APIC2012
ORTHOXYLENE, PHTHALIC ANHYDRIDE & PLASTICISERS CHAIN

• Global Overview and Forecast of Orthoxylene
• Overview, Trends and Forecast for Phthalic Anhydride
• Oxo Alcohols Overview and Trends
• Plasticisers Overview and Forecast
• Phthalates and Non-Phthalate Plasticisers Trends

Source: Tecnon OrbiChem
**APIC 2012**

**WORLD ORTHOXYLENE CAPACITY BY REGION**

Source: Tecnon OrbiChem
## APIC 2012
### NEW ORTHOXYLENE PLANTS & EXPANSIONS

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Capacity Change (ktpa)</th>
<th>Start-up Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dragon Aromatics</td>
<td>Zhangzhou, Fujian, China</td>
<td>240</td>
<td>2012</td>
</tr>
<tr>
<td>Byco Oil Pakistan Ltd</td>
<td>Lasbela, Pakistan</td>
<td>50</td>
<td>2013</td>
</tr>
<tr>
<td>Shanghai Petrochemical (SPC)</td>
<td>Jinshan, Shanghai, China</td>
<td>100</td>
<td>2013</td>
</tr>
<tr>
<td>Jurong Aromatics Corp.</td>
<td>Jurong Island, Singapore</td>
<td>200</td>
<td>2014</td>
</tr>
<tr>
<td>Hainan Refinery &amp; Chemical Co.</td>
<td>Yangpu, Hainan, China</td>
<td>100</td>
<td>2014</td>
</tr>
</tbody>
</table>

Source: Tecnon OrbiChem
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WORLD PHTHALIC ANHYDRIDE SUPPLY & DEMAND

Source: Tecnon OrbiChem
APIC 2012

PHTHALIC ANHYDRIDE TRENDS

- Phthalic anhydride downstream application areas, such as construction, automotive and marine industries have been severely affected by the financial crisis, especially in Europe and North America.
- Some plasticisers producers are looking at production of non-phthalate plasticisers, where PA is not needed as a feedstock.
- Margins have been eroded as phthalic producers are unable to pass on feedstock orthoxylene cost increases.
- In Asia, many plants have been forced to run at low operating rates to reduce production losses.
- In Europe, while there is an estimated oversupply of phthalic anhydride in the market, there are no plant closures announced.

Source: Tecnon OrbiChem
APIC 2012

PHTHALIC ANHYDRIDE CONSUMPTION BY END USE

Source: Tecnon OrbiChem
APIC 2012
WORLD PLASTICISERS ALCOHOLS CONSUMPTION

Source: Tecnon OrbiChem
APIC 2012
WORLD 2-EH CONSUMPTION BY REGION

1,000 Metric Tons

Source: Tecnon OrbiChem

New capacities coming in China
APIC 2012
2-ETHYLHEXANOL - WHAT NEXT?

• Asia, and particularly China, is the main growth area for 2-EH on the back of continued demand for DOP and increasing consumption in DOTP in the recent years.

• China is the only area where new 2-EH plants are coming on stream. This new capacity is raising fears in the traditional 2-EH export countries that China could become self-sufficient in the near future.

• Conversely, demand in many other parts of the world is already slowing down due to a decrease in DOP use and its substitution by other plasticisers.

• Many 2-EH producers, especially those with captive DOP production, are looking for alternatives, like producing non-phthalate plasticisers such as TOTM, DOA and especially DOTP.

• 2-EH consumption in 2-ethylhexyl acrylate accounts for approximately 12% of 2-EH demand worldwide.

Source: Tecnon OrbiChem
The substitution of DOP by DINP has already had a significant impact on the increase in demand for INA over the last few years, with growth worldwide forecast to continue at around 3% annually.

This would bring INA production close to total capacity in around 5 years time.

The ExxonMobil expansion to 345 ktpa in Singapore in 2011, is so far the only announced major increase in INA capacity.

However BASF has recently signed an agreement with top local company PETRONAS to form a new entity (BASF 60%; PETRONAS 40%) to develop and build production facilities for isononanol in Malaysia.

Source: Tecnon OrbiChem
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LINEAR ALCOHOLS, ISODECANOL & MISCELLANEOUS C7-C13 PLASTICISERS ALCOHOLS, OVERVIEW AND TRENDS

- DIDP is by far the largest end-use for isodecanol accounting for 94% of the total global consumption
- The total demand growth for the miscellaneous C7-C13 plasticiser alcohols is estimated at around 7% over the next several years
- This is predominantly due to the forecast growth for DPHP, and in turn for its precursor alcohol 2-PH
- BASF is by far the dominant producer of 2-PH worldwide with production in Europe and the US, and from 2011 in China
- Evonik also has a relatively small production in Germany while Perstorp has plans to start producing 2-PH by 2014 in Sweden

Source: Tecnon OrbiChem
• In the US after the introduction of the consumer product safety improvement act DOP demand has been decreasing in recent years

• In Europe the implementation of the new REACH regulations DOP has had a significant negative impact on demand and it could decline as much as 9% for some time to come

• In some countries in Northeast Asia DOP consumption has started to slow down or decrease in some cases

• Demand in South and Southeast Asia is expected to grow at a relatively healthy 3.5% over the next several years

• China is now estimated to grow at a similar pace compared with annual growth rates well in excess of 5% annually in the earlier 2000’s

Source: Tecnon OrbiChem
• DINP production is forecast to grow worldwide at around 3.3% per annum through to 2020

• West Europe is the main production region of DINP worldwide and will have an estimated growth of around 3.5% during this period

• The European Commission has confirmed that DINP poses no risk to either human health or the environment from any current use

• DINP production is expected to grow in Asia over the next several years as supply of DINP’s precursor alcohol isononanol is expected to increase in the region

Source: Tecnon OrbiChem
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DOP & DINP PRODUCTION BY REGION

2011
DINP
- China: 25%
- Northeast Asia: 18%
- South & Southeast Asia: 7%
- West Europe: 30%

DOP
- China: 44%
- Northeast Asia: 23%
- South & Southeast Asia: 11%
- West Europe: 23%

2019
DINP
- China: 25%
- Northeast Asia: 18%
- South & Southeast Asia: 7%
- West Europe: 31%

DOP
- China: 53%
- Northeast Asia: 23%
- South & Southeast Asia: 11%
- West Europe: 33%

Source: Tecnon OrbiChem
APIC 2012

OTHER C7-C13 PHTHALATE PLASTICISERS

• Production of miscellaneous C7-C13 plasticisers (of which DPHP is the largest product) is expected to show growth of around 8% annually for several years to come

• BASF is the main producer of DPHP worldwide, with production in the US and Europe and has started 2-PH production in Nanjing, China in 2011

• Perstorp is also building up DPHP production, and has plans to produce its feedstock 2-PH, in Sweden, expected start-up 2014

• DIDP is expected to grow steadily at around 2% per annum

Source: Tecnon OrbiChem
Several plasticiser manufacturers are looking at producing and promoting phthalate-free plasticisers as an alternative to the traditional phthalate products and of DOP in particular.

**OXEA** stopped DOP production in Germany in 2009 and it has plans to increase its production of DOTP, TOTM and DOA in Europe and from 2013 will start production of phthalate-free plasticisers in China.

**Eastman** is now the sole DOP producer in the US, however the company is also expanding and promoting DOTP among other products (TOTM, DOA).

DOTP is rapidly becoming a commodity phthalate in China where its production has surged over the last few years.

**BASF** has also developed a non-phthalate plasticiser, DINCH.

Source: Tecnon OrbiChem
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WHAT NEXT FOR SOME MAJOR PLAYERS IN THE PLASTICISER MARKET?

• **BASF** produces 2-PH, and DPHP in the US and Europe
  - BASF has recently announced an agreement with PETRONAS to produce isononanol in Malaysia
  - It plans to double DINCH production capacity, at its plant in Ludwigshafen, up to 200 ktpa

• **Eastman** in 2011 acquired the Sterling Chemical plasticiser plant
  - This plant is starting to produce non-phthalate plasticisers (including DOTP) from Q2 2012
  - Eastman is also promoting DOTP in Europe and has acquired a plant in Estonia, where they produce benzoate plasticisers

• **ExxonMobil** will continue to promote DINP and DIDP
  - It has recently increased its INA capacity at Singapore to 345 ktpa

Source: Tecnon OrbiChem
APIC 2012
CONCLUSIONS

• There is overcapacity on phthalic anhydride in Europe. Expansions are mainly confined to China.

• Some 2-EH producers, particularly those with captive DOP production, are looking for alternative end uses such as producing non-phthalate plasticisers DOTP in particular.

• Key phthalate market players are focusing on a specific phthalate product.

• Consumption of DOP will continue to decrease in Europe and North America and to a lesser extent in some other areas such as Northeast Asia. Some producers in these areas are looking to move away from DOP production.

Source: Tecnon OrbiChem
.....your source of expert chemical industry knowledge
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CHINESE ORTHOXYLENE, PHTHALIC ANHYDRIDE & PLASTICISERS CHAIN

- Orthoxylene Overview and Forecast
- Phthalic Anhydride Overview, Forecast and Trends
- 2-EH Overview, Expansions and Trends
- Plasticisers Market Overview

Source: Tecnon OrbiChem
APIC 2012
CHINA ORTHOXYLENE SUPPLY & DEMAND

Source: Tecnon OrbiChem
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<td>240</td>
<td>late 2012</td>
</tr>
<tr>
<td>Shanghai Petrochemical (SPC)</td>
<td>Jinshan, Shanghai, China</td>
<td>100</td>
<td>2013</td>
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<td>Hainan Refinery &amp; Chemical Co.</td>
<td>Yangpu, Hainan, China</td>
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<td>2014</td>
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Source: Tecnon OrbiChem
APIC 2012
CHINA PHTHALIC ANHYDRIDE SUPPLY & DEMAND

1,000 Metric Tons

Capacity
Consumption
Production

Source: Tecnon OrbiChem
# APIC 2012

## CHINESE OX-BASED PHTHALIC ANHYDRIDE PLANTS & EXPANSIONS

<table>
<thead>
<tr>
<th>Producer</th>
<th>Location</th>
<th>Capacity Change (ktpa)</th>
<th>Start-up Date</th>
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</thead>
<tbody>
<tr>
<td>Taizhou Union</td>
<td>Taizhou, Jiangsu</td>
<td>70</td>
<td>Q1 2011</td>
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<tr>
<td>Changzhou Yabang</td>
<td>Changzhou, Jiangsu</td>
<td>100</td>
<td>H1 2011</td>
</tr>
<tr>
<td>Wuxi Coking</td>
<td>Taixing, Jiangsu</td>
<td>50</td>
<td>H2 2011</td>
</tr>
<tr>
<td>Anhui Tongling</td>
<td>Tongling, Anhui</td>
<td>50</td>
<td>Q1 2012</td>
</tr>
<tr>
<td>Shandong Xintai Liaherd</td>
<td>Xintai, Shandong</td>
<td>50</td>
<td>Q2 2012</td>
</tr>
<tr>
<td>Shandong Hongxin</td>
<td>Zibo, Shandong</td>
<td>60</td>
<td>Q3 2012</td>
</tr>
<tr>
<td>Continental Petrochemicals</td>
<td>Zhuhai, Guangdong</td>
<td>80</td>
<td>late 2012/early 2013</td>
</tr>
<tr>
<td>UPC</td>
<td>Liaoyang, Liaoning</td>
<td>140</td>
<td>2013</td>
</tr>
</tbody>
</table>

Source: Tecnon OrbiChem
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CHINESE PHTHALIC ANHYDRIDE & ORTHOXYLENE PRICES

Source: Tecnon OrbiChem
APIC 2012
CHINESE 2-EH SUPPLY & DEMAND

Source: Tecnon OrbiChem
## APIC 2012
### CHINESE 2-EH PLANTS AND EXPANSIONS

<table>
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<tbody>
<tr>
<td>Daqing Petrochemical</td>
<td>Daqing, Heilongjiang</td>
<td>75</td>
<td>2012</td>
</tr>
<tr>
<td>Shandong Jianlan</td>
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<td>70</td>
<td>Q2 2012</td>
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<tr>
<td>Shandong Quilu Plasticisers</td>
<td>Zibo, Shandong</td>
<td>140</td>
<td>H2 2012</td>
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<tr>
<td>PetroChina Sichuan</td>
<td>Chengdu, Sichuan</td>
<td>80</td>
<td>H2 2012</td>
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<tr>
<td>Tianjin Bohai</td>
<td>Tianjin</td>
<td>140</td>
<td>Q2 2013</td>
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<tr>
<td>Baling Petrochemical</td>
<td>Yueyang, Hunan</td>
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<td>2013</td>
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<td>Shandong Hualu Hengsheng Group</td>
<td>Dezhou, Shandong</td>
<td>140</td>
<td>2013</td>
</tr>
<tr>
<td>Shandong Luxi Chemical</td>
<td>Liaocheng, Shandong</td>
<td>140</td>
<td>2013</td>
</tr>
<tr>
<td>Wison (Nanjing) Clean Energy</td>
<td>Nanjing, Jiangsu</td>
<td>125</td>
<td>Q3 2013</td>
</tr>
<tr>
<td>Anqing Petrochemical</td>
<td>Anqing, Anhui</td>
<td>110</td>
<td>End 2013</td>
</tr>
</tbody>
</table>

Source: Tecnon OrbiChem
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CHINESE PHTHALATE PLASTICISERS CAPACITY & PRODUCTION

1,000 Metric Tons

Source: Tecnon OrbiChem
# APIC 2012
## NEW PHTHALATE PLASTICISERS (DOP) PLANTS & EXPANSIONS

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Tianjin Bohua Vastrde Yongli Chemical</td>
<td>Tianjin</td>
<td>100</td>
<td>July 2011</td>
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<tr>
<td>Zhejiang Hailiye</td>
<td>Jiaxing, Zhejiang</td>
<td>80</td>
<td>Nov 2011</td>
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<tr>
<td>Jingzhou Pearled</td>
<td>Jingzhou, Hubei</td>
<td>50</td>
<td>Sep 2011</td>
</tr>
<tr>
<td>Dongying Yimeide</td>
<td>Dongying, Shandong</td>
<td>100</td>
<td>2012</td>
</tr>
<tr>
<td>Continental Petrochemicals</td>
<td>Zhuhai, Guangdong</td>
<td>120</td>
<td>H2 2012</td>
</tr>
<tr>
<td>Tianjin Jinyuantai Chemical</td>
<td>Tianjin</td>
<td>200</td>
<td>End 2012</td>
</tr>
<tr>
<td>Shandong Chenxi Petrochemical</td>
<td>Rizhao, Shandong</td>
<td>150</td>
<td>2012</td>
</tr>
</tbody>
</table>

Source: Tecnon OrbiChem
APIC 2012
CONCLUSIONS

• Short supply of orthoxylene is expected to continue in the future

• Phthalic anhydride outlook is not optimistic, due to cost pressure and slow demand

• 2-EH new plants coming on stream could result in overcapacity in the coming years and 2-EH producers are considering other potential uses downstream

• DOP still dominates the Chinese market and will continue to do so for the foreseeable future

• DINP, as a major alternative to DOP, is developing fast but its growth could be limited by the availability of its feedstock isononanol

• Demand for non-phthalate plasticisers, especially DOTP, is also increasing rapidly but replacement of DOP as a dominant plasticiser could take some time

Source: Tecnon OrbiChem
your source of expert chemical industry knowledge
APIC 2012

CHINESE 2-EH & INA CONSUMPTION

1,000 Metric Tons

Source: Tecnon OrbiChem