The 1st China International Acetic Acid – Vinyl Acetate Forum

China National Petroleum & Chemical Planning Institute
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1. The Outline of Acetic Acid Industry

**Acetic acid overview--2008**

- AA capacity: about 3.80 million t/a.
- Producer number: around 18 (average capacity of 210 kt/a).
- Largest scale: Celanese, Shanghai Wujing and Jiangsu Sopo, with capacity of 600 kt/a each.
- High concentration; average scale centered.
- The methanol oxo-synthesis process roughly accounts for 75% of total capacity, and it will be fully applied in the future.

Output: 1.7124 million tons in China, up 5.18% year on year, roughly accounting for 20% of the world total.
- Import volume: 304.5kt, ↓ 38.98% year on year.
- Export volume: 23.4kt, ↓ 83.04% year on year.
- Consumption volume: 1.994 million tons, up 0.23% year on year, accounting for 25% of the world total.
- Import price (CIF): 4,278 yuan/ton, ↓ 7.70% year on year.
- Duty-paid price: 4,513 yuan/ton, ↓ 7.71% year on year.
- Market price in East China (Jan-Sep): 4,800-6,800 yuan/ton.
- Market price in East China (Oct-Dec): 3,100-3,600 yuan/ton.
- Market price in East China (Jan-Feb 2009): 2,700-2,800 yuan/ton.
1. The Outline of Acetic Acid Industry

**Production:**

**AA Output Changes in China (unit: kt)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1712</td>
</tr>
<tr>
<td>2007</td>
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<tr>
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<tr>
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<td>359</td>
</tr>
<tr>
<td>1985</td>
<td>187</td>
</tr>
</tbody>
</table>

During 1990-2000, the annual growth rate of AA output in China was 9.19%, and the growth rate during 2000-2008 was 8.91%.

**Consumption:**

**AA Consumption Changes in China (unit: kt)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
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<tr>
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<tr>
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<td>1995</td>
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</tr>
<tr>
<td>1990</td>
<td>346</td>
</tr>
<tr>
<td>1985</td>
<td>181</td>
</tr>
</tbody>
</table>

During 1990-2000, the annual growth rate of AA consumption in China was 10.84%, and during 2000-2008 was 9.45%.
1. The Outline of Acetic Acid Industry

Supply/Demand Fundamental:

China's acetic acid supply/demand changes in China (unit: kt)

Price Trend:

China's AA Prices in Recent Years (unit: yuan/ton)
1. The Outline of Acetic Acid Industry

**Price Trend:**

AA prices during Jan-Dec 2008 in China (unit: yuan/ton)

- **Import price (CIF)**
- **Duty-paid price**
- **Market price (East China)**

**Price Trend:**

Price spread between AA and feedstock in China during Jan-Dec 2008 (unit: yuan/ton)

- **Crude (Daqing Spots, Platts)**
- **Coal (from Qinhuangdao and Datong, 6000 kcal/kg)**
- **Methanol (East China)**
- **Acetic acid (East China)**
1. The Outline of Acetic Acid Industry

Margins:

AA Margin in China (unit: yuan/ton)

- Import price (CIF)
- Duty-paid price
- Market price
- Cost of AA (methanol 2,500 yuan/ton)
- Cost of AA (methanol 3,000 yuan/ton)

AA Margin during Jan-Dec 2008 in China (unit: yuan/ton)

- Import price (CIF)
- Duty-paid price
- Market price
- Cost of AA (methanol 2,500 yuan/ton)
- Cost of AA (methanol 3,000 yuan/ton)
1. The Outline of Acetic Acid Industry

**Summary:**

- Acetic acid market in China widely waved throughout 2008. The production and consumption were normal during Q1-Q3, but in Q4, AA market entered frost stage due to spreading global financial crisis and end of petrochemical industry’s booming circle, with prices slumping and demand shrinking.
- In 2008, the growth rates of Chinese AA production and consumption both hit record lows of recent years, and the trend is expected to last, but when to recover is pending.

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1. The Outline of Acetic Acid Industry

**Summary:**

- In Q1-Q3 2008, although feedstock coal and methanol had risen to high levels, the spread between AA and feedstock still remained large, while entering Q4, the spread gradually narrowed, leading the margin down.
- There are many large-scale AA units to start up by 2010, thus the competition in China will gradually become fierce, and prices will drop and margins will shrink.
2. Acetic Acid Market Analysis

**Consumption Structure:**

- China AA consumption structure in 2008
  - consumption volume=1,994kt
  - Others 25.80%
  - Acetic anhydride 9.40%
  - Chloroacetic acid 6.80%
  - Acetic ester 25.20%
  - VAM 17.00%
  - PTA 15.80%

**Capacity Locations:**

- China AA Capacity Locations in 2008
  - Output=1,712.4kt
  - Jiangsu 37.10%
  - Chongqing 19.00%
  - Hebei 3.70%
  - Heilongjiang 4.80%
  - Shanghai 23.90%
  - Jilin 5.50%
  - other areas 6.00%

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2. Acetic Acid Market Analysis

Import Origins:

- Singapore 28.48%
- Taiwan 18.46%
- Malaysia 37.22%
- Japan 6.23%
- South Korea 7.47%
- Others 21.4%

Export Regions in China:

- Jiangsu 22.70%
- Zhejiang 29.38%
- Guangdong 22.57%
- Shanghai 5.31%
- Fujian 14.87%
- Others 5.18%
2. Acetic Acid Market Analysis

**Acetic Ester:**

- Ethyl acetate/butyl acetate are the main downstream products of acetic acid, and they are also the key organic solvents, widely applied in coating, adhesives and pharmaceutical fields. In 2008, China’s coating production reached 6,380kt, ranking 2nd in the world; adhesives and printing ink industries also developed quickly, thus demand for acetic acid grew steadily;
- China’s demand for acetic ester is expected to touch 1,100kt by 2010 and 1,600kt by 2015.

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**Acetic Ester:**

- The AA units under construction or to be built in China are: Yankuang Cathay Coal Chemicals Co.’s 100kt/yr, Guangxi Xinle Petrochemicals Co.’s 100kt/yr, Chongzuo’s Kaiyuan Wine Chemicals Co.’s 80kt/yr planned; Jilin Liaoyuan’s 50kt/yr planned, Jiangsu Taixing’s 100kt/yr planned, Shandong Lunan Fertilizer’s 80kt/yr planned (to match with its 200kt/yr AA unit), ethylene project jointly invested by Shanghai Petrochemical and BP Chemicals including the plan to build a 150kt/yr ethyl acetate/butyl acetate unit.
- The development of ethanol dehydrogenation process to make ethyl acetate will lead AA to lose some market share.
2. Acetic Acid Market Analysis

**Vinyl Acetate Monomer:**

- Vinyl acetate monomer (VAM) is one of the most important organic chemical feedstocks, and it’s mainly used to produce polyvinyl alcohol (PVA), EVA resin, vinyl chloride-vinyl acetate copolymers, vinyl acetate-acrylate emulsion and polyvinyl acetate emulsion (mainly applied in adhesive, coating, paper coating, textiles processing, resin adhesive etc.)
- China’s VAM demand is expected to reach 1,850kt in 2010 and 2,600kt in 2015.

Celanese (Nanjing)’s 300kt/yr VAM project and Sinopec Sichuan Vinylon Plant’s 300kt/yr project had completed the general design. Hubei Yihua Group plans to build a 300kt/yr VAM project in Wuhai City; Fujian Textile and Chemical Fiber Group Co., Ltd plans to build a 200kt/yr VAM project; Yankuang Cathay Coal Chemicals Co.’ 100kt/yr VAM project is also under schedule.

Vinyl acetate monomer will be one of the largest fields for acetic acid application in the future.
2. Acetic Acid Market Analysis

EVA Resin:

- EVA resin is the copolymer resin from ethylene and VAM. Compared with PE, EVA resin has good softness, impact residence, environmental stress crack resistance in relatively wide temperature range, and it’s nontoxic. EVA resin has a wide application in shoes materials, thermosol, injection products, film, foam, tubular products, wires/cables and sheet etc.
- EVA resin demand in China is expected to reach 1,000kt in 2010 and 1,500kt in 2015.

2. Acetic Acid Market Analysis

EVA Resin:

- Beijing Eastern Petrochemical Co. Ltd. has an EVA capacity of 60kt/yr (Italy’s EniChem); Sichuan Vinylon Plant’s EVA capacity is 40kt/yr; Yangzi Petrochemical has built a 200kt/yr EVA unit.
- Sinopec proposed to cooperate with Dupont Packaging & Industrial Polymers to build a 60kt/yr EVA project.
- China’s EVA demand has a great potential, deserving our attention.
### 2. Acetic Acid Market Analysis

#### Purified Terephthalic Acid (PTA):
- PTA is the monomer of polyester, mainly used to produce PET resin, and the PET resin is mainly used for making fibers, packing materials (including bottle and film) and sheet. It has a large consumption as an organic feedstock.
- China’s PTA demand is expected to reach 22.5 million tons in 2010 and 36 million tons in 2015. The growth rate is mainly restricted by feedstock PX and environment.

#### Chloroacetic Acid:
- As a basic organic feedstock, chloroacetic acid is mainly applied in pesticide, medicine, dye, domestic chemical and organic synthesis etc.
- Chloroacetic acid is mainly used to produce glyphosate in pesticide field. Glyphosate is a kind of high efficient, low toxic and total-weed-control weedicide, and it has the rapidest demand growth in pesticide sector and the largest output in the world, accounting for 30% of the total weedicide market.
2. Acetic Acid Market Analysis

**Chloroacetic Acid:**

- Although glyphosate has a flourish prospect, it faces pressure and challenge from environment protection. In 2008, pesticide industry consumed about 90kt of chloroacetic acid, and the consumption volume is expected to grow to 110kt and 150kt in 2010 and 2015 respectively.

- Chloroacetic acid demand from carboxymethyl cellulose (CMC) and carboxymethyl starch sector is expected to reach 70kt in 2010 and 100kt in 2015.

- The demand from pharmaceutical industry is forecasted to total 30kt and 40kt in 2010 and 2015 respectively.

- It is expected that chloroacetic acid demand from organic synthesis and domestic chemical sectors will rise to 60kt in 2010 and to 70kt in 2015.

- Demand for chloroacetic acid from other sectors will reach 30kt in 2010 and 40kt in 2015 as forecast.

- To sum up, the total demand for chloroacetic acid in China is expected to reach 300kt in 2010 and 400kt in 2015.
2. Acetic Acid Market Analysis

Other Sectors:

- Diketene — diketene and its derivatives are major intermediates, widely applied in organic synthesis, medicine, dye, pigment and pesticide etc. At present the production and consumption of diketene and its derivatives in China have achieved certain scale and level, and China has become one of the major producing and consuming countries in the world. Diketene sector consumes 100kt of AA per year at present.

- Medicine — AA is mainly used for Penicillin G Potassium, Penicillin G Sodium, procaine penicillin, acetic acid, sulfadiazine, sulfamethoxazole, Norfloxacin, Ciprofloxacin, acetylsalicylic acid, phenacetin and caffeine etc in pharmaceutical industry, with consumption for AA of about 150kt per year.

- Dye/textiles printing and dyeing — AA is mainly used to produce disperse dye and vat dye, and also for textiles printing and dyeing. China has the largest dye production in the world, and also has a large export volume of textiles. At present AA consumption volume from dye sector is around 80kt per year.

- Synthetic ammonia — in the process, AA is used to refine hydrogen and nitrogen by chemisorbing the little CO and CO$_2$ in the form of copper acetate-ammonia solution. Many medium- and small-sized ammonia units are adopting the process now. AA consumption in synthetic ammonia is around 40kt per year.
2. Acetic Acid Market Analysis

Other Sectors:

- Others — other application fields for AA include various acetates, pesticide and photography etc. At present the combined consumption volume in these sectors is roughly at 140kt per year. China is a net exporter for acetates.

During 2007-2010, annual growth rate of AA demand is expected to be 12.07%, and the rate during 2010-2015 is expected to be 9.95%. The growth rate is relatively high in the late three years of “11th five-year plan” period, mainly driven by PTA, EVA and VAM projects.
2. Acetic Acid Market Analysis

**Supply:**

- During 2008-2010, the newly added AA capacity is anticipated to be around 3,000kt/yr, hereinto, 1,250kt/yr in 2008, 1,400kt/yr in 2009, and the total AA capacity will reach 6,800kt/yr in 2010.
- BP Yangtze River Acetyls Company’s capacity will expand from 400kt/yr to 1,050kt/yr; BP Nanjing’s 500kt/yr AA project will start up in June 2009; Celanese’s capacity will increase to 1,200kt/yr from 600kt/yr; the capacity of Jiangsu Sopo will also grow to 1,200kt/yr from 600kt/yr; Shandong Yankuang’s capacity will expand to 1,000kt/yr from 600kt/yr.

**Supply/demand Balance:**

Forecast for supply/demand of China's glacial acetic acid, kt

- China’s AA supply will excess demand in the future, and export volume will sharply increase, with less imports. The competition will become fiercer.
2. Acetic Acid Market Analysis

**Summary:**

- AA market is expected to welcome rapid growth in the consumption from PTA, VAM, EVA resin and acetic ester sectors. The growth rate and market consumption in other sectors are relatively low.

- China’s AA market will see oversupply in 2010, thus expanding exports is a way for enterprises to seize market share.

- Due to long supply, AA prices are anticipated to lose, leading to narrower margins.

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2. Acetic Acid Market Analysis

**Summary:**

- Amid global economic downturn, AA consumption industries, like building construction (coating and adhesive), textile (PTA) and shoemaking (EVA), will see slowdown in demand growth, which will have heavy impact on AA market.
3. Existing Problems and Investment Opportunities

- As coal chemical industry developed rapidly these years, its basic product — methanol saw quick capacity expansion. However, the consumption growth speed was slower than the capacity expansion speed, leading many methanol enterprises to build AA projects so as to extend methanol chain. Therefore, AA capacity was over-increased, laying pressure and challenges on AA enterprises.

- Most domestic AA producers are passive in competition due to lack of own technologies for AA and downstream derivatives. (Both BP and Celanese have independent intellectual property rights of their AA and derivatives production technologies.)

3. Existing Problems and Investment Opportunities

- On lack of downstream support, Chinese AA enterprises are passive in the competition. Multinational companies have complete industry chain, e.g. Celanese has downstream derivative units of VAM, EVA and emulsion etc; BP has acetic ester and large-scale PTA units, which can consume its own AA products.
3. Existing Problems and Investment Opportunities

- In order to maintain leading position in the market, AA producers must take low-cost strategy, that is to say, using standardized products to maximize market share. Following methods can be referred to achieve the target:

  - **Integration:** In an integrated production chain, feedstock methanol and CO can be gotten from internal companies, and production costs can be effectively axed. Using natural gas and coal as feedstock to produce methanol and CO through transition and gasification, and provide the basic feedstock and special gas to AA production, so that it will carry out the optimum combination of production elements and take full effect of coordination.

- **To transfer to China’s midwest with rich coal and natural gas:** to lower AA production costs through cheap resources and energy.

- **Large capacity scales** According to the developing tendency of AA industry both at home and abroad, it becomes necessary to develop large-scale units. Celanese has 1,200kt/yr AA capacity in US and 500kt/yr capacity in Singapore. Large scale can reduce investment per unit capacity, as well as the facility depreciation expense in products’ costs.
3. Existing Problems and Investment Opportunities

- Lower investment for per unit product directly reduces amortization charge and other fixed costs. Taking depreciation period as 15 years, the depreciation charge of a 100kt/yr AA unit is 630 yuan/ton, while of a 200kt/yr unit is 320 yuan/ton and a 600kt/yr unit is only 130 yuan/ton, showing products’ cost differential of 200-500 yuan/ton.

- The most direct method to realize large scale, besides expanding reactor size, is to change catalyst system and add catalyst promoter, in order to operate with less water, decrease materiel circulating and carry out long-lived operation.

3. Existing Problems and Investment Opportunities

- Upstream integration, to get cheap methanol feedstock. China’s AA enterprises that use methanol oxo-synthesis process mostly purchase methanol from suppliers. Taking a 200kt/yr methanol project for example, methanol production cost is below 1,800 yuan/ton, based on raw coal of 400 yuan/ton.

- Methanol industry saw investment fever in recent years and most of the investments focus on coal rich regions as methanol is the first choice for coal to develop C1 products, but most methanol units are lack of downstream support. Thus, AA producers can build methanol units by themselves or through joint ventures, to get cheap methanol resources.
3. Existing Problems and Investment Opportunities

- **Downstream integration, to lessen and pass on market risks.** By 2010, China’s AA industry will face oversupply, fierce competition and shrunk margins. To solve the issues, AA producers can try to extend business downstream, like VAM, acetic ester, chloroacetic acid and acetic anhydride etc, to pass on the risks of a single AA product.

- We have paradigm of extending AA business to acetic ester, chloroacetic acid and acetic anhydride etc, and such downstream integration should be encouraged in the future. However, there are few AA producers to extend production to VAM in China. In contrast, overseas leader Celanese has the world largest scale in both AA and VAM production.

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**Thank you!**

China National Petroleum & Chemical Planning Institute
Assistant Chief Engineer
Liu Yanwei
Tel: +86-10-64280159
Mobil Phone: 8613901284958