

# Butadiene: Capacity Growth Heats up Competition

DATE : 2014-04-06

In recent years more lightweight raw materials have been used to produce ethylene, and China's capacity to make synthetic rubber has increased rapidly, so butadiene has come to be in short supply here. Butadiene is normally produced in two ways: extraction distillation, which uses C4 as feedstock, and catalytic dehydrogenation of n-butylene. In China, C4-related resources are mainly owned by Sinopec and PetroChina, and most private companies and Sino-foreigner JVs are using the catalytic dehydrogenation process.

## ***Domestic capacity increased***

The many large ethylene units built in recent years now yield large quantities of C4 chemicals for China's butadiene industry. Meanwhile, the industries that consume butadiene have also grown continuously, both in number and in scale. As of the end of 2013, China's butadiene capacity reached 3.419 million t/a (see Table 1), of which Sinopec owns 1.738 million t/a, accounting for 50.8%; PetroChina, 886 kt/a, 25.9%; CNOOC, 155 kt/a, 4.5%. Many Chinese butadiene producers consume their own output. For example, PetroChina Jilin Petrochemical Co., Ltd. has SBR and ABS units; Sinopec Qilu Petrochemical Co., Ltd. has SBR and polybutadiene units; PetroChina Dushanzi Co., Ltd. has SSBR and SBS units; PetroChina Fushun Petrochemical Co., Ltd. has a SBR unit; Zibo Qixiangtengda Chemical Co., Ltd., Shandong Yuhuang Chemical (Group) Co., Ltd. and Shandong Tianhong Chemical Co., Ltd. have cis-polybutadiene rubber units.

From 2014 to 2017, many new butadiene units will be built in China. New units of Sinopec and PetroChina will use C4 extraction methods, while most units of other companies will use catalytic dehydrogenation processes. If all these projects are put into operation according to schedule, China's butadiene capacity will reach 4.95 million t/a in 2017, within which the combined capacity of units that use C4 will increase from 14.04% in 2013 to 29.9%, and combined capacity of units owned by China's three oil giants, Sinopec, PetroChina and CNOOC, will decrease from 81.2% in 2013 to 66.8%.

## ***Import volume grows***

According to customs statistics, China imported 111.2 kt of butadiene in 2007; it increased to 297.7 kt in 2009. Since then, the volume has decreased as many new units in China have come on line. It was 183 kt in 2011, down 15.16% year-on-year. In the past two years, the import volume increased dramatically, since many new butadiene rubber and SBR units started operation, increasing the domestic demand for butadiene. In 2013, the import volume was 370.5 kt, up 7.45% year-on-year. Meanwhile, some butadiene products are exported from China each year. The export volume in 2007 was 24.7 kt; it reached a historical high in 2010, 102.3 kt, up 149.5% year-on-year; it was 8.2 kt in 2013, down 79.24% year-on-year.

## ***Consumption increases continually***

In recent years, with the rapid development of China's synthetic rubber industry, the apparent consumption of butadiene increased year-by-year. It reached 2.5553 million tons in 2012, up 15.71% year-on-year. In 2013, it was 2.5406 million tons. Meanwhile, as can be seen in Figure 1, the self-sufficiency rate increased from 85.39% in 2009 to 95.09% in 2011; in 2013, it was 88.56%.

In China, butadiene is mainly used to produce rubber, SBS thermoplastic elastomers, ABS resins, etc. It is expected that, by 2017, the demand for butadiene from industries including butadiene rubber, SBR, styrene-butadiene copolymers, nitrile rubber and ABS resin will reach 3.6 million t/a. Adding the consumption in making SBR copolymers, adipic dinitrile and hexamethylene diamine, the total domestic consumption will reach 4.2 million t/a. At that time, the butadiene capacity will reach 4.95 million t/a. In the future, the manufacture of SBR and butadiene rubber will still two largest uses of butadiene, and the consumption of butadiene for the production of nitrile rubber will increase rapidly.

**Table 1 Major butadiene producers in China, 2013 (kt/a)**

### ***Company Capacity Technical process***

Sinopec Yangzi Petrochemical Co., Ltd. 210 DMF extraction

Sinopec Yanshan Petrochemical Co., Ltd. 135 ACN extraction (1 unit), DMF extraction (1 unit)

Sinopec Shanghai Petrochemical Co., Ltd. 110 DMF extraction

Sinopec Qilu Petrochemical Co., Ltd. 164 ACN extraction (1 unit), DMF extraction (2 units)

Sinopec Maoming Petrochemical Co., Ltd. 150 DMF extraction

Sinopec Guangzhou Petrochemical Co., Ltd. 34 DMF extraction

Sinopec Shanghai Gaoqiao Petrochemical Co. 45 ACN extraction

Beijing Eastern Petrochemical Co., Ltd. 30 NMP extraction

Beijing Eastern Petrochemical Co., Ltd. 120 NMP extraction

Beijing Eastern Petrochemical Co., Ltd. 120 DMF extraction

Sinopec Zhenhai Refining and Petrochemical Co., Ltd. 160 ACN extraction

Sinopec-Sabic Tianjin Petrochemical Co., Ltd. 200 ACN extraction

BASF-YPC Co., Ltd. 130 NMP extraction

Sinopec Wuhan Company 130 ACN extraction

Subtotal of Sinopec **1 738**

PetroChina Jilin Petrochemical Co., Ltd. 230 ACN extraction

PetroChina Lanzhou Petrochemical Co., Ltd. 135 ACN extraction

PetroChina Daqing Co., Ltd. 171 DMF extraction

PetroChina Dushanzi Co., Ltd. 180 NMP extraction

PetroChina Fushun Petrochemical Co., Ltd. 140 ACN extraction (1 unit), DMF extraction (1 unit)

PetroChina Fushun Petrochemical Co., Ltd. 30 ACN extraction

Subtotal of PetroChina **886**

CNOOC and Shell Petrochemicals Co., Ltd. 155 NMP extraction

Subtotal of CNOOC **155**

Bluestar New Materials Company Tianjin Branch 30 NMP extraction

Liaoning jinxing Chemical Plant 30 ACN extraction

Liaoning Hua jin Tongda Chemical Co., Ltd. 100 ACN extraction

Zibo Qixiangtengda Chemical Co., Ltd. 150 Catalytic dehydrogenation of n-butylene

Shandong Yuhuang Chemical (Group) Co., Ltd. 180 Catalytic dehydrogenation of n-butylene

Shandong Tianhong Chemical Co., Ltd. 150 Catalytic dehydrogenation of n-butylene

Subtotal of other companies 640

Total 3 419

### ***Price declined amid fluctuations***

As shown in Figure 2, in January 2012, the average price of butadiene in China was RMB21 000/t; then it climbed to the highest of the year in February, RMB27 500/t. In the remaining months of 2012, China's butadiene market was rocked by imports, pushing prices down to around RMB14 600/t in December 2012. In 2013, butadiene prices fluctuated at a relatively low level for the whole year, the highest prices were in February, averaging about RMB15 500/t.

### ***Suggestions***

The construction of so much new butadiene capacity will stoke the competition in China's market over the next few years. Enterprises are advised to accelerate the upgrade of obsolete production processes and decrease the consumption of energy and raw materials through technical innovation. Moreover, domestic industries that need butadiene, like the manufacture of propylene and adipic dinitrile, should be developed.

With more and more butadiene production units built by private companies and foreign-funded companies, more production units will use the n-butylene catalytic dehydrogenation process, which, however, has higher cost and immature processes compared to the traditional C4 extraction method. Moreover, the insufficient supply of butylene, the raw material of the butylene catalytic dehydrogenation process, may drive associated prices up in the near future. Enterprises evaluating the prospect of building new butadiene capacity that employs the butylene catalytic dehydrogenation process should consider that many experts expect a breakthrough in C4 extraction technology soon.

In recent years, the demand for butadiene in the global market has increased. Therefore, Chinese producers should actively develop overseas markets, as China still exports very little butadiene.

*SOURCE CCR*