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.

ACHEMASIA 2004 was organized by DECHEMA and trend reports of the China's food industry and the China's petrochemical sector are presented in this issue of Chemical Industry.

CHINA'S FOOD INDUSTRY

The food sector is one of the most liberal and international of China's industries. Over the next five years, Chinese food industry sales are estimated to grow at a steady rate of 9–11%. Clearly there is huge scope for growth in the food industry. The domestic industry is growing fast, though it is still hampered by the presence of many small, uncompetitive companies and by outdated technology. Foreign investors with an eye on China's 1.3 billion consumers, meanwhile, are beginning to see the country as a battleground.

Equipment and know–how for mechanical and thermal processes and separation technologies as well as for analytical and packaging techniques and biotechnology are all basic technologies in the food processing industry. The latest developments and experience in these fields were presented at the 6th ACHEMASIA International Exhibition & Congress on Chemical Engineering and Biotechnology.

The food industry is China's largest industry in terms of both sales and number of people employed. Over the last two decades the food industry has grown at an average of 13.1% a year, outstripping even the 9.3% average annual growth of China's GDP.

The food industry here includes food production, food processing, beverage production and tobacco processing. On this basis food has been the number one industrial sector since 1996 in terms of its total output value.

According to The National Statistics Bureau's survey of enterprises with sales of over 5 million RMB (both state–owned and private), overall output of large enterprises in the food sector in 2002 was 1,061 billion RMB, up 13% from 2001. Sales income was 1,009 billion RMB (+16.4%), and profit was 52.2 billion RMB.

In 2002 the food industry groups listed in the annex (Table 2) employed a total of 4.6 million people. The 2002 figures show significant increases in the production of machine–made sugar (9 million t, +48% from 2001), dairy products (93 million t, +10%), canned food (2 million t, +23%) and beverages (20 million t, +21%).

This momentum carried on into 2003. In the first half of 2003, overall output value was 595 billion RMB, up 17.2% year on year. Sales totalled 562 billion RMB (+19.2%) and profit was 33.7 billion RMB (+24.8%). The first seven months of 2003 saw 3,258 new projects in the food industry, counting only those projects with a total investment of more than 5 million RMB in fixed assets. The fixed assets of the food industry (both existing plants and spending on new projects) totalled 44.6 billion RMB, up 86% on 2002. New food industry projects in China in 2003 are listed in the annex.

The main product groups of the Chinese food industry, with production figures for 2001 and 2002 are shown in the annex (Table 1).

Sales income from both food and beverage manufacturing grew from 2001 to 2002, but that growth in food (20.3%) was much faster than in beverages (8.4%). Among foodstuffs, the fastest–growing were fermented foods (39%), dairy products (28%), canned food (21%), and pastry and candy (10%). Profits in food manufacturing also grew faster than in beverages (25% profit growth for food, 17% for beverages). But profits as a percentage of sales were higher for beverages (6.4%) than for food (4.5%). (see annex Table 2).

The fastest profit growth was seen in fermented food (98%), fruit and vegetable beverages (91%), fruit alcohol (84%), carbonated beverages 44%), a negative development is suspected in spirits (–16%) and alcohol sectors (–88%).

China's meat industry has been going through a hard time and is now restructuring. Although this sector has seen few new entrants, a price war has squeezed profits down to 4%. Problems with the quality of sausages from some manufacturers caused a drop in demand. Frozen meat products are a relative novelty in China, and offer scope for rapid growth in the future.

A promising future for dairy products

The average person in China eats just 6.6 kg of dairy products a year, but big changes are in store. Partly as a result of advice Chinese Nutrition Association to eat more dairy products, annual consumption is forecast to rise to 20–30 kg per person, and the dairy sector is regarded as the most promising sector of the food industry for growth in the next few years.

Now that the government has identified dairy products as a key industry, production has grown by leaps and bounds. Until recently China's dairy sector produced almost nothing except milk and dried milk. In the last few years, however, the industry has started to produce yogurt, sour milk drinks, sterile milk products, protein drinks, fruit milk, ice–cream, cream and cheese. According to an estimate by the China National Food Industry Association, there are now over a thousand domestic brands of milk and dairy products on the market.

Dried milk products account for 70% of the total output of dairy products. Dried milk products are split between whole milk (20%), whole sweetened milk (38%) non–fat milk (3%); infant formula (18%) and other dried milk products (22)%. Pasteurized milk, ultra–high–pasteurized milk and yogurt respectively accounted for 53%, 30% and 17% of overall milk output.

According to the National Statistics Bureau, in 2002 China had over 1,600 dairy manufacturers, of which 462 were state–owned or private enterprises with annual sales above 5 million RMB. These 462 enterprises had total assets worth 31 billion RMB and employed 116,000 people. Their total output was worth 35.8 billion RMB, up 23% from the previous year, and their profits totalled 2.0 billion RMB, up by 15.2%. Their output of all dairy products in 2002 was up by 26% on 2001, and output of milk increased by 66%.

In 2002 a great deal of capital was injected into dairy sector, and most projects were large ones, with capacities in the range 400–500 t/d. 14 projects funded by state loans accounted for a total investment of 2.19 billion RMB and a total processing capacity of 1.7 million t/y. The Ministry of Science and Technology also carried out a special project to improve science and technology in the dairy sector, with an overall investment of 405 million RMB.

Soft drinks: a largely untapped market

In the beverage sector, the fastest growth and the greatest potential are in soft drinks, particularly those based on juice and tea.

In the last two decades the soft drinks sector has grown at an average of 24% a year, but the average annual consumption of soft drinks, at 10 litres per person, is still much lower than the figures for Taiwan (39 litres), Hong Kong (30 litres), Japan (109 litres) and the world average (18 litres). There is therefore tremendous potential for growth.

Figures for the first half of 2003 show that despite rocketing overall growth in soft drinks, regional differences were large. Eastern China accounted for more than 80% of national production, but growth was fastest in western China.

Product diversity is increasing fast. Carbonated beverages are no longer the most popular drinks on the market. Instead, China is following the trends seen in the rest of the world, and juice, tea drinks, bottled water, health drinks and sports drinks are all increasing their market share. The expansion of domestic brands is slowing somewhat as the industry restructures to concentrate on international brands.

The rise of international trade and investment

In recent years China's food industry has taken a vigorous part in international trade. Exports of beverages, for instance, reached $2.5 bilion in 2002, an increase of 22% on 2001. Imports of beverages were worth $9 billion in 2002, an increase of 4.8% on 2001.

Food imports are also rising. This extends to raw materials such as sugar cane, which is being imported by refineries in the Pearl River Delta to make up for a shortage of home–grown sugar cane.

To ensure that their products are acceptable on the world market, Chinese companies have put a lot of emphasis on learning the standards and test procedures required by the regulatory authorities in the USA, Europe and Japan.

They are also learning the rules for exporting food in special categories, such as organic produce, and are beginning to apply the trade rules required by the WTO. The result is that the food sector is one of the most liberal and international of China's industries.

In recent years China's food industry has seen an influx of international capital. Many multinational food companies have set up headquarters in China to co–ordinate production and investment, and to look for business opportunities. Some of them have also established Chinese research and development centres aimed especially at the local market.

Examples of foreign investment and technology transfer include:

- American AB Company increased in 2001 its equity in the Qingdao Beer Company and agreed to help Qingdao with capital and technology.
- Interbrew of Belgium, the world's second–largest brewer, set up a joint venture company with Zhujiang Beer Company.
- Danone of France, a well–known manufacturer of dairy products, bought shares in Shanghai Bright.
- The Meng Niu Dairy Limited Company of Inner Mongolia attracted $26 million in foreign capital from three investment companies: Morgan Stanley, Dinghui Investment and China Capital Partners.
- The Tetra Company of Sweden invested 570 million RMB to establish Tetra Pak Packaging Limited Company, a joint venture in Beijing, in September 2002.
- The Swiss industrial group Combibloc set up a subsidiary based in Suzhou Industrial Park in November 2002. At the moment, most of the modern technology used by Chinese food companies has been acquired by buying equipment from abroad. An example is Huiyuan Juice Company, which has invested $30 million in a sophisticated filling line for PET containers.

But some Chinese companies have started working with their foreign counterparts to develop new products. Huiyuan Juice Company, for instance,

co–operated with an Israeli company to develop baby foods, and has established a partnership with Ocean Spray, a well–known US canned and bottled juice manufacturer, to develop a new berry juice drink.

The future of China's food industry

China is the world's largest producer of grain, edible oil, fruit, beans and meat, but very little of these raw foodstuffs currently enter the food processing industry. For example, 8% of China's grain, 3–4% of meat and 5% of apples are processed by the food industry.

According to the statistics, China has 18,893 food processing plants, of which 5,092 are loss–making. Most Chinese food processing plants are small or medium–sized, have low productivity and use outdated technology that leads to high energy consumption and poor economics. For example, Chinese beet sugar factories use 10 t of water per tonne of sugar, compared to just 1–2 t of water in the best factories abroad.

Over the next five years, Chinese food industry sales are estimated to grow at a steady rate of 9–11%. Food is still the largest single item of household expenditure, accounting for 42% of income on average. Growth in the food industry is likely to be uneven, with the best performance seen in health foods, instant foods, dairy products, bean products, non–alcoholic and low–alcohol drinks, and processed meat products. Other promising areas are baby foods; foods aimed at children; fermented products and animal feeds; specialities in rice and edible oils; milk–based convenience foods; and functional foods. New food industry projects in China in 2003 are listed in the annex.

Strong demand for new technologies

Technologies growing in importance include preservatives, freeze drying, aseptic packaging, freezing, food additives for fermented products, microwave processing, irradiation and membrane separations. Production equipment in China's food industry will becomes more mechanised and automated.

Large enterprises will capture most of the profits of the food industry. Competition among branded foods is squeezing profit margins, so the manufacturers with the best chance of success are large companies with expertise in management, marketing and sales. The same applies to mature markets involving relatively undifferentiated products, such as beer and MSG.

For foreign companies investing in China, the food industry will become a battleground. Foreign food manufacturers are less interested in low Chinese wage rates than in the potential market among the country's 1.3 billion people, which could easily generate sales of over 1 trillion RMB.

The new food industry projects in China in 2003

Several projects were announced:

– a plant at Hetao, valued at 65 million RMB and to be built in three phases;

– startup of the first phase of the 300 million RMB Chendu plant;

– startup of the first phase of the 300 million RMB Huirou PET plant;

– a plant at Gongcheng with a planned investment of 3 million RMB;

– a plant at Huanggang with a planned investment of 500 million RMB. The plant will start up by the end of 2004 and will be in full production by April 2005;

– a fruit and vegetable processing plant at Yuanmo, with planned investment of 300 million RMB;

– a plant at Feicheng with a planned investment of 500 million RMB in three phases.

• The Weigang Dairy Industrial Park in Nanjing, Jiangshu province, began production. This is China's largest dairy, with planned investment of 200 million RMB and 15,000 m^2 of production space.

• Beijing Tianlihai Chemical Factory established China's largest GMP plant, with an annual output of 1,500 t and total investment of 28 million RMB.

• American Lianshu Co. and Jiangshu Lilian Co. Ins. agreed to invest jointly in a filling plant for plastic containers. The first phase will cost $70 million and will start production within 12 months. Another $100 million is planned for the second phase.

• Jinwei Beer (Shantou) Limited Company announced that it will build a 200,000 t/y brewery in the Jinping district of Shantou City.

• Zhendu Yashi Food Limited Company spent 30 million RMB on a GMP plant for sweet–tomato instant glass noodles. The company has invested another 10 million RMB in a plant to produce 10,000 t/y of sweet–potato starch for export. Startup is scheduled for next August.

• Henan Shuanghui Company signed an agreement with the East, West and Jianghan Districts of Wuhan City. The company will invest 106 million RMB in a modern logistics system for meat production and sale. In the first phase, the company will spend 660 million RMB on a plant in which 1.5 million pigs will produce 15,000 t/y of meat. The second phase, costing 400 million RMB, will include facilities for rearing 500,000 pigs and producing feedstuffs.

• Sanlu Company invested 75.8 million RMB to build an "ecological" cattle farm at Luquan Tongyan. The farm will have 5,200 cattle, with planned sales of 70 million RMB and profits of 15 million RMB.

• Shangdong Deyi Dairy Limited Company finished the 130 million–RMB first phase of a dairy industrial park designed to process 500 t/d of fresh milk. Throughput is currently 300 t/d.

• Heilongjiang Beidahuang Wheat Company introduced internationally advanced technology for wheat protein transformation. The first production line for high–quality speciality flour using this technology was launched recently, and the company has invested 18 million RMB in five new production lines.

• Nongfu Shanquan Company announced a 32 million RMB project in Danjiang, Hubei City. The plant will produce 30,000 t/y of mineral water and juice.

• Amway (China) Limited Company announced that it had signed an investment agreement with Guangzhou Economic and Technological Development Zone. The company plans to invest $120 million to expand production of nutritional supplements, protein beverages and functional foods.

• Weiwangdi Company started building an orange juice plant, scheduled to start production in 2004. The factory is located Zhong County, which will become Asia's largest citrus processing area. Overall investment is 962.5 million RMB, including foreign capital of $31.5 million.

• Filiale Sugar Alcohol Refinery in Baoding, Hebei Province, owned by Baoshuo Limited Company, announced a starch/sugar project with a capacity of 60,000 t/y.

• Xiwang Company of Shangdong Province announced a project to produce 200,000 t/y of grape sugar. Planned investment is 350 million RMB.

• Singapore Fanlian Company invested $48 million in Asia's largest bean oil processing project. The plant, in Fulin County, Chongqing City, will start production in October 2004.

• China's Academy of Agricultural Sciences opened its International Agricultural High–Technology Industrial Park at Langfang City, Hebei Province. 5 billion RMB will be invested to build the park by the end of 2007.

• Mengniu Dairy Limited Company announced that it is investing 960 million RMB in a three–phase project. The plant will meet GMA and HACCP standards, and will process more than 1,000 t/d of milk in more than 20 production lines.

• Yefeng Pineapple Manufacturing Limited Company invested 150 million RMB to set up a plant in the industrial park of Hainai Yangpu Economic Development Zone. The plant will produce 30,000 t/y of canned pineapple and 3,000 t/y of condensed pineapple juice.

• Wandashan company announced a dairy project in Nanning City. With an investment of 150 million RMB, the plant will produce 300 t/d of milk, yogurt and other dairy products. Annual sales are estimated to reach 214 million RMB.

• Construction of China's largest beef and lamb processing factory began in Dalian City. Overall investment amounted to 660 million RMB.

• Tongliao City in Inner Mongolia and Fengyuan Company of Anhui Province signed a framework agreement for a corn processing project with a capacity of over 1million t/y. With a total investment of 150 million RMB, the plant will employ 2000 people. Construction is expected to start this year.

• Zhangye of Gansu Province started a new 20,000 t/y production line for brewer's malt. Gansu Province, meanwhile, invested 30 million RMB in its own 50,000 t/y malt plant.

• Jinluo Company invested 450 million RMB in a meat production project with an output of 150,000 t/y. The plant is situated in the industrial park of KeErqin District, Tongliao City, Inner Mongolia.

• China's largest starch manufacturer, Wanshunda Company of Shenyang City, signed an agreement with Changtu County, Lieling City, Liaoning Province. Wanshunda will invest 410 million RMB to build a starch factory with a capacity of 400,000 t/y in Changtu County, which is China's main production area for grain. The project has two phases, the first of which will be complete by the end of 2004 and the second by the end of 2005.

• A large–scale tomato processing plant was announced in Linze County, Zhangye City, Gansu Province, near the Yellow River corridor. An overall investment of 110 million RMB will be used to establish a 25,000 t/y tomato sauce production line and a 25,000 t/y tomato processing line. All the production will be exported.

• Maoliang Wine Company of Yun County, Yunnan Province, and Burmese Olympic Import and Export Company jointly invested 80 million RMB in China's first plant to make wine from papayas.

• Yipin Food Company of Ningxia Autonomous Region invested 110 million RMB in a corn starch project with an output of 12,000 t/y, and to increase output of glutamic acid.

• Zhongning Yingjia Company of Ningxia Autonomous Region invested 90 million RMB in plants to produce 20,000 t/y of glutamic acid and 10,000 t/y of lysine.

• Ruide Natural Pigment Company invested 18 million RMB to expand the production of natural pigments, with an output of 100 t/y, and to launch an L–arginine project with an output of 100 t/y.

• Xiajin Dairy Beverage Company invested 290 million RMB in a milk plant with a capacity of 140,000 t/y.

• Xiangshan Wine Company of Ningxia Autonomous Region invested 100 million RMB in a project to increase production of wine made from medlars by 10,000 t/y.

• Fuli Vegetable Dehydration Limited Company of Huinong County, Ningxia Autonomous Region, invested 46 million RMB in a plant to produce 728 t/y of dried vegetables.

Table 10. Output of the main product groups in the Chinese food and drink sector

Product	Production (million t)		Annual growth (%)
	2001	2002	
Candy	39.1	46.4	18.6
Pastry	14.6	20.6	41.1
Biscuits	62.0	68.8	11.0
Instant foods	262.8	287.9	9.6
Dairy products	74.3	93.3	25.6
Frozen beverages	53	59.6	11.9
Milk	213.3	353.7	65.8
Canned food	173.7	223.2	28.5
Monosodium glutamate (MSG)	91.3	110.3	20.8
Starch	601.5	757.4	25.9
Fermented alcohol	200.8	212.8	6.0
Beverage alcohol	2803.2	2886.9	3.0
Spirits	420.2	378.5	–9.9
Beer	2273.8	2386.8	5.0
Wine	25.1	28.8	15.0
Soft drinks	1680.3	2025.0	20.5
Carbonated beverages	536.7	603.5	12.4
Juice and juice beverages	146.1	213.0	45.8
Bottled drinking water	678.4	810.4	19.5

Table 11. Sales, profits and employee numbers by manufacturing sector in the Chinese food and drink industry

	2001			2002			Change		
	Sales (b RMB)	Profits (m RMB)	Employees (thousand)	Sales (b RMB)	Profits (m RMB)	Employees (*1000)	Sales (%)	Profits (%)	Employees (%)
Food (total)	151.9	6617.5	900.5	182.8	8259.6	984.8	20.3	24.8	+9.4
Pastry and candy	49.8	2393.4	287.5	54.9	2220.2	305.6	10.3	–7.2	+6.3
Dairy products	27.2	1712.1	110.4	34.7	2373.0	121.6	27.8	38.6	+10.1
Canned food	12.6	93.7	104.7	15.2	409.6	140.7	20.8	336.9	+34.5
Fermented food	14.7	556.5	91.8	20.4	1102.2	103.9	39.0	98.1	+13.3
Spices	12.1	524.7	95.6	12.8	457.8	86.8	5.5	–12.8	–9.2
Others	35.6	1337.1	210.6	44.8	1696.9	226.2	25.8	26.9	+7.4
Beverages (total):	172.7	10231.2	910.8	187.3	24931.7	872.1	8.4	143.7	–4.2
Alcoholic beverages (total):	109.2	6186.6	747.5	74.1	6266.6	703.9	–32.1	1.3	–5.8
Other alcohol	5.8	–56.6	41.4	5.3	–6.7	36.3	–8.0	–88.1	–12.3
Spirits	49.3	3957.4	399.0	31.8	3327.7	365.6	–35.5	–15.9	–8.4
Beer	45.4	1494.0	264.8	30.7	2008.8	260.7	–32.4	34.5	–1.5
White wine	2.6	185.0	18.5	2.1	228.6	17.3	–17.9	23.6	–6.5
Other wine	5.0	567.3	16.0	3.4	635.4	16.1	–30.8	12.0	+0.6
Fruit alcohol	1.3	39.5	7.7	0.8	72.8	8.0	–37.0	84.2	+3.0
Soft drinks (total):	38.8	2824.1	146.4	34.1	4130.4	154.1	–12.3	46.3	+5.2
Carbonated beverages	4.8	1296.2	45.5	3.6	1860.1	47.8	–23.6	43.5	+5.1
Mineral water	8.0	199.2	22.9	7.0	236.2	28.2	–12.8	18.6	+22.7
Fruit and vegetable beverages	8.9	242.7	35.8	8.6	462.6	35.6	–3.4	90.6	–0.6
Solid beverages	7.0	671.7	19.3	4.3	913.1	22.4	–38.0	35.9	+16.1
Other soft drinks	10.3	414.3	23.0	10.6	658.5	20.2	3.0	59.0	–12.1
Other beverages (total)	24.7	1220.5	16.9	79.1	14 534.7	14.1	220.7	1090.9	–16.5
Grand total	325	16849	1811	370	33191	1857	14.0	97.0	+2.5

China's Petrochemical Sector

Already the 6th successful event in a row, ACHEMASIA International Exhibition & Congress on Chemical Engineering and Biotechnology was by far the most comprehensive and most international event for China's and Asia's process industries. It represented the uncontested platform for the equipment sector and the major forums for establishing new contacts and new collaborative ventures.

With its population exceeding 1.2 billion people, China is now home to 20% of the world's total. As the standard of living enjoyed by many of its citizens continues to increase, and its economy continues to grow, these factors are working in tandem to increase the demand for many of the petrochemical–based raw materials, intermediates and finished end products that typify a modern lifestyle.

In recent years, strong demand for chemicals and chemical–related end products has ushered in an unprecedented era of foreign investment, and today, many of the world's petrochemical giants have put a stake in the ground in China – literally and figuratively – to take part in this huge and fast–growing economy.

In the first half of 2003, China's overall manufacturing output grew by 16.2%, spurred, in part, by booming output of many commercial products that have a high chemical content, such as cars, information technology products, and textiles, according to China's State Statistical Bureau (SSB; Beijing). Such strong demand for chemical–intensive consumer good helped to drive a 27% increase in total chemicals output in China in the first half of 2003, reaching $55.1 billion, according to China Petroleum and Chemical Industry Association (CPCIA; Beijing).

For the first 8 months of 2003, China's 60 largest state–owned chemical enterprises posted combined profits of $217 million, a rise of 72% from the same period in 2002, according to the State Property Regulatory and Management Commission (Beijing). The companies' combined sales increased by 20%, and only 9 of the 60 companies reported a loss in the first half of 2003, compared with 16 in the same period in 2002, says the Commission.

Meanwhile, foreign direct investment in China surged by 34% in the first half of 2003, reaching $30.3 billion. If this trend continues, the full–year total is expected to surpass 2002's record level of $53 million (which, itself, was up by 13% from the year before), according to China's State Statistical Bureau (SSB; Beijing) and the government's Ministry of Foreign Trade and Economic Cooperation (Beijing).

One factor that has helped to open China's doors to foreign investment is the fact that in 2001, China was finally granted full membership in the World Trade Organization (WTO; Geneva, Switzerland). As part of the concessions made to secure WTO entry, China has lowered the tariffs on China–bound chemical products

from foreign companies. The average chemical tariff will fall from nearly 15% to nearly 7%. In addition, by the end of 2004, foreign companies will be more free to distribute their imported products throughout China, rather than relying on local intermediates, and they should find it easier to establish production facilities within the country.

China's petrochemical and related sectors are currently experiencing an unprecedented level of engineering, design and construction right now, with numerous world–class petrochemical facilities scheduled to come onstream in the 2004–2007 period. A representative sampling of current projects is provided below. This list notes three types of major projects – those related to basic chemical feedstocks and intermediates; plastics and resins; and industrial gases (which are an integral part of most petrochemical process operations).

Chemical feedstocks and derivatives

During the 1990s, China's annual growth in demand for ethylene – a basic petrochemical feedstock – was as high as 17%/yr, greatly surpassing that of Chinese GDP, according to 3E Information Development and Consultants (Beijing). At the same time, China's domestic ethylene supply only grew by 12%/yr, resulting in a sharp increase in the import of both petrochemical raw materials and downstream finished products. For example, for much of the 1990s, more than half of China's demand for synthetic resins and ethylene–equivalent petrochemicals, and more than 80% of polystyrene and acrylonitrile butadiene styrene (ABS) consumption, was satisfied by foreign raw materials and products.

More recently, however, ethylene production in China has been on the rise. For instance, in the first seven months of 2003, China's output of ethylene increased by 15%, to 3.44 million m.t., according to the State Statistical Bureau (SSB; Beijing). Ethylene consumption in the same period rose by 14%, to 3.45 million m.t. Output of purified terephthalic acid – a key raw material in the production of many petrochemical derivatives and plastics – rose by 10%, to reach 1.47 million m.t., while the production of benzene increased 16%, to 1.16 million m.t., says SSB.

China's two major state–owned companies – China Petrochemical Group Corp. (Sinopec; Beijing; www.sinopec.com) and China National Petroleum Corp. (CNPC; Beijing; www.cnpc.com.cn) – still dominate the production of feedstock ethylene and many petrochemical intermediates and downstream products, and their combined capacity accounts for more than 90% of the country's total output, according to 3E Information Development & Consultants. However, increasingly, Sinopec and CNPC, have been partnering with many of the world's leading chemical companies to build world–class petrochemical complexes.

The global multinationals that have put a stake in the ground in China represent a veritable Who's Who of the worldwide petrochemical community:

• Sinopec subsidiary Guangzhou Petrochemical Corp. (GPC; Guangzhou) has completed an 85,000–metric tons/year (m.t./yr) expansion of its ethylene plant, bringing total capacity to 200,000 m.t./yr. The additional capacity will allow GPC to double its downstream polyethylene capacity to 200,000 m.t./yr, and raise its polypropylene output from 70,000 m.t./yr to 100,000 m.t./yr.

• Sinopec's Maoming Petrochemical subsidiary is currently expanding ethylene capacity at Maoming from 380,000 m.t./yr to 800,000 m.t./yr, synthetic resin capacity from 440,000 m.t./yr to 1.02 million m.t./yr, and total product throughput from 1.1 to 2.3 million m.t./yr. The $530–million project is due for completion in early 2005.

• PetroChina Co. (Beijing) has received government approval for its subsidiary Lanzhou Petrochemical to increase ethylene capacity at Lanzhou from 240,000 m.t./yr to 600,000 m.t./yr, and build plants with capacity for 400,000 m.t./yr of polyethylene and 300,000 m.t./yr of polypropylene as part of the project.

• Saudi Aramco (Dharan, Saudia Arabia), Sinopec and Fujian Petrochemical Co. (Fujian Province) are collaborating to build a 12–million m.t./yr refinery, due to be completed in 2007 at Fujian's facility at Hui An.
The $32–billion facility will manufacture a range of fuels, and provide feedstock for an 800,000–m.t./yr cracker, which in turn will feed downstream units producing 400,000 m.t./yr of polyethylene and 300,000 m.t./yr of polypropylene. ExxonMobil (Houston, Tex) was one of the original partners in this jv, but recently pulled out of the project. However, ExxonMobil is also involved in a project to build a 1–million–m.t./yr ethylene complex with Sinopec at Guangzhou, for startup in 2008.

• BASF AG (Ludwigshafen) is working with local partners Yangzi Petrochemical and Sinopec to build a $3–billion complex, in Nanjing. The facility will have a power plant, a 600,000–m.t./yr ethylene cracker, plus downstream facilities, including those to make ethylene glycol, acrylic acids and C4–oxo–alcohols. The first plants are due onstream in 2004 and 2005.

• Shell Chemical LP (Houston, Tex) and China National Offshore Oil Corp. (CNOOC; Beijing), have formed a jv to construct an integrated petrochemical complex in southern China. Due to start up in 2005, the complex includes an 800,000–m.t./yr ethylene cracker, plus units to make 2.3 million m.t./yr of other petrochemical products, including propylene oxide, ethylene glycol, styrene monomer, polypropylene, high– and low–density polyethylene.

• Shanghai Secco Petrochemicals Co. Ltd., a joint venture company of BP Amoco (London), Sinopec and Shanghai Petrochemicals Corp., are building a world–scale complex at Shanghai Chemicals Industry Park in Caojing. The Secco complex, expected to begin operation in 2005, will comprise a 900,000–m.t./yr, naphtha–fed ethylene cracker, plus downstream facilities with combined polyethylene, polypropylene and polystyrene capacity of more than 1 million m.t./yr, plus world–scale styrene, acrylonitrile and other olefins–derivative units.

• Formosa Petrochemical Corp. (FPC; Taipei; Taiwan) will construct a $725–million at Mailiao, Taiwan. The complex will include a naphtha crackers and units with the capacity for 1.2 million m.t./yr of ethylene, 600,000 m.t./yr of propylene, and 170,000 m.t./yr of butadiene. Completion is scheduled for late 2006. FPC

already has two ethylene plants at Mailiao, with a combined capacity of 1.7 million m.t./yr, and, according to the company, downstream chemical producers at the complex have requested that FPC build a third cracker to meet additional raw material requirements that are expected to come onstream from planned downstream expansions.

• Davy Process Technology (London, U.K.), in cooperation with Union Carbide Corp. (Danbury, Conn.; a subsidiary of The Dow Chemical Co.; Midland, Mich.) has signed separate agreements to license its low–pressure oxo–alcohols process technology to both Sinopec and PetroChina. In one deal, Davy is providing a license, design and technical services to Sinopec subsidiary Qilu Petrochemical Co. for a complex at Zibo (Shandong Province). It will have capacity of 171,000 m.t./yr of 2–ethylhexanol, and 20,000 m.t./yr of iso–butyraldehyde. Startup is expected by late 2004. Separately, Davy is supplying a similar package to PetroChina subsidiary Jilin Petrochemical Co. for a 128,000–m.t./yr n–butanol plant at Jilin, also for late 2004 startup.

• Toyo Engineering Corp. (Narashino, Japan), has signed a contract with Lutianhau Group Inc. (Sichuan, China) to build a 10,000–m.t./yr plant for dimethyl ether (DME; which can be used a fuel and gasoline oxygenate). Located in Luzhou, the DME plant will utilize methanol from an existing production facility.

• Celanese Chemicals (Dallas, Tex) is building a 600,000 m.t./yr acetic acid plant at the Nanjing Chemical Industry Park, adjacent to the $2.9–billion petrochemical complex that BASF and Sinopec are jointly building there. Production is expected by early 2006. Acetic acid demand in China is growing by about 10%/yr, and demand for its major derivative, vinyl acetate monomer, is growing by 6%/yr, according to Celanese.

• BP (London, U.K.) is expanding capacity at its acetic acid plant at Chongqing, operated by Yangtze River Acetyls Co. (Yaraco; a jv with Sinopec) from 200,000 m.t./yr to 350,000 m.t./yr, for completion in 2005. The facility also has the capacity for 80,000 m.t./yr of acetate esters.

• Guizhou Crystal Organic Chemical Group Co. (Guizhou Province, China) is the first licensee of a new acetic acid process developed by Chiyoda Corp. (Yokohama, Japan). Guizhou started up a 36,000–m.t./yr plant in 2003.

• Bayer AG's Bayer Material Science division (Leverkusen, Germany; www.bayer.com) is building a 230,000–m.t./yr plant in Caojing, to produce diphenyl methane diisocyanate, a key raw material in the production of polyurethane. The plant is due online by 2008.

• CNPC Daqing Petrochemical Complex in Daquing has selected technology from Lummus/UOP (Des Plaines, Ill) to increase its capacity for ethyl benzene and styrene monomer. The upgrade will boost styrene monomer production at the facility by 30,000 m.t./yr, to 90,000 m.t./yr.

• Axens North America (Princeton, N.J.; www.axens.net), a subsidiary of the French Institute of Petroleum (IFP) will use its T–Star technology in a direct coal–liquefaction project in Inner Mongolia. Spearheading the project is the Shenhua Group Corp. of China, which will build a plant to produce about 19,000 barrels/d of syncrude from coal in a single train. Startup is scheduled for late 2005.

Torch Investment Co. (Pudong), a unit of privately held D'Long International Strategic Investment Co. (Shanghai) is planning a complex that will include a coal–based methanol unit (yielding up to 2 million m.t./yr of methanol), a methanol–to–propylene unit that will produce 350,000 m.t/yr of propylene, and a 350,000–m.t./yr polypropylene plant. The integrated complex will be built close to the Huaibei coal field in he eastern province of Anhui. Shell (Houston, Tex) and ChevronTexaco (San Ramon, Calif.) are competing to license their respective goal–gasification technologies to Torch, while Lurgi (Frankfurt, Germany) is offering its MegaMethanol and MTP technologies. China currently consumes 3.6 million m.t./yr of methanol (nearly half of which is imported) and demand for methanol is expected to doubly by 2010.

• Shell has also agreed to license its coal–gasification technology to four ammonia producers in China. Yuntianhua Group (Kunming) and Yunnan Zhanhua Co. (Qujing) will use the technology to produce synthesis gas feedstock for their respective 500,000–m.t./yr ammonia plants under construction at Kunming and Qujing. Sinopec will use the technology to supply synthesis gas for existing plants at Zhijaiang and Anqing that currently use naphtha feedstock. In a joint venture with Sinopec, Shell is also building a gasification plant at Yueyang that will supply Sinopec Baling Fertilizer's ammonia plant at Yueyang.

• Guangxi Liuzhou Chemical (Guangxi) is planning a 1–million m.t./yr, coal–based methanol complex at Guangxi. The company says it has completed a feasibility study and is seeking partners.

China: A strong market for plastic resins and finished products

China is the currently the world's largest producer and consumer of polyester fibers (for textile use). According to government statistics, in 2002, China's consumption of purified terephthalic acid (PTA) – the primary raw material used in the manufacture of polyester fibers for textiles use, and polyethylene terephthalate (PET) for bottles, textiles, packaging and film products – exceeded 6.6 million tons. However, of that amount, only 30% was supplied by domestic production.

Meanwhile, the Asia–Pacific region has, for the first time ever, overtaken the U.S. as the world's largest consumer of polyethylene (PE), according to market consultants Philip Townsend Associates (PTAI; Houston). Consumption of PE throughout the Asia–Pacific region exceeded 16 million m.t./yr in 2002 – a 60% jump since 1998. PE demand in the Asia–Pacific region is projected to grow by another 7.5%/yr during the next five years, to reach 23 million m.t. by 2007.

Much of the region's growth in PE demand is driven by strong demand in China, whose PE consumption is expected to grow by 7.7%/year, to reach 12 million m.t. by 2007, according to PTAI. By contrast, demand for PE in the North American market has grown by just 7% since 1998, reaching 15 million m.t. in 2002,

says the firm. Demand in North America is forecast to slow a bit in the next few years, growing by just 4.8%/year, to reach 19 million m.t. by 2007, according to PTAI.

As for production, polyethylene output in the first half of 2003 in China rose by 12%, to almost 2 million m.t., says consulting firm PTAI, while domestic production of polypropylene in China grew by 11% in the first half of 2003, to just over 2 million m.t.

• DSM Engineering Plastics (Heerlen, Netherlands) recently increased, by 40%, the production capacity at its manufacturing and compounding plant at Jiangyin, Jiangsu Province. The facility produces polyamide 6 and polyamide 66, polyester, and polyamide 46 materials, both for the domestic China market and to support other customers in the Asia Pacific region. The company estimates that overall demand for engineering plastics in Asia is growing by 25%/yr.

• Bayer AG (Leverkusen, Germany) has broken ground on a $450–million polycarbonate plant at Caojing, near Shanghai. Once online by mid–2006, the plant will have an eventual capacity of 200,000 m.t/yr, but the capacity will be brought on in increments, as demand for the products grow.

• Noveon (Cleveland, Ohio) is building a thermoplastic polyurethane (TPU) plant near Shanghai, with startup expected for fourth–quarter 2004. Noveon currently supplies TPU to customers in Asia from plants in the U.S. and in Belgium. Project costs were not disclosed.

• GE Plastics (Pittsfield, Mass) is spending $60 million to double its plastics–compounding and film–extrusion capacity at Nansha. The plant, online since 1996, supplies acrylonitrile butadiene styrene, polycarbonate, and polyphenylene oxide compounds and blends. The expansion is expected to come online in late 2004.

• Mitsubishi Rayon Polymer Nantong Co. Ltd., a jv between Mitsubishi Rayon Co. (Tokyo, Japan) and Marubeni Corp., (Tokyo, Japan) is building a plant to produce acrylic sheets based on methyl methacrylate and polymethyl methalacrylate. The $19–million facility has a capacity of 20,000 m.t./yr of acrylic sheets, plus an additional 3,500 m.t./yr of acrylic coating resins for the paint industry. Completion is due in spring 2005. The company estimates the Chinese market for acrylic coating resins at 60,000–70,000 m.t./yr, and projects growth rates of 15%/yr for the foreseeable future.

• Mitsubishi Chemical (Tokyo; m–kagaku.co.jp) and China International Trust and Investment Co. (Beijing) are building a $300–million, 600,000–m.t./yr plant to produce purified terephthalic acid (PTA) at Daxie Island in Zhejiang province. Completion is anticipated for the end of 2005. The companies say they plan to expand capacity to 1.6 million m.t./yr at a later date.

• Heng Sheng (Ningbo) has secured land at Ningbo for a world–class purified terephthalic acid (PTA) project to be completed in 2006.

• SNF China (Taixing), a subsidiary of SNF Floerger (Andregieux, France) will double the polyacrylamide capacity at Taixing to 40,000 m.t./yr, following closure of an outdated unit at Saint–Etienne, France.

• LG Chemical (Seoul, Korea) has started up a 100,000–m.t./yr polyvinyl chloride (PVC) expansion at its LG Dagu Chemical joint venture plant at Tianjing, bringing total PVC capacity at the site to 340,000 m.t./yr. LG is also planning a jv with Fujian Petrochemical (Quanzhou) for a chlor–alkali and PVC plant at Quanzhou.

• Kaneka (Tokyo, Japan) plans to build a $4.6–million plant to produce 1,200–m.t./yr of expandable polyolefin beads plant at Suzhou. Completion is expected by mid–2004.

• BP (London) has agreed to license its Innovene gas–phase polypropylene (PP) technology to Sinopec subsidiary Beijing Yanhua Petrochemical's polypropylene plant at Yanshan. The project will raise capacity from 80,000 m.t./yr to 120,000 m.t./yr, and allow production of homopolymers and copolymers, by 2005.

• Basell (Milan, Italy) has won a contract from PetroChina Co. The company will use Basell's Spheripol process in three new polypropylene plants (at Daquing, Lanzhou and Dalian), which will have a total output of 800,000 m.t./yr.

• Technip (Paris, France) has been awarded a $50–million contract by Cangzhou Cang Hua Chemical Industry, for a plant to produce both the intermediate vinyl chloride monomer (VCM) and the end product polyvinyl chloride (PVC). The unit will be built adjacent to the firm's existing petrochemical complex at Guangzhou. Once completed in 2005, the plant will produce 400,000 m.t./yr of VCM/PVC from ethhane dichloride.

• Changzhou Worldbest Radici (Changzhou), a jv between Radici Group (Bergamo, Italy) and China Worldbest (Changzhou), recently completed a 165,000–m.t./yr polyethylene terephthalate (PET) resin line at Changzhou, at a cost of $80 million, raising the total capacity there to 300,000 m.t./yr. The company now says it will expand capacity to more than 450,000 m.t./yr by the end of 2005.

• Zimmer AG (Frankfurt, Germany) has been commissioned by Baoding Swan Co. Ltd. (Baoding) to build a plant to produce Lyocell staple fiber. When the 120–million–Euros facility starts up in mid–2005, it will produce 30,000 m.t/yr of staple fiber using Zimmer's Alternative Cellulose Rudolstadt Lyocell process, which is environmentally friendly because it does not require carbon disulfide (as does the conventional viscose process).

• Zimmer has also been awarded two additional contract: One is to build a 660–m.t./d polyester polycondensation plant for Changzhou Plastics Group Corp. in Changzhou, to produce granulate for use in making polyethylene terephthalate (PET) bottles. Completion is due in late 2004. The other is to build a $30–million contract to build a 350,000–m.t./yr, direct–spinning polyester plant for Jiansu Hengli Chemical Fibre Co. (Jiangsu Province).

• The engineering firm Inventa–Fischer, a member of the EMS Group (Surrey, U.K.) has been granted a contract to perform the design and engineering work for a 480,000–m.t/yr polyester plant that will be operated by Jiangsu Senjo Chemical Fiber Co., at Taicang City in the Jiangsu Province. Startup is scheduled for early 2005. The firm has received several other recent awards for polyester projects in China.

• SAL Petrochemical Co., a jv between Dow Chemical Co. (Midland, Mich.) and Asahi Kasei Corp.

(Tokyo, Japan) recently started up a 120,000–m.t./yr polystyrene plant, and a 41,000 m.t./yr converted epoxy resin plant, in Zhangjiagang.

• Two separate petrochemical facilities are being planned in the Lingang industrial zone of Zhuai City. RunDa Group (Hong Kong) says it will spend $1.6 billion to build a world–scale aromatics complex, an 850,000–m.t./yr styrene plant, and a 230,000–m.t./yr octanol unit. Meanwhile, KeDi Group (Singapore) will spend $120 million to build an 80,000–m.t./yr phthalic anhydride plant, and a facility to produce 120,000 m.t./yr of phthalate plasticizers. The units are scheduled to start up between 2005 and 2008.

• Showa Denko's Show Highpolymer unit (Tokyo, Japan) has started work on a 9,600–m.t/yr resin emulsions unit at its Shanghai complex. The plant, which is due to start up in late 2004, will produce acrylic, vinyl acetate, and modified ethylene vinyl acetate emulsions for paints and adhesives, and can easily be expanded to 20,000 m.t./yr, says the firm.

• Atofina (Paris, France) is planning to build a 3,000–m.t./yr production plant for organic peroxides, including polymerization initiators, crosslinking agents for rubber and polyethylene, and curing agents for unsaturated polyester resins. With an initial 3,000 m.t./yr capacity, this future plant will located at Changshu (near Shanghai). Startup is planned for 2005.

• DuPont Co. (Wilmington, Del.) has signed an agreement to provide its acetylene–based butanediol (BDO) technology to Sichuan Tianhua Co. (Luzhou) for a plant at Luzhou with capacity for 25,000 to 30,000 m.t./yr. It is the first time DuPont has licensed the BDO technology to a third party. The project is due to be completed by 2006. DuPont's textiles and interiors unit uses the BDO process to make tetrahydrofuran raw material for Lycra spandex fiber. Sichuan Tianhua is expected to sell the new plant's BDO output to the Chinese merchant market.

• DuPont Hongji Films Foshan Co. (Foshan), a joint venture between DuPont Teijin Films and Foshan Plastics Group, plans to build a polyethylene terephthalate (PET) film train with a capacity of 17,000 m.t./yr at Foshan, which will increase DuPont Teijin's capacity in China to 57,000 m.t./yr.

• China Worldbest Group (Changzhou), a conglomerate of resin producers and a major producer of pharmaceuticals and textiles, says it plans to build a 500–m.t./yr polyacrylonitrile (PAN) and carbon fiber plant in Bengbu. The facility will polymerize feedstock acrylonitrile to produce PAN, which is then spun into a yarn and further processed and dried to form carbon fiber, which is used to make a broad range of consumer goods. According to China Worldbest, China imported more than 3,000 m.t. of carbon fiber in 2002.

• Shantou Ocean Enterprise Group (SOE; Shantou), China's biggest producer of polystyrene, plans to build a $3.7–billion refining and integrated petrochemicals complex at Shantou. The project will consist of a 6.5–million m./yr vacuum crude distillation unit and an olefins plant with capacity for 600,000 m.t./yr of ethylene, 400,000 m.t./yr of propylene, and 200,000 m.t./yr of butadiene, as well as aromatics units. Completion of the refinery is expected by 2007, and construction of the petrochemical units will take place between 2008 and 2012. SOE also recently started up a 100,000–m.t./yr polystyrene plant at Quanzhou.

• Lucite International (Southhampton, U.K.) will invest $100 million to build a methyl methacrylate (MMA) plant at Caojing. The plant, due to come onstream in mid–2005, will have an initial capacity of 93,000 m.t./yr, with an option to expand it to 150,000 m.t./yr.

• Mitsubishi Gas Chemical (MGC; Tokyo, Japan) says it is studying a 100,000–m.t./yr polycarbonate project at an undisclosed location in China. The plant would come online in 2007 and cost about $125 million. The company is also building a 60,000–m.t./yr polyacetal copolymer plant at Nantong, in a jv with Korea Engineering Plastics, Polyplastics (Tokyo) and Celanese subsidiary Ticona (Summit, N.J.).

Industrial gases

Industrial gases – mainly the atmospheric gases oxygen and nitrogen, but helium, hydrogen and others – are an integral part of most petroleum–refining, petrochemical–manufacturing and steelmaking processes. Demand for industrial gases in China continues to grow – by 12 to 15%/year, according to industrial gas giant Messer Griesheim (Krefeld, Germany). – as a direct result of strong demand for petrochemical products and steel, and growth in China's production capacity for these products.

Drawn to this expanding market, all of the world's major industrial gas producers are now making significant investments, establishing joint ventures, and building air–separation units (ASUs) in China. Here is a summary of some recent activity in this sector, organized by multinational company:

Messer Griesheim (Krefeld, Germany)

• Messer Griesheim, which claims a 5% share of China's industrial gases market, recently announced that over the next four years, it is planning ten or more individual projects in China, with total investment expected at 50 million Euros ($67.7 million). In addition to future projects, Messer already has a variety of projects under way in China:

• Messer Griesheim recently acquired the industrial gases assets of Aventis China Investment Co. (Beijing), a subsidiary of Aventis (Strasbourg, France; a company created in 1998 as a merger of Hoechst and Rhone–Poulenc) for an undisclosed amount. The acquired business consists of stakes in seven gas–related jv's in China. This brings to 14 the number of industrial–gas–related jv's involving Messer in China.

• Xianggang Messer Gas Products (Xiangtan, China), a jv between Messer Griesheim and Xingtan Iron and Steel Group (XIS; Xiangtan) will invest $21 million to build an air–separation unit (ASU) at XIS's Xiangtan iron and steel works. Once completed in mid–2005, the plant will have the capacity to produce 16,000 cubic meters/hour (m^3/h) of oxygen and nitrogen. This will expand Xianggang Messer's total capacity to about 30,000 m^3/h, and enable XIS to increase its iron and steelmaking capacity by 25%.

• Messer will build a $10–million, wholly owned ASU at Foshan Petrochemical's Foshan site. Once complete in early 2005, it will have a capacity of 3,200 m^3/h of oxygen and 3,000 m^3/h of nitrogen.

• Wujiang Messer Gas (Wujiang), a jv between Messer and Wujiang Steel, is building two helium–filling stations at Wujiang to serve customers between Shanghai and Suzhou in eastern China. Messer expects helium demand growth of 20%/year in the region, mainly from the electronics industry.

The BOC Group (Windlesham, U.K.)

• Through an $80–million contract with Taiyuan Iron and Steel Corp. (TISCO), the largest stainless steel producer in China, located in the Shanxi province of North–central China, BOC will build two additional ASUs to increase the supply of oxygen by 2,800 metric tons/day (existing capacity there is 1,500 m.t./day), and provide significant quantities of nitrogen, as well. When the ASU comes onstream by the end of 2005, it will help TISCO to boost its stainless steel output from current 600,000 m.t./yr of crude stainless, to 900,000 m.t./yr.

• BOC and Sinopec Yangzi Petrochemical Corp (YPC; a subsidiary of Sinopec) have formed a joint venture, known as Nanjing BOC–YPC Gases Co. Ltd. (BYG), which will supply industrial gases to both YPC's Petrochemical Co. Ltd. Complex, and to a new $3–billion integrated petrochemical complex now under construction by BASF–YPC Co. Ltd., a joint venture between BASF and YPC. BYG's first major project – estimated at nearly $100 million – includes the acquisition of three existing ASUs formerly owned by Sinopec–YPC, and the construction of an additional ASU, which will produce 2,600 m.t./day of gaseous oxygen, 2,000 m.t./day of gaseous nitrogen, and liquefied products for the local merchant market.

• BOC's wholly owned subsidiary in Suzhou has begun construction on a new network of pipelines to meet increasing demand for industrial gases from key customers in the Suzhou Industrial Park and Suzhou New District, strengthening BOC's position in the Shanghai/Nanjing area.

• In a novel use of its oxygen–supply technology, BOC designed and supplied the technology for China's first mobile oxygenation barge, which began operation in 2001. The barge, which contains a BOC Novox oxygen generator and two Vitox oxygen injectors, is being used as part of a 12–year plan to rehabilitate Suzhou Creek, a highly polluted river that flows through Shanghai, China's largest city. Stretches of the 125 km river have reached anaerobic conditions. Pumping oxygen into the water through the barge will assist the natural decomposition of the pollutants and reinvigorate aquatic life in the river.

Air Liquide (Paris, France)

• Hong Kong Oxygen and Acetylene, a jv between Air Liquide and BOC, has reached an agreement with Guangzhou Iron and Steel for the company's Pearl River Gases (Guangzhou) jv to build two air–separation plants that will add a combined capacity of 400 m.t./d.. Costing $19 million, the two plants are due onstream at the end of 2004.

• Air Liquide has signed a contract with UID – Yankuang Chemical Industry Co. to construct an ASU to supply 60,000 m^3/h of oxygen to a coal–fired power plant near the Yellow Sea in Shangdong Province. The plant is scheduled to start up in early 2005.

• Shanghai Chemical Industry Park Industrial Gases Co. jv between Air Liquide and Praxair (Danbury, Conn.; www.praxair.com), will build an ASU and a synthesis gas plant at the Shanghai Chemical Industry Park (Caojing). The plants will supply hydrogen to BASF's planned tetrahydrofuran (80,000 m.t./yr) and polytetrahydrofuran (60,000 m.t./yr) units at Caojing, and nitrogen to a 900–metric ton/year (m.t./yr) ethylene plant being built there by Shanghai Secco Petrochemical (mentioned above). The gas plants are due onstream by the end of 2004.

• In addition to the Shanghai Chemical Industry Park Industrial Gases Co. projects mentioned above, Praxair's involvement in China comes largely through its Praxair China (Shanghai) company, which has become one of the largest industrial gas suppliers in China over the last 10 years, according to the firm. Praxair China is currently involved in 6 jv's, 9 wholly–owned companies, several strategic alliances, and is designing and building a number of ASUs for Chinese operating companies.

Linde AG (Wiesbaden, Germany)

Linde AG subsidiary Linde Gas Xiamen (LGX; Xiamen, China) has signed a long–term contract to build a third ASU to supply oxygen and nitrogen to Xiang Lu Petrochemicals (Xiamen), which is expanding its purified terephthalic acid (PTA) capacity. LGX will invest $36 million; completion is expected mid–2004. The ASU will have a capacity of 11,500 m^3/h, and supply 200 m.t./d of gases to the merchant market in Fujian pro–vince.

Shanghai Nissan Gas Co., a newly created subsidiary of Nippon Sanso (Tokyo, Japan) is building an industrial gases plant at Xinzhang Industry Park (Shanghai). The capacity of the unit, which is scheduled for completion in mid–2004, was not disclosed. This will be Nippon Sanso's second production unit in China (the company's Dalian Nissan Gas Co. subsidiary operates a gases plant at Dalian).

Air Products (Lehigh Valley, Pa)

Air Products and Chemicals, through its Southern Air Products (Guangzhou) Ltd. Subsidiary, designed and constructed a standalone plant that has the capacity to supply 500 m.t./d of gaseous nitrogen and 330 m.t./d of liquid oxygen, nitrogen and argon on a combined basis for the electronics, steel, metal, chemical, and glass industries in Guangdong Province.

• Air Products is building an onsite ASU and liquefier, for startup in 2005, that will supply gaseous oxygen Xingfeng Steel's plant in Tangshan, Hebei Province, and will allow the company to concurrently expand its liquid production to the merchant market in northern China.

• Air Products is currently supplying hydrogen and nitrogen to BP's 350,000–m.t./yr purified terephthalic acid (PTA) facility at Zhuhai (BP recently received government approval to double the PTA capacity at that plant), and hydrogen to the merchant market in Guangdong Province.

• Air Products recently introduced three new native–language websites for its growing China, Taiwan and Thailand markets, to support its estimated 50,000 customers in nine countries throughout Asia (mostly makers and users of electronic chemicals, industrial gases, metals and steel).