Petrochemical Industry in China

- Growing Demand and Supply in the Future

by

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• Chemical Industry Review
• Supply/Demand of Petrochemicals in China
• Supply/Demand of Methanol in China
China’s GDP Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>3.8%</td>
</tr>
<tr>
<td>1991</td>
<td>9.2%</td>
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<tr>
<td>1992</td>
<td>14.2%</td>
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<tr>
<td>1993</td>
<td>13.5%</td>
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<tr>
<td>1994</td>
<td>12.6%</td>
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<tr>
<td>1995</td>
<td>10.5%</td>
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<td>1996</td>
<td>9.6%</td>
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<tr>
<td>1997</td>
<td>8.8%</td>
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<tr>
<td>1998</td>
<td>7.8%</td>
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<tr>
<td>1999</td>
<td>7.1%</td>
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<tr>
<td>2000</td>
<td>8.0%</td>
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<tr>
<td>2001</td>
<td>7.3%</td>
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<tr>
<td>2002</td>
<td>8.0%</td>
</tr>
<tr>
<td>2003</td>
<td>9.1%</td>
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<tr>
<td>2004</td>
<td>9.5%</td>
</tr>
<tr>
<td>2005</td>
<td>9.5%</td>
</tr>
<tr>
<td>2005e</td>
<td>9.0%</td>
</tr>
</tbody>
</table>

Note: GDP in billion US$ (constant 1990 dollars)
Utilized FDI relatively stable in value

<table>
<thead>
<tr>
<th>Year</th>
<th>FDI</th>
<th>Growth Rate (%)</th>
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<tbody>
<tr>
<td>1990</td>
<td>3.49</td>
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<td>1991</td>
<td>4.37</td>
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<td>1992</td>
<td>11.01</td>
<td>151.9%</td>
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<td>1993</td>
<td>27.52</td>
<td>150.0%</td>
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<td>1994</td>
<td>33.77</td>
<td>22.7%</td>
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<tr>
<td>1995</td>
<td>37.52</td>
<td>11.1%</td>
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<tr>
<td>1996</td>
<td>41.73</td>
<td>11.2%</td>
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<tr>
<td>1997</td>
<td>47.26</td>
<td>13.3%</td>
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<tr>
<td>1998</td>
<td>45.46</td>
<td>-3.8%</td>
</tr>
<tr>
<td>1999</td>
<td>40.4</td>
<td>-11.4%</td>
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<tr>
<td>2000</td>
<td>40.7</td>
<td>0.93%</td>
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<tr>
<td>2001</td>
<td>46.9</td>
<td>15.20%</td>
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<td>2002</td>
<td>52.7</td>
<td>12.40%</td>
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<tr>
<td>2003</td>
<td>53.5</td>
<td>1.40%</td>
</tr>
<tr>
<td>2004</td>
<td>60.6</td>
<td>13.30%</td>
</tr>
<tr>
<td>2005, Q1</td>
<td>13.4</td>
<td>9.50%</td>
</tr>
</tbody>
</table>

Note: Utilized FDI in billion US$. 
- Export Value has been larger than Import since 1994
- Total value of I & E exceeded 1,000.0 Billion US$ for the first time in 2004, reaching 1,154.8 Billion US$
- Increasing rate will slow down to 15% in 2005
Unemployment
Registered Unemployment Rate (%)
For long-term, China will quadruple its 2000 GDP to US$ 4 trillion with a per capita GDP of US$ 3,000. GDP will keep growth at 7-8%.

For short-term, Chinese economy is facing challenges. Government has been taking actions on dealing with overheating Investment and related problems.

The main challenges facing the Chinese economy are that aggregate investment in some industries and regions is somewhat excessive, inflationary pressures are building up and much remain to be done in the areas of employment and social security. Solutions to these problems will require China to pay even closer attention to proper macroeconomic management and to the proper handling of the relationship between reform, development and stability.

The total value of Import and Export exceeded 1.0 trillion in 2004, ranking the third in world. However, Large value does not mean “Strong”.

China turned in “double surpluses”-in both current and capital accounts-in 2004. The pressure on RMB appreciation is going up.
Characteristics of China’s Chemical Industry:

- Consists of Many Small Plants
- Developed Rapidly During Past Decade
- Net Importer of Most Chemicals
- Restructuring to Increase Competitiveness
- The development of Chemical Parks has been speeding up the development of Chemical Industry
China’s Chemical Industry In 2004-----Excellent Year

- Total output reached about US$ 298 Billion, increasing 32.3% over the previous year
- Total sales revenue, US$ 293 Billion, increasing 32.5% over the previous year
- Total profit, US$ 33.7 Billion, increasing 58.7% over the previous year
- Total value of I & E, US$ 159 Billion, increasing 40.0% over the previous year
China’s Chemical Industry In 2004-----Excellent Year

• The output of the following products Ranked the first in the world: Fertilizer, Ammonia, Sodium Carbonate, Sulfuric Acid, Dye Stuff, Synthetic Fibers, Rubber Shoes.

• The output of the following products Ranked the second in the world: Pesticides, Tires and Sodium Hydroxide

• The output of the following products Ranked the third in the world: Oil refining, Ethylene, Paints & Coating
China’s Chemical Industry ----- Difficulties

- Industrial Structure Imbalance
- Very High Energy Consuming
- Environment Pollution
- Trade war
Supply/Demand of Petrochemicals in China

- Ethylene
- Propylene
- Polymers
Ethylene Capacity Situation:

- Capacity Grew 8.2% Per Year From 1990 to 2004
- From 2004 to 2009, Capacity Will Increase 21.9% Per Year. However, 4.2% From 2009 to 2014.
- Annual Capacity From 16 Plants Equaled 6,205 Thousand Metric Tons At 2004 Year-end
- 3 Large Joint-Venture Plants start-up this year
- 1 Large Joint-Venture Plants Has Got Approval
- 2 New Ethylene Units in Existing Producers
- 6 Are Waiting For Government Approval
During 2001-2004, Capacity Increase is only from the expansion of Existing Plants

(Thousands of Metric Tons/Year)

<table>
<thead>
<tr>
<th>Company</th>
<th>2001</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINOPEC Shanghai Petrochemical Co. Ltd</td>
<td>545</td>
<td>845</td>
</tr>
<tr>
<td>SINOPEC Maoming Petrochemical Co.</td>
<td>380</td>
<td>380</td>
</tr>
<tr>
<td>PetroChina Jilin Petrochemical Co.</td>
<td>530</td>
<td>530</td>
</tr>
<tr>
<td>SINOPEC Beijing Yanhua Petrochemical</td>
<td>660</td>
<td>710</td>
</tr>
<tr>
<td>SINOPEC Yangzi Petrochemical Co. Ltd</td>
<td>400</td>
<td>800</td>
</tr>
<tr>
<td>PetroChina Daqing Petrochemical Co.</td>
<td>480</td>
<td>600</td>
</tr>
<tr>
<td>SINOPEC Qilu Petrochemical Co. Ltd</td>
<td>450</td>
<td>720</td>
</tr>
<tr>
<td>PetroChina Lanzhou Petrochemical Co.</td>
<td>160</td>
<td>240</td>
</tr>
<tr>
<td>PetroChina Dushuanzi Petrochemical Co.</td>
<td>180</td>
<td>220</td>
</tr>
<tr>
<td>SINOPEC Tianjin Petrochemical Co</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>SINOPEC Guangzhou Company</td>
<td>150</td>
<td>210</td>
</tr>
<tr>
<td>Sinopec Zhongyuan Petrochemical Co. Ltd</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>Liaoning Huajin Chemical Group</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>Sinopec Beijing Dongfang Petrochemical Co. Ltd</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>PetroChina Fushun Petrochemical Co.</td>
<td>144</td>
<td>140</td>
</tr>
<tr>
<td>PetroChina Liaoyang Petrochemical</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4889</strong></td>
<td><strong>6,205</strong></td>
</tr>
</tbody>
</table>
3 Joint Venture Ethylene Plants Have Been Under Construction And Will Add 2.3 Million Tons of Capacity

BASF-YPC Company Ltd.
Location: Nanjing, Jiansu
Capacity: 600,000 mtpa
Start-up: 2005

CNOOC-Shell Petrochemical Company Ltd.
Location: Huizhou, Guangdong
Capacity: 800,000 mtpa
Start-up: 2005

Shanghai Secco Petrochemical Company Ltd. (SECCO)
Location: Jinshan, Shanghai
Capacity: 900,000 mtpa
Start-up: 2005
1 Joint Venture Ethylene Plants

2 New Ethylene Units in the Existing Producers

**Exxon Fujian PC**
*Location: Quanzhou, Fujian*
*Capacity: 800,000 mtpa*
*Start-up: 2007*

**PetroChina Dushanzi PetroChemical**
*Location: Dushanzi, Xinjiang*
*Capacity: 1,000,000 mtpa*
*Start-up: 2008*

**PetroChina Fushun Petrochemical**
*Location: Fushun, Liaoning*
*Capacity: 800,000 mtpa*
*Start-up: 2008*
New Ethylene Plants

6 Are Waiting for Approval

**Sinopec Tianjin PC**
- **Location:** Tianjin
- **Capacity:** 800,000 mtpa
- **Start-up:** 2008

**Sinopec Zhenhai Refining & Chemical Co. Ltd**
- **Location:** Zhenhai, Zhejiang
- **Capacity:** 800,000-1000,000 mtpa
- **Start-up:** 2009

**Sinopec Wuhan Company**
- **Location:** Wuhan, Hubei
- **Capacity:** 800,000 mtpa
- **Start-up:** 2010

**Dalian Shide Group, Ethylene Project**
- **Location:** Dalian, Liaoning
- **Capacity:** 1,300,000 mtpa
- **Start-up:** 2010

**Sinopec Shanghai Chemical Park Ethylene Project**
- **Location:** Shanghai
- **Capacity:** 1,000,000 mtpa
- **Start-up:** 2010

**PetroChina Chengdu Ethylene Project**
- **Location:** Chengdu, Sichuan
- **Capacity:** 800,000 mtpa
- **Start-up:** 2010

*Planned Start-up Year is 2008-2010, But Might Delay!*
Ethylene Capacity

Longer-term Increases in Capacity Dominated by New Plants

(Thousands of Metric Tons/Year)
Ethylene Supply Situation

- Production Increased at AAGR of 10.4% from 1990-2004
- Production Will Increase at AAGR of 12.7% from 2004-2014
- The Percentage of Domestic Supply of Ethylene Over Total Ethylene Equivalents Consumption is Increasing
  - 38% in 2004
  - 63% in 2014
From 2004 to 2014:
Ethylene Production grows at 12.7%
Ethylene Apparent Consumption grows at 12.9%
Ethylene Equivalents Demand Grows at 7.3%
Self-supply rates (%)  
(Ethylene Production over Ethylene Equivalents Demand)
EDC/VCM/PVC is the Fastest Growing Areas in Ethylene Equivalents Requirements

(Thousands of Equivalent Metric Tons)

Polyethylene Demand Increase Accounts for 56% of Total Growth

8.1% growth rate from 2004-2014
Ethylene Demand

New Ethylene Capacity Has Dramatic Impact on
Derivative Import Requirements

(Thousands of Equivalent Metric Tons)

- Production
- Import

2004: 5000
2009: 10000
2014: 15000

Ethylene Demand

- New Ethylene Capacity
- Derivative Import Requirements

- 14.4 Million
- 2.3 Million
Ethylene Demand

Polyethylene Single Largest Derivative Imported

(Thousands of Equivalent Metric Tons)
ETHYLENE DEMAND SITUATION

• Ethylene Self-Supply Rate will increase Dramatically.

• Future Imports Will Decrease Gradually Along With the Start-up Of New Ethylene Plants

• Ethylene Capacity Still Insufficient to Make Derivatives

-Substantial Imports of Derivatives for Next Decade

PE    PS
PVC   PET
ABS   EG
PROPYLENE SITUATION

• Capacity Grew 14.5% Per Year from 1990 through 2004
• Market Demand for Derivatives Grew Faster than Domestic Supply
• Substantial Amount of Derivatives Imported
  – Polypropylene
  – Acrylonitrile
    • n-Butyl Alcohol
    • 2-EH Alcohol
• Imported Derivatives Account for Large Amount of Total Propylene Equivalents Consumption
  – 47% in 2004
  – 33% in 2014
Propylene Demand

From 2004 to 2014:
- Propylene Production grows at 9.1%
- Propylene Apparent Consumption grows at 9.2%
- Propylene Equivalents Demand Grows at 6.6%

(Thousands of Metric Tons)
Polypropylene Demand Growth Drives Polypropylene Equivalents Requirements

(Thousands of Equivalent Metric Tons)

Polypropylene Demand Increase Accounts for 66% of Total Growth
Propylene Demand

Derivatives Production Increases Limit Import Opportunities

(Thousands of Equivalent Metric Tons)
Propylene Demand

PP & AN Imports are Real Opportunity

(Thousands of Equivalent Metric Tons)
POLYMERS SITUATION

- Domestic Demand Increased Rapidly in Past Decade
  - 11.7% Growth Rate in Past Five years
  - 7.0% in Next Ten Years

- Large Volume of Imports
  - 13 Million of 5 Main Polymers in 2004
  - 17 Million in 2014
Total Five Polymers Demand Grows at 7% per Year in Next Ten Year

(Thousands of Metric Tons)
Self-Supply Rate of Five Major Polymers will reach the highest in 2011
Import Opportunities of Five Major Polymers

(Thousands of Metric Tons)
Supply/Demand of Methanol in China

Why Methanol So Important Now?

- High Oil Price
- Technology Improvement
- Coal Reserves is Aboundant
Supply/Demand of Methanol in China

Current Situation of Methanol Producers

- More Than 100 Producers, Total Capacity 7400 Thousand Ton
- Only 8 Of Them Produced More than 100 Thousand Ton Methanol last year.
- Feedstock: Coal 58%, Natural Gas 20%, Other 22%
Current Situation of Methanol Supply

• Production In 2004, More Than 4400 Thousand Ton.

• Import 1358 Thousand Ton In 2004. Mainly From Saudi Arabia, New Zealand...
Supply/Demand of Methanol in China

Current Situation of Methanol Consumption

- Formaldehyde: 32.8%
- Fuel: 23.4%
- MTBE: 5.1%
- Solvent: 6.6%
- Acetic Acid: 8.4%
- Methylamines: 8.7%
- Chlorinated Methanes: 12.6%
- Others: 2.4%
Future Methanol Projects

- **Under Construction Projects:** 3,810 Thousand Ton.
- **Approved Projects:** 1,970 Thousand Ton.
- **Waiting for Approval Projects:** 4,000 Thousand Ton.
- **Planning Projects:** 30,000 Thousand Ton.
- **Total New Capacity:** 39,780 Thousand Ton.
Future Methanol Projects

Feedstock:

- Coal: 60%
- Natural Gas: 26%
- Other: 14%
Future Consumption Trends:

• Methanol to Olefins
• Fuel
• DME
Summary

- Chinese economy is facing challenges but the prospective growth is positive.

- China’s Petrochemical Industry Has Been Developing Very Fast and Will Continue to Grow.

- Huge Investment In Petrochemical Complex Would Dramatically Increase Domestic Supply for Most Petrochemicals

- But Continued Dependency on Imports for Next Decade

- Methanol Is Becoming More Important In Chemical Industry
Thank You !