry. Primarily employed in catalytic cracking applications, the relative maturity of this technology will prevent more significant gains for zeolite catalysts. Other major refinery chemicals include corrosion inhibitors, pH adjusters and solvents.
Demand for refinery chemicals used in petroleum treatment processes is projected to expand 6.1 percent annually to $3.6 billion in 2014, significantly outpacing demand gains for other types of refinery operations. Several factors are driving petroleum treatment gains for several reasons. More stringent environmental regulations regarding petroleum fuels, particularly the recent tightening in sulfur standards, are limiting the amounts of impurities acceptable in finished products. This is occurring in combination with the increased use of higher levels of sulfur and other contaminants, which further enhances the need for greater treatment.

Crude oil is a complex mixture consisting mostly of hydrocarbons, although a number of other impurities are also present, such as nitrogen, hydrogen sulfide gas, heavy metals and salts. These occur both separately and bonded with other molecules. Many non-hydrogen, non-carbon elements of crude oil are very undesirable due to their potential for contaminating catalysts, damaging refinery equipment or lowering the quality of finished petroleum products to detrimental levels. To mitigate these problems, refiners treat the petroleum via a number of processes that consume large volumes of refinery chemicals. Treatment processes are also used to separate out hydrocarbons such as naphthenes or aromatics from some product streams.

Of the numerous petroleum treatment processes, hydrotreating represents both the largest and fastest growing consumer of refinery chemicals. Tightening fuel quality standards have made hydrotreating a particularly important component of the refining process. Desalting process a crude oil stream is passed through in a refinery, is a large consumer of refinery chemicals, although advances in this segment are subpar based on the relatively small increases expected in it.

### Table III-2

<table>
<thead>
<tr>
<th>Item</th>
<th>1999</th>
<th>2004</th>
<th>2009</th>
<th>2014</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinery Output (million barrels)</td>
<td>6017</td>
<td>6452</td>
<td>6350</td>
<td>6300</td>
<td>6390</td>
</tr>
<tr>
<td>$ chemical/000 bbl output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petroleum Treatment Chemical Demand</td>
<td>795</td>
<td>1467</td>
<td>2650</td>
<td>3570</td>
<td>4750</td>
</tr>
<tr>
<td>By Application:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrotreating</td>
<td>563</td>
<td>1180</td>
<td>2270</td>
<td>3150</td>
<td>4280</td>
</tr>
<tr>
<td>Desalting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solvent Processes</td>
<td>96</td>
<td>119</td>
<td>160</td>
<td>170</td>
<td>185</td>
</tr>
<tr>
<td>Hydrogen Sulfide Recovery</td>
<td>61</td>
<td>77</td>
<td>100</td>
<td>115</td>
<td>132</td>
</tr>
<tr>
<td>Other Treatment Processes</td>
<td>46</td>
<td>56</td>
<td>75</td>
<td>84</td>
<td>93</td>
</tr>
<tr>
<td>% petroleum treating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refinery Chemical Demand</td>
<td>1995</td>
<td>3375</td>
<td>5540</td>
<td>7070</td>
<td>9200</td>
</tr>
</tbody>
</table>

### Chart IV-3

**US Refinery Catalyst Market Share, 2009** ($1.4 billion)

- Marketers: 63.4%
- Others: 36.6%

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Sample Profile, Table & Forecast

### COMPANY PROFILES

**Intercat Incorporated**  
Ramshorn Executive Center  
2399 Highway 34, Suite C-1  
Manasquan, NJ 08736  
732-223-4644  
http://www.intercatinc.com

- Annual Sales: $60 million (estimated)  
- Employment: 150 (estimated)  
- Key Products: fluid catalytic cracking (FCC) additives and addition systems for the refining industry.

Intercat is a developer, producer and marketer of fluid catalytic cracking (FCC) additives and addition systems for the refining industry. The privately held company also provides related technical support.

The Company is involved in the US refinery chemical industry through the production and sale of FCC additives. According to Intercat, it serves virtually every major oil refining company in the US, as well as in Mexico, Canada, Japan, India, Europe and Australia, and has approximately 70 percent of the additive market.

Intercat’s FCC additives include types for sulfur oxide and nitrogen oxide reduction, octane and catalyst enhancement, and other refinery applications. For sulfur oxide reduction applications, the Company makes such products as SOXGETTER additives, which are designed to decrease the cost of removing sulfur oxide from FCC flue gas.  
SOXGETTER sulfur oxide emission control agents include standard and SUPER SOXGETTER additives. Related offerings from Intercat include ULTRA LO-SOX additives, which feature high sulfur oxide sorption capacity with rapid sulfur oxide pickup rates. The Company’s nitrogen oxide reduction products include NOXGETTER additives,

#### TABLE IV-8  
CORROSION INHIBITOR DEMAND IN REFINING  
(million dollars)

<table>
<thead>
<tr>
<th>Item</th>
<th>1999</th>
<th>2004</th>
<th>2009</th>
<th>2014</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinery Output (million barrels)</td>
<td>6017</td>
<td>6452</td>
<td>6350</td>
<td>6300</td>
<td>6390</td>
</tr>
<tr>
<td>lb corrosion inhibitor/000 bbl output</td>
<td>41</td>
<td>45</td>
<td>48</td>
<td>51</td>
<td>53</td>
</tr>
<tr>
<td>Corrosion Inhibitor Demand (million lbs)</td>
<td>249</td>
<td>292</td>
<td>305</td>
<td>320</td>
<td>340</td>
</tr>
<tr>
<td>$/lb</td>
<td>0.95</td>
<td>1.01</td>
<td>1.26</td>
<td>1.44</td>
<td>1.68</td>
</tr>
<tr>
<td>Corrosion Inhibitor Demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Treatment</td>
<td>192</td>
<td>241</td>
<td>318</td>
<td>380</td>
<td>475</td>
</tr>
<tr>
<td>Petroleum Treatment</td>
<td>15</td>
<td>19</td>
<td>24</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Conversion Applications</td>
<td>9</td>
<td>10</td>
<td>13</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Other Applications</td>
<td>21</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>% corrosion inhibitors</td>
<td>11.9</td>
<td>8.7</td>
<td>6.9</td>
<td>6.5</td>
<td>6.2</td>
</tr>
<tr>
<td>Refinery Chemical Demand</td>
<td>1995</td>
<td>3375</td>
<td>5540</td>
<td>7070</td>
<td>9200</td>
</tr>
</tbody>
</table>

"Demand for corrosion inhibitors in refinery applications is forecast to expand 3.6 percent annually to $460 million in 2014, with volume reaching 320 million pounds. The large water treatment segment will account for the majority of demand growth, as the rising use of internal water recycling is causing refiners to increase the volume of corrosion inhibitors used in this market segment. Additionally, an increasing number of refiners are ..."  
--Section IV, pg. 126-7
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