



**ACHEMASIA 2004
organized in Beijing, China:
The most comprehensive
exhibition and congress for the
process industries**

DECHEMA Society for Chemical Engineering and Biotechnology is a non-profit scientific and technical society based in Frankfurt on Main, Germany. It was founded in 1926. Meanwhile it has over 5,000 private and institutional members. DECHEMA is an interdisciplinary platform for scientists, engineers and technologists. The society is dedicated to the support of research, teaching and technological progress in chemical engineering and biotechnology. DECHEMA serves as a network for technology transfer between research and industry, especially SMEs.

Based on the ACHEMA concept, DECHEMA organizes the following International Exhibition-Congresses on Chemical Engineering and Biotechnology on three continents under the label "ACHEMA worldwide":

ACHEMA – International Exhibition-Congress on Chemical Engineering, Environmental Protection and Biotechnology held every 3 years in Frankfurt on Main/Germany – the world's most important chemical engineering event with over 4,000 exhibitors and more than 200,000 visitors

AchemAsia – International Exhibition-Congress on Chemical Engineering, Environmental Protection and Biotechnology held every 3 years in Beijing/PR China – the gateway to China's process industry

ACHEMAMERICA – International Exhibition-Congress on Chemical Engineering, Environmental Protection and Biotechnology held every 3 years in Mexico-City/Mexico – Latin America's leading event for the process industries.

ACHEMASIA is part of the 'ACHEMA Worldwide' concept on three continents – Asia, Europe and North America in a three-year cycle. This is what gives to AchemAsia forum its truly worldwide scale. The international character of ACHEMASIA makes it the key event of its kind in China and, therefore, of special significance for the Chinese economy.

AchemAsia –Gateway to the Asian Growth Markets

China is paving its way to become a global industrial player by backing high technology, technology transfer, modernisation and the expansion of existing production capacity. This is opening up tremendous opportunities not only for large international companies, but also for smaller and medium-sized companies and service providers in this growth market. The AchemAsia exhibition and congress were tailored to fit this favourable business climate.

The congress – a blend of practice-oriented workshops and business meetings

Once again a congress complemented the comprehensive exhibition. The congress presented the latest, application-oriented research results from the following sectors: pharmaceutical engineering, separation technology, biotechnology, environmental technology and water treatment. Furthermore there were specific meetings on topics, such as sustainable water management for industry and municipalities, clean energy conversion (gasification of coal and biomass, synthetic fuels and petrochemicals from syngas, low-emission energy production), modern plant engineering for pharma production. Workshops with high-ranking representatives from industry, research and management provided an opportunity to discuss current trends and opportunities for cooperations.

Organiser backed by diverse partners

The event organiser, DECHEMA (Society for Chemical Engineering and Biotechnology, Germany), was preparing for AchemAsia in close cooperation with an impressive number of Chinese and international partners. With CIESC (Chemical Industry and Engineering Society of China) as the co-organiser and diverse supporting institutions, such as CCATA (China Chemical Anticorrosion Technology Association), CCPIT-CIEC (China Council for the Promotion of International Trade – China International Exhibition Centre), CAST (China Association for Science and Technology, China Petroleum and Chemical Industry Association, SINOPEC China Petro-Chemical Corporation, CPI Chemical Planning Institute, CITIC China International Trust and Investment Corpora-

tion, Chinese ministries and around 20 further eminent technical organisations from Asia and the whole world.

More usefull information from this event

International Exhibition–Congress on Chemical Engineering and Biotechnology was held for the sixth time in Beijing/PR China from 11 to 15 May 2004 at the China International Exhibition Center. It was the foremost exhibition in Asia for the chemical processing industries, plant engineers and technology suppliers.

More than 400 exhibitors from 25 countries makes it the key event of its kind in China and, therefore, of special significance for the Chinese economy. Four halls with a total of 6855 square metres' net exhibition space were fully booked. The greatest number of exhibitors came from China (170) and Germany (135). Large contingents with more than 10 exhibitors each also came from the UK, France, USA, Switzerland and Australia. Some 20,000 visitors were expected.

The main thrusts of the exhibition were chemical apparatus and plant construction, process technology, petrochemistry, maintenance and quality assurance, environmental protection, water treatment, pharmaceutical technology, biotechnology, the food industry, agrochemistry, laboratory and analytical techniques, packaging and storage techniques.

The plant and equipment industries are currently profiting from the favourable economic climate. In the priority sectors set by the Chinese economy, the chemical industry, pharmaceutical engineering, petrochemistry, food technology, biotechnology and environmental protection, there is an serious need for equipment, technologies and know-how. Against this background ACHEMASIA 2004 was the ideal show case for the equipment sector for establishing and consolidating contacts and collaborative ventures in the fast-track economic region of China.

The accompanying scientific conference and workshops held by the exhibiting companies gave the trade visitors a plenty of opportunity to exchange experience on a high level. Specific business meetings on topics, such as Water Management for Industry and Municipalities, Clean Energy (gasification of coal and biomass, synthetic fuels and petrochemicals from syngas, low-emission energy production) and Biotechnology, with high-ranking representatives from industry, research and management provided an opportunity to discuss current trends and opportunities for cooperations.

The event organisers, DECHEMA (Society for Chemical Engineering and Biotechnology, Germany), and CIESC (Chemical Industry and Engineering Society of China) were preparing for AchemAsia in close cooperation with Chinese ministries and around 20 further eminent technical organisations from Asia and the whole world.

The chemical industry as a catalyst for economic growth in China

High technology, technology transfer, modernisation and expansion of current capacity are the foundations of China's progress towards a globally-competitive economy. In the chemical industry, petrochemicals, pharmaceuticals, food technology, biotechnology and environmental protection – all priority sectors of the Chinese economy – there is a huge need for equipment, technology and know-how. The machinery and chemical equipment industries are already profiting from these trends, and ACHEMASIA 2004 were an essential link between the Chinese process industries and foreign suppliers of equipment and technology. As by far the most comprehensive and international exhibition and congress for China's process industries, ACHEMASIA is a unique key to the huge and growing Chinese market.

China's chemical industry is world-scale in terms of both size and growth rate, and accounts for an impressive 10% of the country's GNP. Sales in 2002 were worth RMB 721 billion, up by 15.7% on the previous year. The total production value of China's chemical industry is increasing at 8–9% per year.

Traditional inorganic and organic chemicals account for 48% of the total. Demand for some coal-based chemicals is still heavy, largely thanks to the fertiliser industry. Next in importance are petrochemicals and natural gas (20%), pharmaceuticals (17%) and artificial fibres (9%).

There are tens of thousands of chemical companies in China, and more than 10,000 of these are joint ventures. Some \$30 billion is invested in China's chemical industry every year, of which foreign investment accounts for 55–60%. There are nearly 80 different commodity chemicals on the market, or 137 if petrochemicals and fibres are included.

Imports and exports are also increasing rapidly, with imports totalling \$32.8 billion (14% of GNP) and exports \$19.5 billion in 2001. China's chemical output is already substantial and is rising year-on-year as shown in Table 1.

Table 1. Output of China's top chemical products in 2001 and 2002

Product	2001 (10,000 t/y)	2002 (10,000 t/y)
Fertilisers	3396	3665
Sulphuric acid	2651	2967
Sodium carbonate	906	1018
Sodium hydroxide	738	823
Benzene	199	213
Methanol	206	211
Acetic acid	86	84
Ethylene	480	541
Synthetic resins	1204	1366
Synthetic fibres	427	493
Synthetic rubber	105	116

An important factor in the continuing transformation of the Chinese chemical industry is investment from abroad, in both foreign-owned plants and joint ventures. Co-operation with European firms has been more successful than with those from the US and Japan.

Much investment is concentrated in chemical parks, in which several chemical plants benefit from shared raw materials and other resources. Despite this, many of China's chemical parks have lost some of their former dynamism and would benefit from revitalisation. An example of a successful project is Caojing Chemical Park in Shanghai.

New plant construction is still concentrated in the more developed south-east of the country, especially the Changjiang and Zhujiang deltas. In contrast, most of mid-western China remains unexploited by the chemical industry.

Industry structure

The report *Analysis of the Economics of the Petrochemical and Chemical Industry in China* gives an insight into the current structure of the industry, and how this is changing.

In 2002 there were 14,985 petrochemical plants, both state-owned and private, with individual sales of over RMB 5 million. These plants recorded total sales of RMB 469,754 million, an increase of 14.7% on 2001.

There were also 13,930 chemical companies outside the petrochemical sector, with a combined sales total of 187,662 million RMB, an increase of 16.8% on the previous year.

In fact, almost every part of the chemical and associated industries grew by 14% or more in the year to 2002. The largest increases were in basic chemicals (17%), organics (16%), rubber (17%), mining (22%) and speciality chemicals (23%).

Total sales of petroleum and chemical industry products reached RMB 1,458,692 million, an increase of 8.8% on 2001. The chemical industry accounted for half of this (RMB 721,604 million, an increase of 15.7% on 2001).

The most important provinces for the chemical industry are Jiangsu, Shandong and Guangdong, whose 2002 shares of total sales were 19%, 13% and 9% respectively.

Imports of chemicals in 2002 were worth \$41,169 million, a rise of 26% on 2001, while exports were \$21,007 million, an increase of 14% on 2001.

The number of state-owned chemical companies in 2002 was 3,346, a fall of 547 from 2001. The proportion of industry output attributable to these companies also fell by 3%, to 45%, but the state-owned companies are still the leaders among Chinese chemical manufacturers.

State capital accounted for 64% of the industry total in 2002, and foreign capital a further 17%. These fig-

ures are very much an average; most foreign investment goes into small plants and high-value products such as fine chemicals, so the splits are different in the various industry sectors.

In 2002 there were 14,527 large petroleum and chemical plants, of which 787 were classified as very large. These large plants account for 5.4% of the total number of chemical plants, but 71% of the capital, 66% of sales and 80% of profits in this sector. And there were 1,311 medium-sized plants, making up 9–10% of the industry in terms of number, capital and sales. The remaining 85% of plants were classified as small.

Challenges remain

Despite such rapid growth, some problems remain. The following sections give examples from different sectors of the process industries.

Fertilisers

Chinese resources of phosphorus and potassium are not enough to meet the country's agricultural needs, so large amounts of these minerals have to be imported from abroad. At the moment, fertilisers are made in a large number of small plants that are inefficient and waste a lot of energy. Production is also largely limited to basic fertilisers; other types including high-concentration, composite, special-purpose and multi-use fertilisers are more difficult to develop, and outputs of these are currently very low.

Petrochemicals

Although petrochemicals (including ethylene) now have a solid base in China, this sector still lags far behind its counterpart in the developed world. China currently produces some 5 million t/y of ethylene, but consumes nearly twice that amount. Small-scale plants make the ethylene industry very inefficient.

Organic chemicals

Organic chemicals are imported on a large scale some 16.2 million t in 2001 (24.6% more than in 2000), costing \$8.9 billion. The most important organic chemical imports are propylene, benzene, toluene, methanol, butanol, octanol, glycol, acetic acid, acrylic acid, acrylate, methyl ethyl ketone, phenol and anhydrides. Imports of monomers such as styrene, p-xylene and PTA are also very substantial.

Chinese organic chemical plants are too small, and many too old, to compete on the world market. A methanol plant, for example, would have to produce at least 300,000 t/y to be competitive, but many Chinese methanol plants produce only 10,000 t/y. This leads to production costs that are often higher than the costs of

imported products, and many Chinese plants have shut down as a result.

Polymers and fibres

Although China produced 7.9 million t of synthetic resins in 2000, this was enough to meet only half the demand. The rest had to be imported.

Synthetic fibres developed rapidly in the 1990s, with polyester, PAN, PP and polyamide accounting for most of the output. With a synthetic fibre output of 7.6 million t, China is now one of the world's largest producers. Despite this, Chinese products continue to fall short of market requirements, and the country does not produce a wide enough range of special and high-quality fibres. China's 15 synthetic rubber factories, for example, together have a capacity of 1 million t/y, but produce mainly SBR and BR, while high-performance synthetic rubbers are made only in very small quantities.

Fine chemicals

The Chinese fine chemical industry is over 50 years old and now produces more than 30,000 different products. China is the world's largest producer of dyes, the second-largest producer of pesticides and the second-largest producer of composite feedstuffs.

Overall, however, China's output of fine chemicals lacks quality and diversity. Exports are low in both quality and price, and the country still relies heavily on imports. There are over 10,000 factories for fine chemicals in China, but most of them are so backward in terms of scientific research and pollution management that they are unlikely to be able to compete on the world market. Many factories are little more than workshops.

The technology and equipment used in China's fine chemical industry is 15–20 years behind that of the developed world. Hydrogenation, continuous nitration, cold nitration and sulphonation using liquid sulphur trioxide have not been adopted on a large scale. The use of automation and distributed control also falls far short of that in developed countries.

Many products in the newer fields of technology—such as functional polymers, fine ceramics, liquid crystals, information chemistry and nanomaterials—are very weak in China.

Future prospects

China's chemical industry will have to develop more high-concentration fertilisers, including DAP and NPK composite fertiliser, to rebuild many of its medium-sized fertiliser factories and build large fertiliser plants in areas that are rich in natural gas, sulphur and phosphorus.

The petrochemical industry and especially ethylene production are promoted as being of national economic importance, and have made great progress in

recent years. Efforts are being made to increase the output of ethylene to 9 million t/y and to increase China's self-sufficiency in ethylene from 43% to about 60%. The Chinese government is encouraging foreign investment in large ethylene plants, of which many have already been built. Examples of existing ethylene plants are those of Nanjing Yangzi/BASF (800,000 t/y), Shanghai Petrochemical Company/BP (900,000 t/y) and Huizhou National Offshore Oil Corp./Shell (600,000 t/y). A number of others, such as Fujian Petrochemical Company/Exxon, Tianjin Petrochemical Company/Dow and Lanzhou Petrochemical/Phillips, are still at the planning or construction stages.

In organic chemicals, it is time to drop obsolete methods such as the use of alkaline salts to make phenol, and fermentation processes for acetone and butanol. Basing more of the organic chemical industry on petrochemicals would be useful, as long as the importance of modern coal-based chemicals is not underestimated. China has huge coal reserves that can be used, for example, to produce water gas (carbon monoxide plus hydrogen), which in turn can be converted into methanol and thence into acetic acid. Bioengineering also deserves greater recognition for the manufacture of ethanol and propylene glycol.

Polymers are among the most important chemical products currently being made in China. Synthetic resins and artificial fibres are both needed urgently and in large amounts. Especially important is the development of higher-value polymers such as epoxies, unsaturated polyesters, polyurethanes, silicones and formaldehyde resins. Much work is also needed to find applications for these products in industries such as packaging, agriculture, electrical, architecture and motor vehicles.

The fine chemicals industry should pay more attention to products that are required only in small amounts but are nonetheless vital to the national economy. Examples are methionine, lysine, pantothenic acid, calcium, vitamins E, A and D, L-lactic acid, behenic acid, nucleic acid, artificial sweeteners, new types of enzyme, biodegradable polymers, long-chain fatty acids and new biotech-based pesticides. Most of China's fine chemicals are currently produced in small quantities, and in relative technical and geographical isolation. Development in this sector should focus on strengthening the country's scientific and technological base, especially in chemical engineering.

Sino-European Collaboration in Life Sciences, Biotechnology and Food

The European Commission has launched its 6th Framework Programme for Research and Development with a strong focus on Life Sciences, Biotechnology and Food. This has opened up many opportunities for Chinese researchers and companies to participate in collaborative projects with EU partners and to benefit from

European Commission funding. This workshop at ACHEMASIA 2004 presented a highly topical theme and provide the necessary platform for new contacts and networks.

Information on funding opportunities for EU–China research cooperation and the support available for finding partners and making applications were the topic of the first session on Wednesday, 12 May. The second session "How to do Business in Biotechnology" on Thursday, 13 May, presented case studies of current EU–China collaborative research projects from the Food Quality and Safety research area to demonstrate what can be done and how it can be done.

High-ranking speakers presented current results from Sino–European collaborative research projects. The comment of Børge Diderichsen, President of the European Federation of Biotechnology, Bagsvaerd, Denmark, on this event was: "This workshop at ACHEMASIA 2004 is outstanding opportunity to initiate new cooperations and funding for joint projects between Chinese and European biotechnology experts from science and industry."

Invited speakers were:

Prof. Børge Diderichsen, President of the European Federation of Biotechnology, Bagsvaerd, Denmark

Prof. Li Yu, Institute for Crop Germplasm Resources, Chinese Academy of Agricultural Sciences, Lab of maize, Beijing, China

Prof. Wu Yongning, National Institute of Nutrition and Food Safety, Chinese Center for Diseases Control and Prevention, Beijing, China

Prof. Shu Qingyao, Zhejiang University College of Agriculture and Biotechnology, Hangzhou, China

Dr. Ib Knudsen, Danish Veterinary and Food Administration, Institute of Food Safety and Nutrition, Sborg, Denmark

Sustainable Water Management in Industry and Municipalities for China

"Sustainable Water Management in Industry and Municipalities" was also one of the main themes of the Exhibition and Congress of the 6th ACHEMASIA – the leading event for chemical engineering, environmental protection and biotechnology in China. ACHEMASIA is the global platform for the process industries and represents a unique opportunity to benefit from the exciting chances that a rapidly developing China offers suppliers to the process industries and to develop productive business relations.

Managing and reducing water pollution is one of the key issues of China's current environmental programme. The water pollution programme of the 10th Five-Year Plan (2001–2005) involves a total investment of 250 billion RMB.

The Business Meeting on "Sustainable Water Management in Industry and Municipalities" was one part of the 6th ACHEMASIA 2004 (11–15 May 2004) held from 12–13 May at the China International Exhibition Center, Beijing. This highly topical event was directly related to the exhibition target groups "Water Treatment" and "Environmental Protection" and focused on technology transfer and international cooperation. Well-known international companies were involved in the programme, which features:

- Water for Industrial Processes
- Wastewater Treatment and Reuse
- Industrial Water Management
- Technologies for Potable Water
- Water Treatment in Municipalities

On the first day, the up-to-date information in this field, as well as discussion the latest market developments, meeting of international decision-makers and initiating co-operations were performed. The second day was reserved for presentation the cutting-edge of technological innovations and applied research.