

## II-1.2 Summary of CPL production

In recent decade, caprolactam industry of China developed rapidly because of the ever-increasing demand from its downstream industries such as textile industry and plastic industry. To 2006, the capacity of CPL has reached 350,000 tonnes per year, and the output of caprolactam in 2005 was ████████ tonnes. The CAGR of output in the past ten year was ██████%. The following table can show the production situation of caprolactam in China in the past.

Table II-1.2-1 Capacity/output of caprolactam in China in the past decade

Year	Capacity(t/a)	Growth rate	Output(t/a)	Growth rate
1996	135,000	0%	74,800	9.2%
1997	135,000	0%	99,500	33.0%
1998	135,000	0%	119,600	20.2%
1999	135,000	0%	113,300	-5.3%
2000	185,000	37.0%	129,600	14.4%
2001	185,000	0%	152,500	17.7%
2002	██████	█	██████	██████
2003	██████	█	██████	██████
2004	██████	██████	██████	██████
2005	██████	██████	██████	██████
<b>CAGR</b>	██████	█	██████	█

Although Chinese manufacturers have kept enlarging their capacity, it cannot satisfy the domestic demand yet. The self-sufficiency rate of caprolactam in China has varied from 7% to 45% since 1990. Every year large quantities of caprolactam have to be imported. In 2005, about 500,000 tonnes of caprolactam were imported, more than two times as domestic output.

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## II-1.3 Special findings about CPL

On the basis of detailed investigation, CCM got two important findings about Chinese CPL industry, which are

### i) Oversea large-scale CPL enterprises are taking many measures to contend for CPL market of China.

Oversea multinational companies pay much attention to information competition. They actively collect information about Chinese PA6 and filature projects which are under construction or in the plan, to make full preparation for entering the newly established enterprises. For example, BASF of Germany searches in time the project information of fetching technologies or equipment and forwardly communicates with ownership units, institutes, and manufacturers of imported equipment so that BASF can supply PA6 slice to them. As a result, PA6 slice used in

some PA6 manufacturers including Shandong Zibo Huaduan Company (12kt/a), Zhejiang Hangzhou Huaou Company (12kt/a), Shandong Jinan Bafang Group (24kt/a), is all supplied by BASF.

Oversea companies directly invest in the downstream industries of CPL and establish joint-ventures, foreign capital companies, then supply raw material to these companies. For instance, in the end of 20<sup>th</sup> century, BASF cooperated with Shanghai Huayuan Company to start up a joint-venture "Shanghai BASF Huayuan Nylon Co., Ltd." in which nylon projects with the first-stage 7kt/a and the second-stage 19kt/a were constructed. BASF supplied the raw material CPL to such joint-venture. Netherlands DSM cooperated with Guangdong Xinhui Meida Stock Co., Ltd. to construct the 45kt/a fullscale plant of PA6 slice and PA6 fibre. In terms of the agreement, DSM could supply a part of raw material "CPL" for this plant.

Some of oversea companies try to improve reserve establishments and transaction surroundings. Mitsubishi Chemical Corporation of Japan constructed liquor CPL storage tank with the capacity of 2,600 tonnes in Guangdong Province of P.R.C.

Some oversea companies directly invest in Chinese CPL manufacturers. For example, in 2000, DSM purchased 60% stock of CPL plant of Jiangsu Nanjing Chemical Group and enlarged its capacity from 50kt/a to 140kt/a.

**ii) The profit level of Chinese CPL manufacturers is currently very low along with the markup of raw materials.**

The price of petroleum increased much in recent years, which led to the markup of raw materials for CPL production including cyclohexanone and toluene. Furthermore, both cyclohexanone and toluene are related with benzene. The price of benzene was only RMB2,360/t in 1997, while it reaches RMB7,470/t in 2006. In the past decade, the CAGR of benzene price was near 14%. The markup of raw material enhanced largely the production cost of caprolactam. At present, it is claimed by domestic CPL manufacturers that they only had a very small profit.

In order to know the exact profit situation of Chinese CPL manufacturers, CCM estimated the production cost of CPL by calculating the cost for raw materials, utilities, management, labor and other items. The result showed that the profit in domestic manufacturers was only several hundred Yuan per tonne of CPL. The following table showed the cost structure of CPL in DSM Orient and Shijiazhuang Chemfibre.

Table II-1.4-1 Cost structure of CPL in DSM Orient estimated by CCM

Item		Unit Cost (RMB/kg)	% in total		
<b>Company : DSM Orient</b>					
Capacity , t/a :	140,000				
Output in 2005, t :	71,800				
Production level, t/m :	8,500				
1. Expense					
	Production Cost				
		Manufacturing costs			
			Raw materials		
				Cyclohexanone	
				Hydrogen	
				Ammonium nitrate	
				Phosphoric acid	
				Oleum	
				NH <sub>3</sub>	
		Utilities			
		Labor, package, maintenance			
	Management costs				
	Tax excluding profit tax				
		Value added tax(VAT)			
		Education added tax(EAT)			
Construction tax					
Sum of other taxes					
2. Total income					
	Sales				
		FOB CMP price			
		Return of VAT for export			
	Other income (selling byproduct: ammonium sulfate)				
3. Gross profit					
4. Profit tax					
5. Profit after tax (retained profits)					

\* Unit cost of raw material = Unit price of raw material × Unit consumption of raw material

Judging from the estimation in the above table, the profit in DSM Orient is really small. In cost structure, the cost for cyclohexanone occupies near 50 percent of total expense, so the price of cyclohexanone will seriously influence the expense of CPL production.

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