

# Adipic acid

## USES

Adipic acid is used in nylon 6,6 fibres and resins, which account for nearly 65% of output. It is also used to produce polyurethanes, as a reactant to form plasticisers, lubricant components and polyester polyols. Other outlets are as a food ingredient in gelatins, desserts and other foods that require acidulation.

Worldwide, about 30% is used in carpets, 13% in manufacturing parts, 12% in apparel, 11% in plasticisers and lubricants, 7% in transportation bodies/parts, 2% in non-nylon polyamides, 2% in packaging and 1% each for pulp/paper, transportation seats/furnishings, lubricants and food.

## SUPPLY/DEMAND

Global capacity stood at 2.99m tonnes/year in 2006, says TranTech. Nearly 1.02m tonnes/year was in western Europe, followed closely by the US with 1m tonnes/year. Third is Asia-Pacific (excluding Japan), with 493,000 tonnes/year. Japan, Canada and Latin America had capacities of 172,000 tonnes/year, 170,000 tonnes/year and 80,000 tonnes/year, respectively. Planned and unplanned shutdowns in Europe and Asia kept supply tight last year, while demand into nylon and non-nylon sectors was strong.

Demand is split by 33.3%, 32%, 18.8%, 5.5%, 5%, 2.6% and 1.9% in western Europe, the US, Asia-Pacific, Japan, Canada, Latin

America and eastern Europe, respectively. The US was the largest net exporter in 2006, with 59,500 tonnes, and Asia-Pacific was the largest net importer, with 52,000 tonnes.

## PRICING

Price depends on purity. March contracts for industrial grade, with a maximum water content of 0.2%, were between €1.35–1.45/kg in Europe, 64–74 cents/lb in the US, and \$1.34–1.5/kg in Asia.

## TECHNOLOGY

Most production is by the liquid phase nitric acid oxidation of KA oil, a cyclohexanone-cyclohexanol mix. Asahi Chemical makes adipic acid by air oxidation/hydration of cyclohexane with boric acid to cyclohexanol, followed by oxidation with nitric acid. This process is licensed to China Shenma. Adipic acid is also made by the hydrocyanation of butadiene to pentenenitrile mixture, followed by hydroisomerisation to adiponitrile, then hydrogenation.

Nitrous oxide (NO<sub>x</sub>) is generated as a byproduct, and emissions are a major environmental concern. Although global adipic acid demand and capacity is increasing, NO<sub>x</sub> emissions will continue to decline substantially as producers carry on installing pollution abatement technologies.

## HEALTH AND SAFETY

Adipic acid is a white, crystalline, odourless powder. It is combustible and finely dispersed particles form explosive mixtures in air. It decomposes on heating, producing volatile acidic vapours. It is an irritant, and inhalation may cause asthmatic reactions.

## OUTLOOK

Global demand is forecast to grow by 6%/year to 2010. Expected annual growth is 12% in Asia-Pacific, 8.5% in Asia/Middle East, 8% in Australia/New Zealand, 6% in Latin America and eastern Europe, 4.6% in western Europe and 4.3% in the US.

This year in China, Xinjiang Dushanzi Tianil and ExxonMobil/Sinopec/Aramco will start plants of 70,000 tonnes/year and 20,000 tonnes/year, respectively. But capacity will be short by 2010 as poor profitability has kept investment lagging demand.

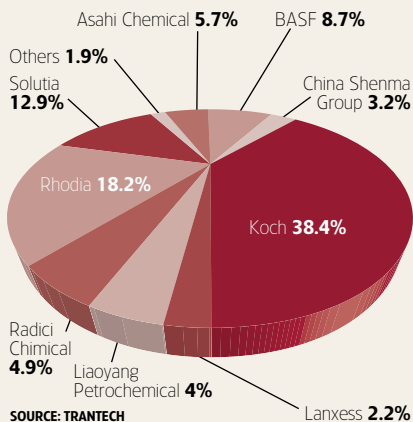
## GLOBAL ADIPIC ACID CAPACITY '000 TONNES/YEAR

| Company                     | Location               | Capacity |
|-----------------------------|------------------------|----------|
| Adarsh Chemical             | Surat, India           | 1        |
| Asahi Chemical              | Mizushima, Japan       | 170      |
| Azot Severodonetsk          | Severodonetsk, Ukraine | 28       |
| BASF                        | Ludwigshafen, Germany  | 260      |
| China Shenma Group          | Jiujiang, China        | 90       |
| Inolex                      | Hopewell, Virginia, US | 18       |
| Jiangsu Euiomoda Paint      | Wuxi, China            | 0.5      |
| Koch                        | Maitland, Canada       | 170      |
|                             | Orange, Texas, US      | 220      |
|                             | Pulau Sakra, Singapore | 120      |
|                             | Victoria, Texas, US    | 365      |
|                             | Wilton, UK             | 220      |
| Lanxess                     | Leverkusen, Germany    | 68       |
| Liaoyang Petrochemical      | Liaoyang, China        | 140      |
| Liaoyang Tiancheng Chemical | Liaoyang, China        | 0.3      |
| Ningbo Fulante Nylon Resin  | Ningbo, China          | 0.5      |
| Radici                      | Novara, Italy          | 70       |
|                             | Zeitz, Germany         | 80       |
| Rhodia                      | Chalampe, France       | 320      |
|                             | Paulinia, Brazil       | 80       |
|                             | Ulsan, South Korea     | 140      |
| Rivneazot                   | Rivne, Ukraine         | 28       |
| Solutia                     | Pensacola, Florida, US | 400      |
| Sumitomo                    | Niihama, Japan         | 2        |
| Taiyuan Chemical            | Taiyuan, China         | 2        |

SOURCE: CHEMPLAN

## GLOBAL MARKET SHARES FOR ADIPIC ACID IN 2006

Total world demand: 2.57m tonnes



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Profile last published 25 March 2002