

I-2.3 Summary of Production

- About capacity and output of pentaerythritol

An overview of the pentaerythritol production capacity and output tendency in recent 7 years (2002-2008) was presented in Figure I -2.3-1 and 1-2.3-2. It can be seen from these figures that the production capacity of pentaerythritol kept steady during 2005-2007 period, however, the market demand, reflected on the output, increased by more than █% annually. It should be noticed that the output of 2006 was dramatically influenced by governmental environmental concerns and the year-on-year growth rate was only █% as several main manufacturers stopped production for months. This event finally resulted in the short supply of pentaerythritol in 2007, thus some production lines were even over loaded. Therefore new production lines of pentaerythritol were or will be established in 2007-2008 and the capacity reaches █t/a in 2008.

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I-2.4 About operation rate

On the whole, the operation rate of pentaerythritol is comparatively high in recent years (See Figure 1-2.3-2). In 2007, the total operation rate was xxx%. The operation rate of almost all main manufacturers reached 100%, especially for Yuntianhua, whose operation rate surpassed 100% for its high-grade monopentaerythritol (98%min). These data ensured the supply to meet the increasing market demand for pentaerythritol.

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Table I-2.3-2 Evaluation of the pentaerythritol producers in the recent years (% , t) (only refer to technical grade, middle grade and mono penta)

| No. | Abbr. | Op. rate 03 act. | Op. rate 04 act. | Op. rate 05 act. | Op. rate 06 act. | Op. rate 07 act. | Excess 03 act. (t) | Excess 04 act. (t) | Excess 05 act. (t) | Excess 06 act. (t) | Excess 07 act. (t) |
|---------|----------------|---------------------|------------------------|---------------------|---------------------|---------------------|-----------------------|-----------------------|--------------------------|--------------------------|--------------------------|
| II-1.1 | | | | | | | | | | | 5000 |
| II-1.2 | | | | | | | | | 1,800 | | |
| II-1.3 | | | | | 75% | | | | | | |
| II-1.4 | | | 50% | | | | | | | | |
| II-1.5 | | | | | | | -1,376 | | | | |
| II-1.6 | Liyang Ruiyang | | | | | | | | | | |
| II-1.7 | | 30% | | | | | | | | | |
| II-1.8 | | | | | | | | | | | |
| II-1.9 | | | | 79% | | | | | | | |
| II-1.10 | | | | | | | | | | | 2000 |
| II-1.11 | | | | | | 93% | | | | | |
| II-1.12 | | | | | | | | | | | |
| II-1.13 | | | | | | | | | | | |
| | Total | | | | | | | | | | |

I-3.2 Analysis on the Export Situation

I-3.2.1 Export Situation of Pentaerythritol in 2007

In 2007, China total exported 46,014t penta, with the year-on-year growth rate being █%, among which █t was dipenta, █t was monopenta accounting for █% of total exported penta. The reasons of the high growth rate of exported-penta are as follows: on the one hand some large penta manufacturers of overseas had idled, on the other hand the applications of penta in painting and coating increased quickly in recent years. Because of the rising price of raw material and the shortage of penta, The price of all kinds of the exported penta in 2007 increased with different degrees than those of 2006. In 2007, the total value of exported penta was USD █ million with the average price of █ USD/Kg.

Table I-3.2.1-1 Export volume of pentaerythritol from 2003 to 2007 (Volume: tonne)

| | 2003 | 2004 | 2005 | 2006 | 2007 |
|-----------------------|-------|-------|---------|----------|------|
| Middle Monopenta | 1,606 | | | | |
| Monopenta | | 5,483 | | | |
| Technical Monopenta | | | | 3,281.60 | |
| 85% Dipentaerythritol | | | | | |
| 90% Dipentaerythritol | | | 246.905 | | |
| Total | | | | | |

I-5 Consumption Pattern of Pentaerythritol in China

I-5.1 Market Size in Major End Use Segments

The pentaerythritol applications mainly fall into the following four sections: alkyd resin, polyurethane, synthetic lubricant and rosin oil ester. The detailed information in each application field was listed in Table 1-5.1-1.

Table I-5.1-1 Consumption structure of pentaerythritol in China 2003-2007

| End use | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | |
|----------------------|----------|------|----------|------|----------|-------|----------|---|----------|---|
| | Mass (t) | % | Mass (t) | % | Mass (t) | % | Mass (t) | % | Mass (t) | % |
| Alkyd resin | | | | | | | 90,100 | | | |
| Polyurethane | | | 5,890 | | | | | | | |
| Synthetic lubricant | | | | 0.80 | | | | | | |
| Rosin/tall oil ester | | 1.95 | | | | | | | | |
| Others | | | | | | 17.37 | | | | |
| Total | | | | | | | | | | |

I-5.2 Brief Introduction to Each Major End Use Segment

I-5.2.1 Alkyd Resin

The largest part of pentaerythritol is consumed to produce Alkyd resin, which is mainly used for coatings and paint formulation, hence the pentaerythritol production is subject to the development of coating and paint industry.

Alkyd resin synthesized by pentaerythritol has many advantages, such as fast-dry, high hardness, good-luster, etc. In 2007, the consumption of pentaerythritol in this field reached ██████ t, amounting to ██████% of total consumption. It is known by CCM that alkyd resin has two breeds, one is produced by pentaerythritol, and another is produced by glycerol. In 2007 about ██████% alkyd resin was produced by pentaerythritol.

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Table I-5.2.1-1 List of Major End Users, alkyd resin manufacturers in 2008

| Company | Products | Demand for penta (t/a) | Supplier |
|-----------------------------------|-------------|------------------------|---------------|
| [REDACTED] | [REDACTED] | [REDACTED] | Jiangsu Sanmu |
| Hunan Xiang River paint Co., Ltd. | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | alkyd resin | [REDACTED] | [REDACTED] |