WILL NEW CHINESE PROPYLENE OXIDE (PO) TECHNOLOGY IMPACT THE WORLD BALANCE?

RHIAN O’CONNOR
SENIOR ANALYST, ICIS CONSULTING AND ANALYTICS, LONDON

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KUALA LUMPUR CONVENTION CENTRE, MALAYSIA
Corporate Structure

ICIS is an independent data and analytics provider focusing on global energy, petrochemical and fertilizer markets.

More than 35 years in petrochemical benchmarks
Global Presence, Local Insight

- More than 35 years of industry insight and data
- Over 100,000 industry customers
- Robust methodologies and editorial standards in compliance with IOSCO
- Over 9,200 price assessments in 1,200 reports covering 180 commodities
- Primary sourced from thousands of market participants
- 27,000+ annual news stories
- Unique news stories
- Leading benchmarks provider
- 600+ global employees and over 350 journalists engaged in reporting market prices and news
Market intelligence to support your commercial planning & decision making

- Pricing intelligence
- Training and Conferences
- Consultancy
- Analytics Solutions
- Supply and Demand
- News
Critical information as it’s needed

**Transactional**

- Pricing Intelligence:
  - Chemical price reports
  - Energy market reports
  - Fertilizer price reports
  - Chemical price alerts
  - Price history

- News:
  - Global real-time news service

**Short-Mid Term Planning**

- Pricing Intelligence:
  - Outlook chemical reports
  - Outlook fertilizer reports
  - Chemical forward curves
  - Price history

- Analysis and Forecasting:
  - Price forecast reports
  - Margin reports
  - Petrochemicals Analytics Solutions
  - Power and Carbon Analytics
  - LNG Solution
  - Training & conferences

**Long Term Planning**

- Pricing Intelligence:
  - Outlook chemical reports
  - Outlook fertilizer reports
  - Chemical forward curves
  - Price history

- Analysis and Forecasting:
  - Supply and demand database
  - Annual studies
  - Consulting
  - Scenario Studies
The ICIS Supply and Demand Database delivers an end-to-end perspective of the global petrochemical markets, covering 160 countries and over 100 products.

Data includes:
- Historical and forecast data (1978-2030)
- Petrochemical trade flows and patterns
- Import, export and consumption volumes
- Plant capacity, production and operating status
- Upcoming plants, including speculative and announced projects
- Data breakdown by country, region, product or product family
- Key information on over 12,000 refinery units, and 18,500 petrochemical plants
- GDP, population, and consumer price index by country
ICIS Price Forecast Reports

Choose ICIS price forecast reports for all of the following:

- Settling contract prices
- Reviewing your market position
- Making production or commercial decisions
- Buying or selling with confidence
Agenda

- What are the PO technologies in China?
- Will PO production in China match consumption?
- Will this impact world supply balance and trade?
The Technologies
## PO Technologies

<table>
<thead>
<tr>
<th></th>
<th>First Generation</th>
<th>Second Generation</th>
<th>Third Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technologies</strong></td>
<td>Propylene chlorohydrin</td>
<td>Propylene oxide styrene monomer (POSM), Propylene oxide t-butyl alcohol (PO-TBA)</td>
<td>Cumene hydroperoxide, hydrogen peroxide</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td>Widely available technology</td>
<td>Cleaner, economical to run with lowest cash costs</td>
<td>Clean, large plants with low capital costs</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>Dirty, small, needs access to chlorine</td>
<td>By-products styrene and MTBE which may not be easy to sell</td>
<td>Licences tightly held, cash costs higher than second generation</td>
</tr>
<tr>
<td></td>
<td>Fines for environmental non-compliance</td>
<td>High capital costs</td>
<td></td>
</tr>
</tbody>
</table>

Source: ICIS Consulting
Cash costs per technology

Cash costs - NE Asia

Source: ICIS Consulting
PO supply from each technology

Source: ICIS Petrochemicals Supply/Demand Database
## China – POSM plants

<table>
<thead>
<tr>
<th>Date</th>
<th>Operator</th>
<th>Capacity (kta)</th>
<th>Location</th>
<th>Licence holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>CNOOC Shell</td>
<td>320</td>
<td>Huizhou, Guangdong</td>
<td>Shell</td>
</tr>
<tr>
<td>2019</td>
<td>CNOOC Shell</td>
<td>320</td>
<td>Huizhou, Guangdong</td>
<td>Shell</td>
</tr>
<tr>
<td>2010</td>
<td>ZRCC Lyondell</td>
<td>285</td>
<td>Zhenhai, Zhejiang</td>
<td>Lyondell / Arco</td>
</tr>
<tr>
<td>2022?</td>
<td>ZRCC Lyondell</td>
<td>285</td>
<td>Zhenhai, Zhejiang</td>
<td>Lyondell / Arco</td>
</tr>
<tr>
<td>2022</td>
<td>North Huajin Chemical Industries</td>
<td>200</td>
<td>Panjin, Liaoning</td>
<td>Repsol</td>
</tr>
<tr>
<td>2022?</td>
<td>Dagu Chemical</td>
<td>200</td>
<td>Tianjin, Tianjin</td>
<td>Repsol</td>
</tr>
<tr>
<td>2020</td>
<td>Sinochem Quanzhou PC</td>
<td>200</td>
<td>Quanzhou, Fujian</td>
<td>Chinese tech</td>
</tr>
<tr>
<td>2020</td>
<td>Wanhua Chemical</td>
<td>300</td>
<td>Yantai, Shandong</td>
<td>Chinese tech</td>
</tr>
<tr>
<td>2019</td>
<td>Dongming Zhongxin Guoan Ruihua New Material</td>
<td>80</td>
<td>Heze, Shandong</td>
<td>Chinese tech</td>
</tr>
</tbody>
</table>

Source: ICIS Petrochemicals Supply/Demand Database
## China – HPPO plants

<table>
<thead>
<tr>
<th>Date</th>
<th>Operator</th>
<th>Capacity (kta)</th>
<th>Location</th>
<th>Licence holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Jishen Chemical</td>
<td>3 x 100</td>
<td>Jilin, Jilin</td>
<td>Evonik/Degussa-Uhde</td>
</tr>
<tr>
<td>2021</td>
<td>Jishen Chemical</td>
<td>100</td>
<td>Jilin, Jilin</td>
<td>Evonik/Degussa-Uhde</td>
</tr>
<tr>
<td>2015</td>
<td>Sinopec Changling</td>
<td>100 (Running intermittently)</td>
<td>Yueyang, Hunan</td>
<td>Chinese tech</td>
</tr>
<tr>
<td>2018</td>
<td>Sinopec Jinling</td>
<td>200</td>
<td>Huaian, Jiangsu</td>
<td>Chinese tech</td>
</tr>
<tr>
<td>2019</td>
<td>Blue Planet Eco Materials</td>
<td>400</td>
<td>Changzhou, Jiangsu</td>
<td>Chinese tech</td>
</tr>
<tr>
<td>2020</td>
<td>Jiangsu Yida</td>
<td>150</td>
<td>Taixing, Jiangsu</td>
<td>Chinese tech</td>
</tr>
<tr>
<td>2023?</td>
<td>Jiangsu Yida</td>
<td>200</td>
<td>Taixing, Jiangsu</td>
<td>Chinese tech</td>
</tr>
<tr>
<td>2020</td>
<td>Fujian Gulei</td>
<td>300</td>
<td>Zhangzhou, Fujian</td>
<td>Unknown</td>
</tr>
<tr>
<td>2021?</td>
<td>Shangdong Huatai</td>
<td>200</td>
<td>Dongying, Shandong</td>
<td>Chinese tech</td>
</tr>
</tbody>
</table>

Source: ICIS Petrochemicals Supply/Demand Database
China - challenges

Can Chinese tech plants produce good quality material?

- A number of China tech HPPO pilot plants have been set up historically e.g. Dagu - unsuccessful
- Sinopec HPPO process – quality not good enough for polyols
- Main test of HPPO is the Blue Planet Eco Materials 400,000 tonne/year plant. The licence is from the Dalian Institute of Chemical Physics and the Chinese Academy of Science

The Chinese government is promoting the HPPO route of PO production. In November 2015, it announced that imported propylene used in the export of PO produced via the HPPO route will be exempt from 16% VAT (value added tax) and import duties.
China - challenges

Can Chinese tech plants produce good quality material?

▶ POSM units similarly unknown quality PO – first to start in 2019 maybe?

▶ Smaller PO to styrene ratios

▶ BUT styrene prices are supported by anti-dumping duties (ADDs) introduced from February 2018

▶ Hong Bao Li’s technology is unknown. Start up of 120,000 tonne/year plant has been delayed now maybe Q4 2018
China’s PO supply balance
China – huge consumer, still short

China PO SD balance

Source: ICIS Petrochemicals Supply/Demand Database
China – huge consumer, still short

PO Consumption

Source: ICIS Petrochemicals Supply/Demand Database
China – balance assumptions

Increase in capacity either increase in production or fall in rates

- We have assumed operating rates fall – why?
  - Unknown quality and reliability of new plants
  - High number of old, dirty chlorohydrin plants with strong environmental regulations
  - Growth in modern supply in Thailand, South Korea – smaller export markets

We have kept a small but decreasing trade deficit in China

Picture could change with measures like ADDs or if a lot of older plants shut
China - trade

China imported 230,000 tonnes of PO in 2017

Source: ICIS Petrochemicals Supply/Demand Database
China - trade

PO imports into China 2017

Source: ICIS Petrochemicals Supply/Demand Database
Asia and Global Balance

Global PO operating rates

Source: ICIS Petrochemicals Supply/Demand Database
Asia and Global Balance

Global PO capacities

Source: ICIS Petrochemicals Supply/Demand Database
Asia and Global Balance

Source: ICIS Petrochemicals Supply/Demand Database
Conclusion

- A lot of Chinese PO to come online using untried Chinese POSM/HPPO or other techs
- The reliability and quality of product is yet to be seen
- It is likely to lead to a dip in operating rates although we believe China will still be a net importer
- Global operating rates could also weaken as units come online in Thailand and India
THANK YOU!

Contact us

Rhian O’Connor
Senior Analyst
ICIS Analytics & Consulting
Tel: +44 79 2007 8331
Email: Rhian.OConnor@icis.com

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