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Production Pattern of EG in China has Changed Significantly

Ethylene glycol(EG) is the raw material for the production of polyester (PET). As the world's PET manufacturing center, China has a huge demand for EG. In 2014, China's total EG consumption reached about 12.87 Mt, of which 95% was used for the production of PET. Because of a high demand for EG in China, the domestic production of the EG can not meet the domestic demand. As a result, China needs to import large quantities of EG every year. In 2014, China's EG imports reached up to 8.45 Mt, creating a record high.

1. Raw material routes become diversified Production pattern changes

In 2014, there were 24 major EG producers in China, with a total production capacity of 5.522 Mt/a, of which the petroleum ethylene method-based capacity was 3.972 Mt/a, accounting for 72% of the country's total EG capacity; the syngas-to-EG (including coal-to-MEG) capacity was 1.05 Mt/a, accounting for 19% of the total; and the MTO-to-EG capacity was 500 kt/a, accounting for 9% of the total.(Note: kt: 1 thousand metric tons; kt/a: 1 thousand metric tons/year; Mt/a: 1 million metric tons/year;the same hereinafter)

In recent years, the raw material routes of EG production in China have undergone significant changes. For example, the proportion of the petroleum ethylene method-based capacity in China's total EG capacity reduced from 100% a few years ago to 72% in 2014. But in terms of the overall operating condition of EG plants in China in 2014, petroleum ethylene method-based EG plants ran steadily and occupied a high market share; but most syngas-to-EG plants still ran unsteadily and their products could not be 100% used for the production of fiber-grade PET. So the syngas-to-EG production technology need be further improved in the future.

Most EG producers in China are still state-owned large-scale petrochemical enterprises. Of them, 10 are Sinopec's subsidiaries (including joint ventures BASF-YPC Co., Ltd. and Sinopec-SABIC (Tianjin) Petrochemical Co., Ltd.), having a combined capacity of 2.843 Mt/a, accounting for 51% of China's total EG capacity; 5 are PetroChina's subsidiaries, having a combined capacity of 829 kt/a, accounting for about 15% of China's total EG capacity; 1 is CNOOC's subsidiary, having a capacity of 350 kt/a, accounting for about 6% of China's total EG capacity; other enterprises have a combined EG capacity of 1.5 Mt/a, accounting for 27% of China's total EG capacity. Sinopec is still the main EG producer in China, but its market share has reduced significantly compared with a few years ago.

Major EG producers and their capacity in China in 2014 are shown in Table 1.

Table 1 Major EG producers and their capacity in China in 2014

Company Name	Capacity (10kt/a)	Remarks
Sinopec Shanghai Petrochemical Company	60.5	Petroleum ethylene method
Sinopec Zhenhai Refining & Chemical Company	55.0	Petroleum ethylene method
Sinopec Yangzi Petrochemical Company	30.0	Petroleum ethylene method
Sinopec Maoming Petrochemical Company	10.5	Petroleum ethylene method
Sinopec Yanshan Petrochemical Company	8.0	Petroleum ethylene method
Sinopec Tianjin Petrochemical Company	6.3	Petroleum ethylene method
Sinopec-SABIC (Tianjin) Petrochemical Co., Ltd.	36.0	Petroleum ethylene method
BASF-YPC Co., Ltd.	30.0	Petroleum ethylene method
Sinopec Wuhan Petrochemical Company	28.0	Petroleum ethylene method
Sinopec Hubei Fertilizer Company	20.0	Syngas-to-EG
Sinopec's subtotal	284.3	
PetroChina Liaoyang Petrochemical Company	20.0	Petroleum ethylene method
PetroChina Jilin Petrochemical Company	15.9	Petroleum ethylene method
PetroChina Fushun Petrochemical Company	6.0	Petroleum ethylene method
PetroChina Dushanzi Petrochemical Company	5.0	Petroleum ethylene method
PetroChina Sichuan Petrochemical Co., Ltd.	36.0	Petroleum ethylene method
PetroChina's subtotal	82.9	
CNOOC - Shell Petrochemicals Co., Ltd.	35.0	Petroleum ethylene method
CNOOC's subtotal	35.0	
China North Chemical Industries Corp.	15.0	Petroleum ethylene method
Tongliao Gem Chemical Co., Ltd.	15.0	Coal-to-EG
Xinxiang Yongjin Chemical Co., Ltd.	20.0	Coal-to-EG
Anyang Yongjin Chemical Co., Ltd.	20.0	Coal-to-EG
Puyang Yongjin Chemical Co., Ltd.	20.0	Coal-to-EG
Ningbo Fund Energy Co., Ltd.	50.0	MTO-to-EG

Xinjiang Tianye Group Co., Ltd.	5.0	Syngas-to-EG
Shandong Hualu Hengsheng Group Co., Ltd.	5.0	Syngas-to-EG
Others' subtotal	150.0	
Total	552.2	

Compared with 2012, China's EG production pattern has now undergone significant changes. For example, the proportion of Sinopec's EG capacity in China's total EG capacity dropped from 70% in 2012 to 52% in 2014, while the combined EG capacity of other enterprises except PetroChina (or CNPC) and CNOOC raised its proportion from 6% in 2012 to 27% in 2014.

The proportions which various types of enterprises accounted for in China's total EG capacity in recent years are shown in Figure 1.

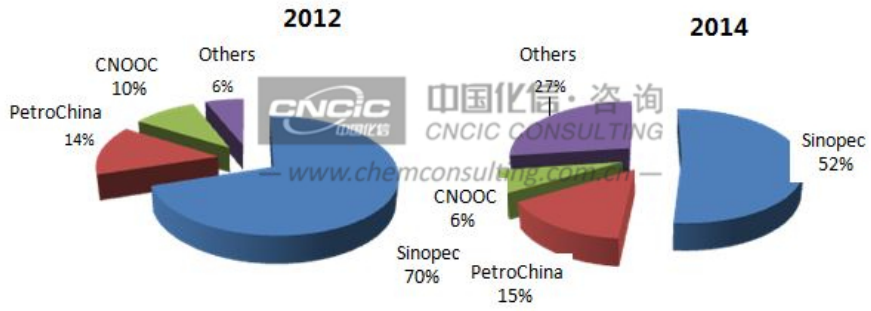

Fig. 1 Proportions which various types of enterprises accounted for in China's total EG capacity in recent years

2. Capacitygrows steadily Imports increase every year

From 2002 to 2014, China's EG capacity and output both grew steadily. In 2014, China's EG production reached 4.43 Mt, and the average operating rate of EG plants in the country was 80%, slightly increasing compared with 2013. China's EG production from 2002 to 2014 is shown in Figure 2.

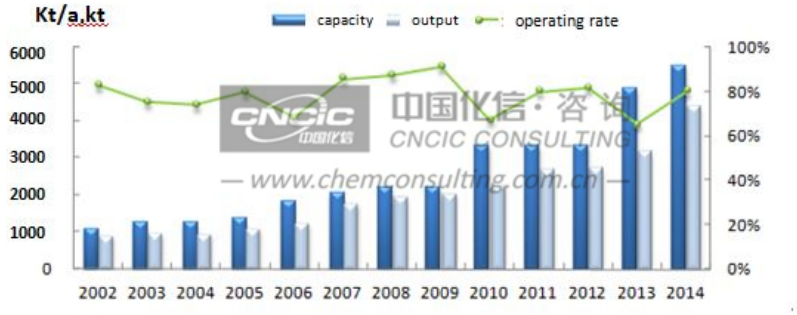

Fig. 2 China's EG production from 2002 to 2014

The supply of EG in China has been short for a long time. Although its EG capacity keeps expanding, China's EG imports grow even faster. Its EG capacity was 1.1 Mt/a in 2002 and increased to 5.522 Mt/a in 2014. At the same time, China's EG imports were 2.15 Mt in 2002 and reached 8.45 Mt in 2014. So it can be seen that EG imports have maintained a sustained, rapid growth. The changes of EG import volume and amount in China from 2002 to 2014 are shown in Figure 3.

Figure 3 shows that China's EG imports have grown steadily in the past 13 years. The main drivers for the growth are:①China has become the world's largest producer of PET, so its demand for EG is very large;②China is heavily dependent on imports of crude oil, so crude oil prices are high in the country, but most of its EG plants use the petroleum ethylene method, resulting in a high production cost of EG;③EG is a supporting product of la ethylene plants; building an EG plant needs a very high investment cost, and this means a high entry barrie

SMEs;④ large amounts ofcheap EG flow from the Middle East into China, thus suppressing the production of EG in China.

Fig. 3 Changes of EG import volume and amount in China from 2002 to 2014

3. Domestic capacity will increase gradually and dependence on imports will reduce gradually in the future

In the next few years, there will be only 6 new petroleum ethylene method-based EG projects built by Fujian Refining & Petrochemical Company Limited (FREP), China Sanjiang Fine Chemical Co., Ltd., Far Eastern Union Petrochemical (Yangzhou) Co., Ltd., Sino-Kuwait Refinery & Petrochemical Complex (Guangdong), Zhejiang Donghai Refinery & Petrochemical Complex and Sinopec Hainan Refining & Chemical Co., Ltd., respectively; these 6 new EG projects will have a total capacity of approximately 2.8 Mt/a; but there will be many syngas-to-EG projects under construction or under being proposed. According to incomplete statistics, the syngas-to-EG capacity put into production in China in 2015 ~ 2016 will reach more than 5.5 Mt/a.

It is expected that in 2015, China's new EG capacity will reach 4.27 Mt/a, of which the new petroleum ethylene method-based capacity will be 1.2 Mt/a and the syngas-to-EG capacity will be 3.07 Mt/a. By then, China's EG capacity will reach 9.79 Mt/a. With the growth of its domestic EG capacity, China is expected to further reduce its dependence on EG imports.

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