Global Ammonia Market Update

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Topics to be Covered

♦ Ammonia Supply & Demand
♦ Ammonia Plant Market Trends
  ▪ Revamps
  ▪ New plants
♦ Summary
### Demand for Basic Chemicals-2007
(approximate millions of mt/year)

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Demand (mt/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfuric acid</td>
<td>190</td>
</tr>
<tr>
<td>Ammonia</td>
<td>157</td>
</tr>
<tr>
<td>Urea</td>
<td>143</td>
</tr>
<tr>
<td>Ethylene</td>
<td>114</td>
</tr>
<tr>
<td>Chlorine</td>
<td>50</td>
</tr>
<tr>
<td>Soda</td>
<td>47</td>
</tr>
<tr>
<td>Methanol</td>
<td>40</td>
</tr>
</tbody>
</table>

Sources: Fertecon, Web searches

### Ammonia Uses

- **81%** Fertilizers  
- **19%** Other Uses  
  - explosives  
  - fibers  
  - resins  
  - animal feed
World Arable Land

Source: SRI

World Population

Average Annual Growth Rate = 1.35%

Source: EIA
### Ammonia Capacity/Demand Gap Analysis

<table>
<thead>
<tr>
<th></th>
<th>MM T/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipated Capacity in 2011</td>
<td>231</td>
</tr>
<tr>
<td>Down Time of 10%</td>
<td>-23</td>
</tr>
<tr>
<td>Available Capacity</td>
<td>208</td>
</tr>
<tr>
<td>Anticipated Demand in 2011</td>
<td>170</td>
</tr>
<tr>
<td>Idled Capacity</td>
<td>38&lt;sup&gt;(1)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> Equivalent to 104 plants each 1000 t/day

- Known idled capacity is about 16 million t/year
  - United States (20 plants)
  - Eastern Europe (14 plants)
  - Western Europe (9 plants)

- Remaining plants are operating at 22 million t/y below capacity

- Overall industry availability = ~81%

- Most of these “at risk” plants will be those that came online during the large build up of capacity during the 1970s.
**Ammonia Plant Capacity by Region – 2007**
(Source: Fertecon Ammonia Outlook – Issue 2009-2)

**ASIA**
- China 32%
- India 8%
- Indonesia 4%
- All other 6%

**Ammonia Plant Capacity by Region (2008)**
(Source: Fertecon Ammonia Outlook – Issue 2009-2)

Total 2008 – 153 million tonnes
(Source: Fertecon Ammonia Outlook – Issue 2009-2)

Total 2008 – 18.5 million tonnes (12% of production)

Asia/Oceania
North America
Latin America
Middle East
Africa
CIS
EU

(Source: Fertecon)

Millions of tons/year

As a % of Production
(Source: Fertecon)

Total trade in 2007 = 19.2 MM mt
Net trade in 2007 = 11.7 MM mt

Middle East – Ammonia Market – MM MT/Yr
(Source: Fertecon Ammonia Outlook – Issue 2009-2)
CIS(FSU) – Ammonia Market – MM MT/Yr
(Source: Fertecon Ammonia Outlook – Issue 2009-2)

Ammonia Price Trends
(Source: Fertecon Ammonia Report – 3 SEP 09)
Historical Ammonia Prices - USGC
(Source: Fertecon)

Ammonia Price Forecast
(Source: Fertecon Ammonia Outlook – Issue 2009-2)
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Revamp Market Overview

♦ Older plants often struggle to remain competitive
  ▪ Higher energy consumption
  ▪ Located in high gas cost area
  ▪ Smaller capacities

♦ Some energy efficiency revamps have already taken place

♦ Many operators are now looking at capacity increases

♦ Capacity by revamp can often be added for lower cost/ton than new capacity
Ammonia Plants Built by Decade

Ammonia Revamp Potential

♦ Plants designed in the 1970s and 1980s have the potential for 50 percent capacity increase.

♦ Newer plants are more tightly designed and so more costly to debottleneck.
### Ammonia Revamp Potential

**Plants built in 1970s & 1980s**

About 100 KBR plants @ 1000 t/d

<table>
<thead>
<tr>
<th>MT/D</th>
<th>Total Nameplate</th>
<th>Current production</th>
<th>Potential production</th>
<th>Potential extra production</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT/D</td>
<td>100,000</td>
<td>110,000</td>
<td>150,000</td>
<td>40,000</td>
</tr>
</tbody>
</table>

### Ammonia Revamp Potential

**Study Results**

<table>
<thead>
<tr>
<th>Plant 1</th>
<th>Plant 2</th>
<th>Plant 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year on-line</td>
<td>1976</td>
<td>1978</td>
</tr>
<tr>
<td>Capacity, tons/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base case</td>
<td>1150</td>
<td>1150</td>
</tr>
<tr>
<td>Revamp case</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>ISBL Energy, Gcal/t</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base case</td>
<td>8.3</td>
<td>8.2</td>
</tr>
<tr>
<td>Revamp</td>
<td>7.8</td>
<td>8.1</td>
</tr>
</tbody>
</table>
Trends in Energy Consumption – New Plants

Gcal/mt - LHV

THEORETICAL MINIMUM


Ammonia Plant Awards by Region

Projects shift to ME and LA where gas is available at lower cost and to APAC where growth is higher.

Source: KBR Marketing
Average Capacity Built by Decade
KBR Licensed Plants

Indicative CAPEX
(Assumes 0.7 exponent)
Trends in Maximum Capacity

♦ All licensors are now claiming that they can design single-train plants for >3000 mt/day

♦ KBR has a 2200 mt/day plant operating that could be revamped to 2800 t/d

♦ KBR offered and guaranteed a single-train 4000 mt/day plant in Trinidad

♦ KBR internal studies have shown that a single train capacity of 5000 mt/day is possible

Implications

♦ There will be fewer projects of larger capacity (2000+ T/D)

♦ Large amounts of ammonia (& urea) will suddenly come on the market

♦ Projects will require more capital, leading to increased industry partnering to share risks

♦ Mega-Capacity projects will be in low gas cost areas
Implications (Cont’d)

♦ “Mega-capacity” plants will be located at coastal sites

♦ There will be some logistics issues moving large volumes of product

♦ Plants that are older, smaller, and in locations with high feed costs will increasingly tend to either
  ▪ Revamp to increase capacity & reduce energy to reduce cost/ton
  ▪ Shut down

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Market Summary

♦ Tightening in supply 2004-2005
  This caused:
  ▪ Ammonia prices to increase
  ▪ Projects to be undertaken
♦ Price Run-up 2007-2008
  ▪ Gas & oil prices increased
  ▪ Supported by high crop prices
♦ Price Collapse 2008-2009
  ▪ World-wide economic downturn
  ▪ Steep decline in oil & gas prices
  ▪ Decline in commodity prices
♦ 2009+ Price Recovery

A lot of capacity will come on line in next three years
Expect capacity rationalization in high gas cost areas
Project Summary

- **1970s** – a period of rapid capacity expansion

- **1980s** – a period of reduced energy consumption

**Graph:**
- Percent of Plants by Decade
- 1950s-2000s

**Chart:**
- 1990s – a decade of moving projects to low gas cost areas

**Bar Chart:**
- Thousand MTPD
- Year of Award
- LA, ME, IN - AF, APAC, Europe, NA

**Graph:**
- 2000s – a decade of increased plant capacities
  - Large Capacity Plants
  - Revamps (up to 50%)
Opportunities

♦ New Plants
  ▪ Large Capacity (2000+ MTPD) for low $/Ton NH3
  ▪ Minimum Energy Consumption to reduce operating cost
  ▪ High Reliability to ensure maximum profitability

♦ Revamps
  ▪ Increase Capacity to Reduce $/Ton of NH3
  ▪ Reduce Energy Consumption to Reduce Operating $$

*KBR offers Proven Solutions to meet all these Objectives*

Thank you very much...

Questions?