

Development of Oleochemicals in China

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INTRODUCTION

The oleochemical industry in China has grown rapidly in the last few years. The growth was attributed to the growing demand of the oleochemical derivatives by the many industries in China. The main driving force for this growth is the increase in disposable income of the population and the strong economic growth in China for the past two decades. Production of basic oleochemicals totaled more than 1.6 million tonnes in 2010 and imports from Malaysia was more than 300 000 t in 2011. The industry is moving from producing basic oleochemicals to producing derivatives that have broad usage, excellent product performance, value-added, safe for human use, environmentally compatible and biodegradable.

The steady and rapid growth of the Chinese economy in the last 30 years has propelled the industrial development of China. The average national GDP during the period 1978-2009 was close to 9.9%. This has resulted in the growth of industries from textiles, food, automobiles, heavy machineries, chemicals, plastics, and others. The development of the oleochemical industry in China is no exception. It began

to increase in early 2000 with demands for such chemicals from the many industries. The rapid growth of the economy has led to demand for better quality and environmental friendly goods. Furthermore, the oleochemicals are derived from renewable natural sources and are environmentally safer than petroleum products. This has led to the development of many downstream oleochemical products for the chemical, rubber, plastics, textiles, surface active agents industries. Since then, the industry has grown steadily and this can be seen from the increase in the production for the basic oleochemicals such as fatty acids, fatty alcohols and fatty amines during the last five years

(Table 1). Apart from its own production China also imported a substantial amount of oleochemicals from Malaysia (Table 2).

CHINA OLEOCHEMICALS INDUSTRY

There are now more than 15 major oleochemical plants in China with capacity ranging from 60 000 t to over 200 000 t (Table 3). The fatty acid industry developed rapidly in 2008 and the total fatty acid production capacity is about 2 million tonnes in 2010. The most widely produced and used fatty acids are stearic acid, oleic acid, lauric acid and palmitic acid. Over 70% of the total fatty acids and derivatives are used in plastic additives, rubber, surfactants and textile additives. Various surfactants such as anionic (soap), cationic and amphoteric as well as non-ionic (amide and esters) are derived from fatty acids. The major fatty acid produced is stearic acid with total plant capacity of 960 000 t in 2010 with an output of 760 000 t in 2010. Stearic acid production capacity has increased considerably since 2005, substantially reducing stearic acid

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TABLE 1. CHINA PRODUCTION OF BASIC OLEOCHEMICALS (t yr⁻¹)

Oleochemical	2005	2010	Increase (%)
Fatty acids	450 000	1 167 600	159
Fatty alcohol	100 980	180 690	70.2
Fatty amines	43 100	120 500	180
Glycerol	35 000	140 390	311
Total	629 080	1 609 180	156

TABLE 2. CHINA IMPORT OF OLEOCHEMICALS FROM MALAYSIA (t)

Year	2007	2008	2009	2010	2011
Volume	258 254	258 457	365 717	309 076	315 963

TABLE 3. CHINA OLEOCHEMICAL PLANT CAPACITY 2010

Company	Capacity (t)	Main product
Yihai & Kerry	530 000	Fatty acid Fatty alcohol
Rugao Deguan	200 000	Fatty acid Fatty alcohol Fatty amines
Rugao Shuangma	230 000	Fatty acid
Taiko Palm Oleo	150 000	Fatty acid
CROC	60 000	Fatty acid
Dongma Palm	200 000	Fatty acid
Hangzhou Oils & Chemical	60 000	Fatty acid
Shanghai Soap Rubu	80 000	Fatty acid soap
Nice	100 000	Soap
Lanxi Jiabo	100 000	Soap
Deqing Huanuo	60 000	Soap
Liaoyang Huaxing	220 000	Fatty alcohol
Sasol Yihai Lianyungang	60 000	Fatty alcohol

imports. Since then, the annual import of stearic acid has stabilised at 130 000-150 000 t in 2006-2010. Almost all the stearic acid import comes from Malaysia (55%) and Indonesia (43%). The demand and supply for stearic acid has been increasing since 2005 (Table 4) but reached a lull in 2007. However, the 2008 financial crisis slowed down the demand resulting in oversupply in 2008 and 2009. The demand

recovered in 2010 and increased to 890 000 t. Although stearic acid is the major oleochemical produced, the production of other oleochemicals had also increased in the last few years. The output of the various oleochemicals in China for 2009 and 2010 showed that the industry is still growing, with the trend moving towards more downstream products (Table 5). The production of fatty alcohol and amines

has also increased substantially.

The growth of the fatty alcohol has increased substantially in the last few years. It is a major source for the production of surfactants and can be used to produce fatty alcohol ether, fatty alcohol (ether) sulfate, fatty alcohol (ether) phosphate, fatty alcohol (ether) carboxylate, fatty alcohol (ether) sulfosuccinate, alkyl glycoside (APG) fatty alcohol sulfate and fatty amines.

Soap is another major product in the Chinese oleochemical industry. China's production capacity of laundry and perfumed soap exceeded 800 000 t. The domestic demand for soap in China exceeds 700 000 t. Basically there are three categories of soap. The first are the alkali metal soaps such as sodium and potassium soap. These are mainly used for the production of perfumed soap, bath soap, household soap, soap flakes, soap powder, industrial soap, medicinal soap and soft soap. The second are the monethanol amine, diethanol amine, triethanol amine and other organic-based soap. These are used for making dry-cleaning soap, textile soap, cosmetic soap, household detergent, emulsifiers and polishing agent. The last category is the metallic soap produced with aluminium, calcium, magnesium, zinc, barium and other metals. These are used as plastic stabilisers and lubricants. However, their usage has been gradually reduced and replaced due to the toxicity of the heavy metal salts and concerns over environmental safety.

The increase in the production capacity of oleochemicals has increased the production of glycerol. Before 2005, the production of glycerol was only 35 000 t which is

TABLE 4. CHINA STEARIC ACID DEMAND AND SUPPLY (t)

Year	Supply	Demand
2005	600 000	750 000
2006	700 000	790 000
2007	720 000	850 000
2008	870 000	820 000
2009	920 000	830 000
2010	950 000	890 000

TABLE 5. CHINA PRODUCTION OF OLEOCHEMICALS (t yr⁻¹)

Oleochemical	2009	2010	Increase (%)
Fatty acids	781 600	1 167 600	49.4
Fatty alcohol	113 980	180 690	40
Fatty amines	109 000	120 500	9.7
Glycerol	158 000	188 000	18.9
Soap	883 000	800 00	-
Total	2 021 700	2 416 000	19.5

below the domestic demand. However, with the increase capacity of the various oleochemicals plants, the production capacity of glycerol has increased substantially to 254 000 t in 2010 (*Table 6*). The demand for glycerine in China is increasing every year and this has to be supplemented with imports. Glycerine is widely used in many industries such as food, pharmaceutical, cosmetic, paint and coat-

ing, tobacco, weapon, polyurethane, textile and paper. Although glycerine is widely used by the pharmaceutical and cosmetic industry in the developed countries such as United States, Europe and Japan, the major use in China is for the production of alkaloid resin. It is expected that the demand by the pharmaceutical and cosmetic industry will increase in the future as the country develops.

TABLE 6. CHINA GLYCERINE DEMAND AND SUPPLY (t)

Year	Capacity	Demand
2005	120 000	194 000
2006	140 000	227 000
2007	154 000	348 000
2008	221 000	386 000
2009	241 000	505 000
2010	254 000	604 000

The rapid growth of the oleochemical industry is attributed to the demand for many downstream products and the growth of the various domestic oleochemical derivatives manufacturers. Apart from producing the basic oleochemical, China has many small domestic manufacturers producing different oleochemical derivatives. These derivative are methyl ester sulfonate (MES), fatty alcohol ether sulfate (AES), fatty alcohol sodium sulfate (K₁₂), fatty alcohol ether sulfosuccinate, alkanolamide and amide ether, mono and diester glycol, polyglycol, propanediol, monoglycerides and polyglycerides, fatty alcohol ether, alkyl polyglucoside (APG), ethoxylated methyl esters and many more. Most of these derivative produced are mainly for local consumption.

CONCLUSION

In conclusion, it is evident from this paper that the oleochemical industry in China is a competitive and growing market. The driving force of the industry will come mainly from the demand for various oleochemical derivatives. The market trend is also moving towards environmental friendly derivatives *vis-à-vis*, simple and cleaner production technology. It is anticipated that there will be a demand for more downstream products which have broad usage, excellent product performance, value-added, environmental friendly and biodegradable.

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