Maleic Anhydride Chain - World Market Overview

Chemicals Committee Meeting at APIC 2015
Seoul, 8 May 2015

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• Feedstock Butane & Benzene Price Trends vs. Crude Oil
• Butane and Benzene – Based Production Economics
• Overview of World Supply & Demand Conditions
• UPR and Other Applications
• Conclusions

Source: Tecnon OrbiChem
APIC 2015
WTI & BRENT CRUDE OIL PRICES 2005-2016
(US EIA Short Term Forecast)

$/bbl

Source: US EIA
APIC 2015

US N-BUTANES & CRUDE OIL PRICES

Source: Tecnon OrbiChem
US N-BUTANES vs WTI CRUDE OIL PRICES

Source: Tecnon OrbiChem
WE MIXED BUTANES, BENZENE & BRENT CRUDE OIL PRICES

Source: Tecnon OrbiChem
APIC 2015
CHINA BENZENE, ASIA BUTANE & BRENT CRUDE OIL PRICES
$/ton

Source: Tecnon OrbiChem
APIC 2015
UNITED STATES MALEIC ANHYDRIDE MARGIN OVER 1.10 x BUTANE

$/ton

Source: Tecnon OrbiChem
APIC 2015
CHINA MALEIC ANHYDRIDE MARGIN OVER 1.15 x BENZENE

$/ton

Source: Tecnon OrbiChem
APIC 2015
CHINA MALEIC ANHYDRIDE MARGIN OVER 1.14 x BUTANE

$/ton


Source: Tecnon OrbiChem
APIC 2015
WORLD MALEIC ANHYDRIDE SUPPLY & DEMAND BY REGION

Source: Tecnon OrbiChem
APIC 2015
WORLD MALEIC ANHYDRIDE CAPACITY BY REGION

Source: Tecnon OrbiChem
APIC 2015
NORTH AMERICA MALEIC ANHYDRIDE SUPPLY & DEMAND

1,000 Metric Tons

Source: Tecnon OrbiChem
APIC 2015
WEST EUROPE MALEIC ANHYDRIDE SUPPLY & DEMAND

1,000 Metric Tons

Source: Tecnon OrbiChem
APIC 2015
CHINA MALEIC ANHYDRIDE SUPPLY & DEMAND

1,000 Metric Tons

Source: Tecnon OrbiChem
APIC 2015
CHINA BUTANE BASED MALEIC ANHYDRIDE CAPACITY GROWTH & NEW PLANTS

Source: Tecnon OrbiChem

<table>
<thead>
<tr>
<th>Producer</th>
<th>Capacity (ktpa)</th>
<th>Start-Up Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhuhai Unicizers (UPC)</td>
<td>30</td>
<td>Apr 2013</td>
</tr>
<tr>
<td>Zibo Qixiang Tengda</td>
<td>100</td>
<td>Nov 2013</td>
</tr>
<tr>
<td>Ningbo Jiangning</td>
<td>80</td>
<td>End 2013</td>
</tr>
<tr>
<td>Puyang Shengyuan</td>
<td>50</td>
<td>Aug 2014</td>
</tr>
<tr>
<td>Shandong Huifeng</td>
<td>50</td>
<td>Dec 2014</td>
</tr>
<tr>
<td>Dongying Qifa</td>
<td>30</td>
<td>Mar 2014</td>
</tr>
<tr>
<td>Dongyin Kede</td>
<td>30</td>
<td>Aug 2014</td>
</tr>
<tr>
<td>Shandong Yongshunda</td>
<td>30</td>
<td>Nov 2014</td>
</tr>
<tr>
<td>Yizheng Chemical Fibre</td>
<td>100</td>
<td>Mid 2015</td>
</tr>
<tr>
<td>Shandong Chenxi</td>
<td>50</td>
<td>H2 2015</td>
</tr>
<tr>
<td>Jiangsu Yabang</td>
<td>60</td>
<td>H1 2016</td>
</tr>
<tr>
<td>Panjin Union (UPC)</td>
<td>80</td>
<td>End 2015</td>
</tr>
</tbody>
</table>
### Top 10 Maleic Anhydride Producers 2015

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Capacity (ktpa)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huntsman Corporation</td>
<td>United States</td>
<td>154</td>
<td>5.5</td>
</tr>
<tr>
<td>Jiangsu Yabang Group</td>
<td>China</td>
<td>150</td>
<td>5.4</td>
</tr>
<tr>
<td>Bohai Chemicals</td>
<td>China</td>
<td>140</td>
<td>5.0</td>
</tr>
<tr>
<td>Sasol/Huntsman</td>
<td>Germany</td>
<td>105</td>
<td>3.8</td>
</tr>
<tr>
<td>Polynt</td>
<td>Italy</td>
<td>101</td>
<td>3.6</td>
</tr>
<tr>
<td>Shanxi Tayiuan Qiaoyou Chemicals</td>
<td>China</td>
<td>100</td>
<td>3.6</td>
</tr>
<tr>
<td>Zibo Qixiang Tengda Chemical Co.</td>
<td>China</td>
<td>100</td>
<td>3.6</td>
</tr>
<tr>
<td>Ningbo Jiangning Chemical</td>
<td>China</td>
<td>80</td>
<td>2.9</td>
</tr>
<tr>
<td>Shandong Hongxin Chemical Industry Co.</td>
<td>China</td>
<td>76</td>
<td>2.7</td>
</tr>
<tr>
<td>Lanxess</td>
<td>United States</td>
<td>73</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Total Capacity of Top 10</strong></td>
<td></td>
<td><strong>1,079</strong></td>
<td><strong>38.5</strong></td>
</tr>
<tr>
<td><strong>Total Capacity World</strong></td>
<td></td>
<td><strong>2,800</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Tecnon OrbiChem
APIC 2015
WORLD MALEIC ANHYDRIDE NET TRADE
2010 - 2014

Source: Tecnon OrbiChem
APIC 2015
WORLD PURE MALEIC ANHYDRIDE APPLICATION
BY REGION 2010 & 2014

Source: Tecnon OrbiChem
UPR squeezed by feedstocks with very volatile pricing
  - Styrene is the biggest component (at more than 35%) of UPR and more volatile than maleic

Demand should be stimulated by lower prices and a pick-up in downstream applications including:
  - Pipe (construction), Marine
  - Wind Energy, Automotive

UPR still faces challenges:
  - In Europe & US due to environmental concerns – over styrene in particular.
  - In Asia from oversupply - Chinese UPR capacity ran at 50% in 2014 but demand growth slows down further

Bio-based UPR is a long way off but opportunities exist in styrene-free UPR and other initiatives.

Source: Tecnon OrbiChem
APIC 2015
EUROPEAN ORTHOPHTHALIC RESIN
COST OF RAW MATERIAL 2004-2015

Source: Tecnon OrbiChem
APIC 2015
UPR MARKET SEGMENTATION

Europe
- Building 21%
- Artificial Marble 15%
- Gelcoats 7%
- Others 8%
- Electrical 8%
- Tanks & Pipes 18%
- Marine 9%
- Transport 14%

China
- Infrastructure 39%
- Architecture & Structure 32%
- Others 11%
- Transport 5%
- Marine 3%
- Others 11%
- Industrial 10%
- Architecture & Structure 32%

Source: Cefic European UP/VE Resin Association; Chinese Society for Composite Materials
The impact of low benzene prices on the global maleic market will be felt in terms of demand improvement, while butane is likely to maintain its cost advantage over benzene as a maleic feedstock in the long run.

The global maleic market has been showing modest improvement in the past few years in US and Europe, strong growth in the Middle East and Southeast Asia and slowing growth in China.

High transportation costs, for heating etc. mean that maleic remains a largely regional market. However, new trading opportunities have emerged amid lengthening supply in China and Northeast Asia and steady demand in Middle East and Southeast Asia.

Butane based maleic has continued to grow in China due to its cost advantage over benzene and easier availability of feedstock butane - both of which could lead to increasing maleic exports from China.

UPR has maintained its dominant share of maleic consumption, but growth has slowed in China.

Source: Tecnon OrbiChem
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