Opportunities and Challenges for ASEAN Petrochemicals amid Growing Global Competition

By Mr. Akbar Md Thayoob
Chief Executive Officer
PETRONAS Chemicals Marketing Sdn Bhd
OUTLINE

- Global competitive landscape
- Opportunities and challenges for ASEAN petrochemical development
- Conclusion
By 2030, the world population is estimated to be >8b with the growth driven by emerging economies

SOURCE: UN
As population grows so does the demand for Petrochemicals

SOURCE: IHS, Fertecon
Taking advantage of its cheap and abundant coal, China's chemical industry has leveraged historical processes and invented brand new ones.

Source: McKinsey, Jacobs and ICIS
With an aggressive capacity building, China is moving towards self-sufficiency, but will they?

China ethylene capacity increases .... thus reduces net trade of ethylene and its derivatives

Likewise, China propylene capacity thus reduces net trade of propylene and its derivatives

Source: IHS
ME is positioning for differentiated and specialty chemicals

ME petrochemical industry growth continues….

..which will stimulate new set of downstream industries

Millions ton

Basic Chemicals
- Ammonia
- Methanol
- PE (butene-1 comonomer)
- PP (homo-polymer mainly)
- MEG
- PVC

Diversification
- Aromatics
- PE (hexene-1 comonomer)
- PP (copolymer)
- Oxo-alcohols
- Acetic acid
- VAM
- LAO

Intermediates
- Nylon 6 & 6.6
- Bis-phenol A
- Polycarbonate
- EVA
- ABS
- Glycol Ethers
- Acrylates
- Acrylonitrile
- Elastomers
- PU

Well-established Industries in GCC
- Basic Chemicals
  - Olefins
  - Aromatics
  - Chlorine

Differentiated Commodities
- Polyethylene
- Polypropylene
- Polystyrene
- PVC

Forward Commodities
- Ethylene glycol
- PTA / PET
- Methanol

Speciality Chemicals
- Flame retardants
- Pharmaceuticals
- Plastic stabilizers
- Biocides

Formulated Specialities
- Water treatment chemicals
- Surfactants / Detergents
- Lubricants
- Adhesives
- Oil fields Chemical

Performance Polymers
- Acrylics / Acrylates
- Engineering plastics
- Elastomers / Rubber
- Polyurethane

Services
- Services & chemical solutions provider
- Logistics / shipping
- Process water / utilities
- Waste water treatment
- Emissions trading / carbon sink

Increasing Value and Differentiation

Source: IHS, KPMG GCC Analysis, ICIS, Company websites
ASEAN at a Glance

General Information

Population
~625 million
~9% of world

Population growth:
1.4% pa
(2013³)

GDP
USD2.32 trillion
(2013³)

Economic Indicators (2013³)

GDP Growth : 5.1%

FDI inflow : USD120 billion

Total export : USD1.27 trillion

Total import : RM1.24 trillion

Labour force : 298 million

Source: UN, US Census Bureau, ASEANstats
With growing population and income, ASEAN’s petrochemical consumption is poised for further growth.

Driven by an expansionary strategy by players in respective countries within ASEAN, there would be sizeable chemical capacity growths in ASEAN.

ASEAN petrochemical players’ expansion and integration strategy will largely hinge upon domestic government’s policies.

Source: MIDA 2014
Per capita plastic consumption in ASEAN countries is still low

Ample room for growth in plastic consumption...

...with promising growth expected in healthcare, transportation and personal items

### Population 2013

<table>
<thead>
<tr>
<th>Country</th>
<th>Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>1361</td>
</tr>
<tr>
<td>India</td>
<td>1239</td>
</tr>
<tr>
<td>Indonesia</td>
<td>248</td>
</tr>
<tr>
<td>Japan</td>
<td>54</td>
</tr>
<tr>
<td>Vietnam</td>
<td>36</td>
</tr>
<tr>
<td>Thailand</td>
<td>56</td>
</tr>
<tr>
<td>Malaysia</td>
<td>45</td>
</tr>
</tbody>
</table>

Percapita plastic consumption, kg

<table>
<thead>
<tr>
<th>Country</th>
<th>China</th>
<th>India</th>
<th>Indonesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>30</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

### Share of annual expenditure, CAGR 2011-2030

<table>
<thead>
<tr>
<th>Category</th>
<th>Indonesia</th>
<th>India</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare</td>
<td>6.2%</td>
<td>16.3%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Transportation</td>
<td>4.6%</td>
<td>9.8%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Personal items</td>
<td>5.3%</td>
<td>6.8%</td>
<td>12.3%</td>
</tr>
<tr>
<td>Apparel</td>
<td>5.0%</td>
<td>8.5%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Housing &amp; utilities</td>
<td>4.5%</td>
<td>7.0%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Food &amp; beverage</td>
<td>5.2%</td>
<td>6.3%</td>
<td>6.2%</td>
</tr>
</tbody>
</table>

Source: PCG Team analysis, IMF 2013

Source: PCG Team analysis, McKinsey
South East Asia offers the widest variety of bio-based feedstock

### Top 5 global producers

<table>
<thead>
<tr>
<th>Feedstock</th>
<th>2010 Production, Million tons per year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sugarcane</strong></td>
<td>Brazil: 719, Mexico: 50, Thailand: 69, China: 111, India: 278, Brazil: 719</td>
</tr>
<tr>
<td><strong>Cassava</strong></td>
<td>Brazil: 24, India: 278, China: 111, Indonesia: 98, Brazil: 24</td>
</tr>
<tr>
<td><strong>Palm oil</strong></td>
<td>Colombia: 0.9, China: 1.8, Thailand: 1.5, Indonesia: 1.5, Malaysia: 18.7, Myanmar: 25.4</td>
</tr>
<tr>
<td><strong>Jatropha</strong></td>
<td>Brazil: 1.8, China: 1.8, Myanmar: 14.0, India: 6.7, Colombia: 0.9, Brazil: 1.8</td>
</tr>
</tbody>
</table>

1. Assume yield of 7 tons of jatropha seeds per ha.

Source: FAOStat; GEXSI; Press; Team analysis
Key competitive edge
ASEAN is an ideal production base to export to the high growth Asia Pacific markets

ASEAN’s strategic location allows for much shorter shipping times to key growth markets

Shipping Distances from Singapore vs. Middle East

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Singapore</th>
<th>Middle East (Jubail, Saudi Arabia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China (Xiamen)</td>
<td>4 days</td>
<td>19 days</td>
</tr>
<tr>
<td>Japan (avg. Shimizu, Sakai, Kobe, Mizushima)</td>
<td>7 days</td>
<td>22 days</td>
</tr>
<tr>
<td>Taiwan (Kaohsiung)</td>
<td>4 days</td>
<td>18 days</td>
</tr>
<tr>
<td>Indonesia (avg. Surabaya, Semarang)</td>
<td>4 days</td>
<td>15 days</td>
</tr>
<tr>
<td>Thailand (Bangkok)</td>
<td>4 days</td>
<td>16 days</td>
</tr>
</tbody>
</table>

**Shipping Considerations**
- Smaller ships and smaller loads economically viable
- Less crowded routes
- More frequent vessels
- Only large ships to maintain economies of scale
- Potential delay through crowded Straits of Malacca

Source: World Ports Distances (www.distances.com) (1) - Assuming 12 knots/hr average cruising speed

Example: Logistics cost for export to China, US$/ton of PE

<table>
<thead>
<tr>
<th>Country</th>
<th>Korea</th>
<th>ASEAN</th>
<th>ME</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistics cost for key markets</td>
<td>15</td>
<td>20</td>
<td>50</td>
<td>70</td>
</tr>
</tbody>
</table>

Import tariffs for petrochemical for ASEAN countries, %

<table>
<thead>
<tr>
<th>Country</th>
<th>ASEAN</th>
<th>Non-ASEAN countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import tariffs to ASEAN &amp; China</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>

Source: IMF 2013, FAOStat; GEXSI; Press
Opportunities for ASEAN petrochemical industry
Poised for future growth driven by chemical megatrends

<table>
<thead>
<tr>
<th>Business Opportunities</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Plastics/elastomer for automotive</td>
<td>Automotive</td>
</tr>
<tr>
<td>2. Composite materials for automotive</td>
<td>Consumer electronics</td>
</tr>
<tr>
<td>3. Plastics for consumer electronics</td>
<td>Food</td>
</tr>
<tr>
<td>4. Plastics for food packaging</td>
<td></td>
</tr>
<tr>
<td>5. Bioplastics</td>
<td></td>
</tr>
<tr>
<td>6. Agrochemicals</td>
<td>Agriculture</td>
</tr>
<tr>
<td>7. Seeds</td>
<td></td>
</tr>
<tr>
<td>8. Active pharmaceutical ingredients</td>
<td>Pharma / Personal care</td>
</tr>
<tr>
<td>9. Personal care chemicals</td>
<td>Food</td>
</tr>
<tr>
<td>10. Food &amp; feed additives</td>
<td></td>
</tr>
<tr>
<td>11. Concrete additives for construction</td>
<td>Construction</td>
</tr>
<tr>
<td>12. Paints &amp; coatings</td>
<td></td>
</tr>
</tbody>
</table>

Source: PCG Team Analysis
Stepping up the game
Asia Pacific market provides opportunity for ASEAN producers to expand

**Countries**

- Malaysia
- Thailand
- Indonesia
- Singapore

**New projects**

- **SAMUR** project (Urea 1.2 mtpa) in Sipitang, Sabah
- **RAPID** Project (Integrated refinery and petrochemical complex)
- Feasibility study to set up oil refinery integrated with petchem production with total output of 10m tonne/year in Vietnam
- Petrochemicals complex in Southern Vietnam with QPI Vietnam, PetroVietnam & Vinachem (1.4 mtpa of olefins), expected start-up by 2018.
- JV with PTTGC to build world scale Petrochemical Complex worth US$ 4-5 bil; start up by 2018
- 30% acquisition by SCG to further drive performance and leverage potential synergies
- Planned cracker expansion by 2015
- ExxonMobil inaugurated the world’s first facility that processes crude oil directly into petrochemical products at a facility in Singapore in January 2014.
# ASEAN support for growth of Petrochemicals Industry

<table>
<thead>
<tr>
<th>Country</th>
<th>Economic Plan</th>
<th>Growth for Petrochemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>- Indonesia’s Master Plan for Economic Development 2011-2025</td>
<td>- Java prioritized for petrochemicals development as it has 3 new refinery projects in the next 5 years allowing for multiple expansion projects.</td>
</tr>
<tr>
<td>Malaysia</td>
<td>- The Government Transformation Programme (GTP) and the New Economic Model (NEM)</td>
<td>- Key drivers to become a developed nation include oil, gas and petrochemical</td>
</tr>
<tr>
<td>Thailand</td>
<td>- The 11th National Economic and Social Development Plan</td>
<td>- Expansion of four newly established industries, specifically petroleum, electronics, automobiles and electrical appliances.</td>
</tr>
<tr>
<td>Singapore</td>
<td>- The Singapore Economic Development Board (EDB)</td>
<td>- Enhance infrastructure development, create competitive feedstock for petrochemicals, and move up the value chain with advanced materials as well as specialty chemicals.</td>
</tr>
</tbody>
</table>
Challenges ahead

1. Global capacity additions

2. Talent Shortage

3. Trade barriers

4. Megatrends requiring higher product customization

SOURCE: PCG Growth Study 2012
CONCLUSION

- Ample room for growth of ASEAN petrochemical market and strategic collaboration opportunity amongst ASEAN petrochemical producers

- Asia Pacific remains the key growth market for ASEAN producers to expand market share and presence for select industry sectors

- In addition to proximity to petrochemical growth markets, key opportunities of ASEAN petrochemical players are access to natural oil and gas feedstock and support from the government i.e. infrastructure/ logistics system development and investment incentives
What is an example of Responsible Care that you can think of?

For further enquiries please contact us at:
PETRONAS Chemicals Group Berhad
Level 15, Tower 1, PETRONAS Twin Towers
KUALA LUMPUR CITY CENTRE,
50088 KUALA LUMPUR, MALAYSIA

Fax: +603 2331 3060
petronaschemicals@petronas.com.my
www.petronaschemicals.com

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