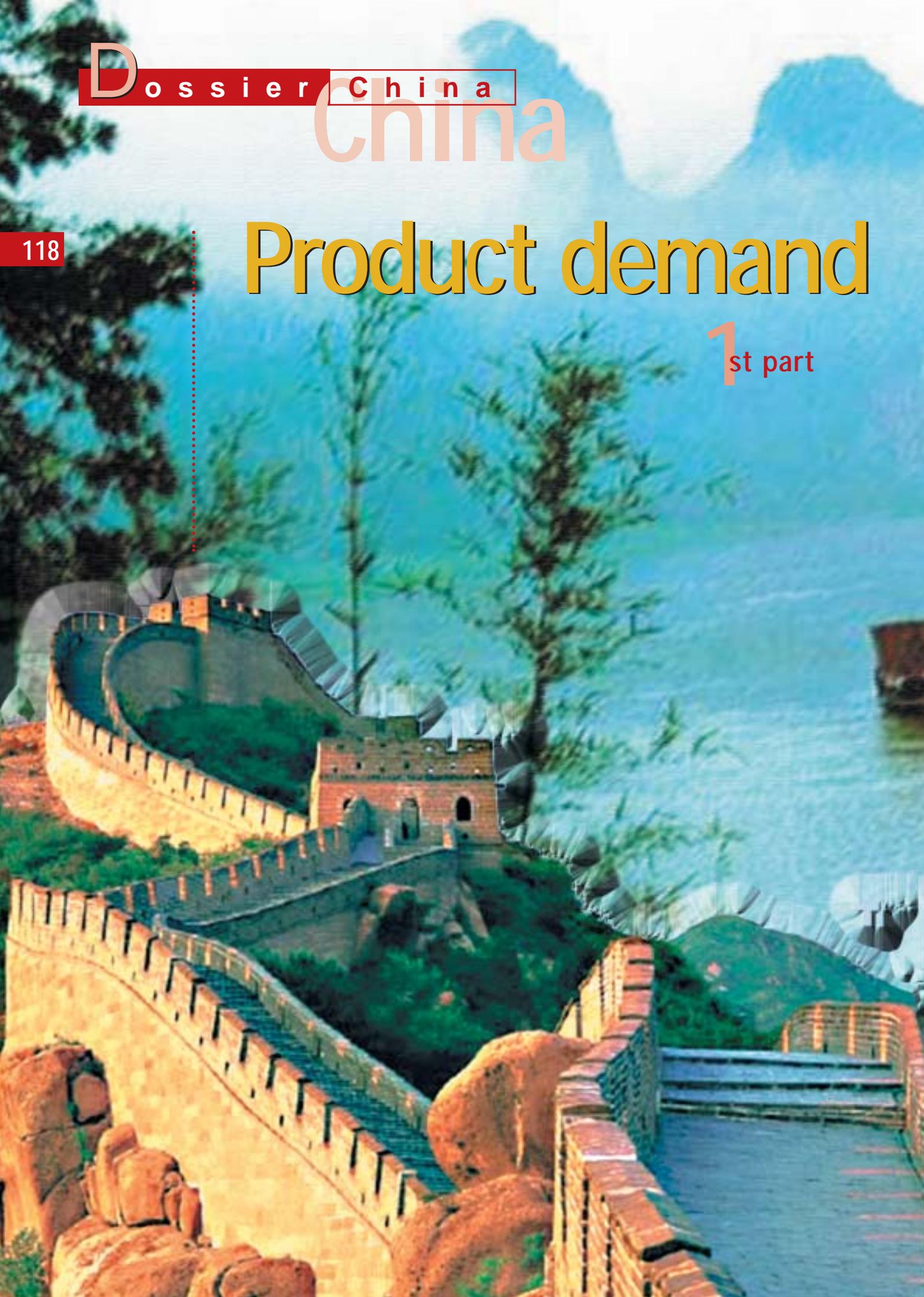


Product demand

1st part



speeds business growth

In the free, global market, China is obviously not the only country to constitute both a market opportunity (in terms of new business) and a business threat (in terms of competition). What makes it both more feared and more eagerly courted is its size.

A massive, well-coordinated and low-cost labour force, relative political stability and extensive natural resources, combined with less tangible assets like ingenuity and determination, plus the totally legitimate right to seek new markets abroad, make Chinese industry a powerful rival indeed. At the same time, the opening of doors has allowed foreign firms to invest and to sell in China, a huge and hungry market.

While technical import barriers to trade (tariffs and quotas) have been and continue to be dismantled, cultural ones still remain. One concrete way of overcoming these is undoubtedly by furthering knowledge of the Chinese industry. This two-part China dossier - taken from research coordinated by the Beijing office of the Italian foreign trade agency, Istituto Nazionale per il Commercio Estero (ICE), with the support of GIMAV, the Italian glass processing machinery and accessory manufacturers' association - analyses and quantifies the Chinese flat glass industry, reveals just how big the Chinese market is and perhaps, for those able to read between the lines, also gives some indication of where opportunities might lie.

Part 1 looks at flat glass production, the internal market and the major players while Part 2, to be published in the next issue of Glass-Technology International, will look at the state of the glass machinery sector in China and at the areas where foreign processing machinery producers may focus their marketing efforts.

Peter Finch

OVERVIEW

The Chinese flat glass industry can be traced back to 1922, when the first vertical glass furnace was erected in *Qinghuangdao Yaohua Glass Factory*, in Hebei province. In 1971, *Luoyang Glass Factory*, today's *Luoyang Float Glass Group Corporation*, invented the Luoyang float process in cooperation with several research institutions. The process, one of the three float processes in the world, was a milestone for the Chinese flat glass industry.

The industry, however, did not take shape until the early 1980s, when China had started to introduce market-oriented economic reforms and had begun opening its doors to the outside world. Before 1982, apart from a number of small flat glass factories with traditional vertical or horizontal production techniques, China had only one float glass production line. The 260-tons-a-year float line, which was built up on the basis of repeated renovation of an experimental line, marked the beginning of massive modern production of float glass in the country.

Thanks to the booming demand for industrial glass as a result of rapid economic development, the Chinese flat glass industry has experienced rapid growth since the 1980s. The output of the Chinese flat glass industry has been the world's largest since 1990, accounting for 28 per cent of the global total. By the end of August 2002, China had 91 float lines, of which 10 were imported or built for foreign float processes. Another 11 float lines are under construction and should be put into operation in 2003. The intensive investment in the industry ensures that production capacity will continue to grow in the coming years.

In China, the deep processing rate of flat glass is only 22 per cent, much lower than the international level of 50-80 per cent. This indicates that the Chinese flat glass industry is dominated by low-technology products with little added value.

PRODUCTION

According to official statistics from the *State Statistics Bureau (SSB)*, the total output of the Chinese flat glass industry hit a record



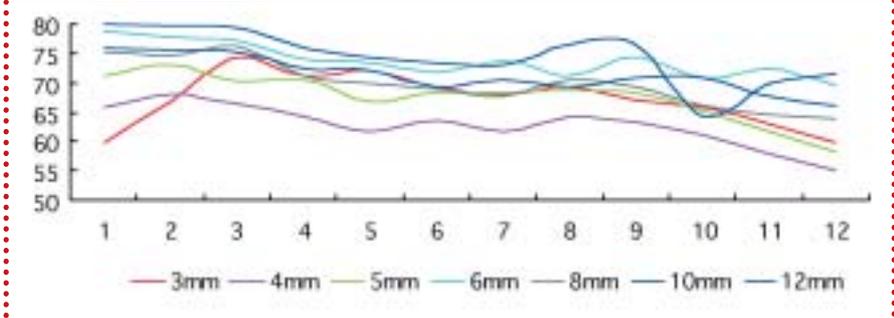
203.6 million weight cases (WCs) in 2001, up 14.5 per cent on the previous year. It was the first time that output had surpassed 200 million weight cases. This historic breakthrough also marked China becoming the world's largest flat glass producer for 12 consecutive years.

Along with fast growth of the flat glass industry, a significant change took place in the product structure as the Luoyang float glass technology became more mature. In 1985, float glass output accounted for only 4.3 per cent of total flat glass production. This percentage rose to 39.8 per cent in 1995 and further to 75 per cent in 2001. It is expected to exceed 80 per cent in 2005. Traditional vertical and horizontal processes, characterized by high energy consumption, product quality inconsistency and a strong environmental impact, is gradually fading out of the market.

According to the *China Architectural and Industrial Glass Association*, there were 128 major flat glass producers in 2001, with 70 large and medium-sized producers controlling 88.6 per cent of total production, 78.34 per cent of total sales and 70.5 per cent of total profits. In 2001, nearly one third of these large and medium-sized producers suffered considerable economic losses.

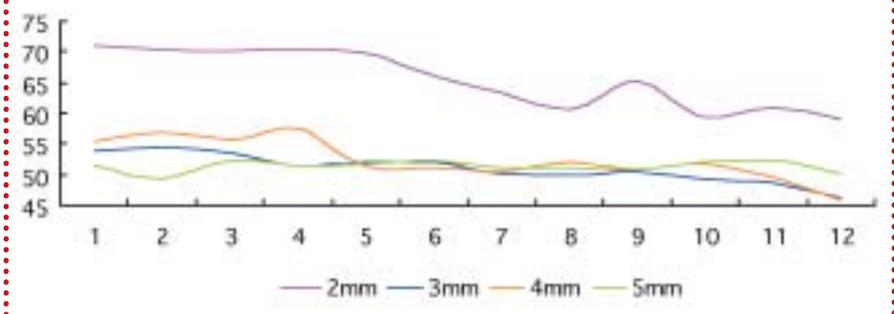
Companies with foreign capital are playing a crucial role in the Chinese flat glass industry, particularly in the high-tech market. World glass giants such as *Asahi*, *Pilkington*, *PPG* and *Saint-Gobain* have been watching the Chinese market since China started its market-oriented economic reform. All these companies have entered the Chinese market by setting up joint ventures with local glass producers. They

**AVERAGE PRICE OF FLOAT GLASS, 2001
(UNIT: RMB/WC)**



Source: State Administration for Building Materials Industry

**AVERAGE PRICE OF ORDINARY FLAT GLASS, 2001
(UNIT: RMB/WC)**



Source: State Administration for Building Materials Industry

usually focus on producing technology-intensive glass and almost monopolize the high-grade market thanks to their advanced production facilities, well-established quality control and management mechanisms. They may continue to lead the high-tech end of the market for at least several years to come.

In recent years, the local private and township enterprises also experienced positive development, as they are fully profit-driven and more sensitive to market signals than state-owned producers.

The importance of state-owned enterprises (SOEs) in the industry was further weakened. In 2001, these SOEs generated 50.3 per cent of total sales revenues but their profits accounted for a humble 1.8 per cent of the industry total. Like most SOEs in other industries, they still suffered from blind production, outmoded management and some historical burdens such as overstaffing. In recent years, massive structural changes were occurring among these SOEs with a view to addressing these problems.

SALES

The total sales volume of the Chinese flat glass industry was 193.7 million weight cases in 2001, up 14 per cent on the previous year. The sales production ratio was 95.14 per cent and the total inventory for the year was 24.887 million weight cases.

Compared to the remarkable growth of sales volume in 2001, the sales revenue of the entire industry reached RMB 18.387 billion, an increase of just 3.82 per cent on the previous year. Overall industry profit, however, was only RMB 712 million, a fall of 58.08 per cent. Most glass producers faced losses, except for those producing high-grade float glass with imported float technology.

As a result of oversupply and fierce market-place competition, the inventory increased by 25 per cent in 2001 but the average price was 30 per cent lower. Price reduction always seemed an ulti-

mate means of market competition. Most producers tended to sacrifice profits for market shares. The price of four-millimetre flat glass was reduced to RMB 55 per weight case. According to industrial professionals, this price was very close to its average production cost.

Indicators suggest that the market is currently experiencing a severe recession. From July 2000 to August 2002, a total 19 float lines were put into operation, while another 11 were under construction. These newly built float lines featured larger output capacity and a shorter building period. The average output capacity was close to 500 tons a day and the building period from project design to trial operation was one year. All 11 lines under construction were expected to start production during the first half 2003.

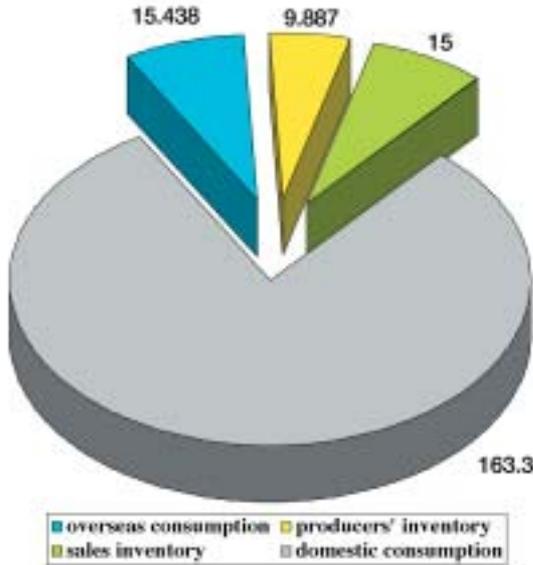
CONSUMPTION

The actual flat glass consumption in the Chinese market, not including the inventories of producers and distributors, was 168.685 million weight cases, of which locally-made products accounted for 97 per cent of the total.

CONSUMPTION BY PRODUCT

Seventy-eight per cent of glass consumed in the Chinese market is in the form of glass

CONSUMPTION OF CHINESE-MADE FLAT GLASS



DOMESTIC CONSUMPTION OF FLAT GLASS

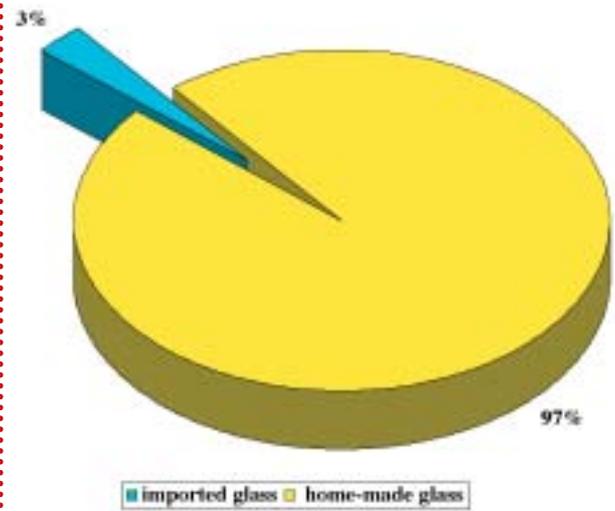


plate. Processed glass consumption in China is still very low. In recent years, the Chinese government issued rules and regulations urging the increased use of safety glass (tempered and laminated) particularly in the construction sector, and industrial professionals called for the consumption of other value-added processed glass products. All these will help guide market consumption, shifting it from low-value-added products to more value-added processed products, although at a gradual pace.

CONSUMPTION BY INDUSTRY

Over 80 per cent of flat glass consumption was in the construction industry, with a dominant proportion used for new buildings. In 2001, China built 825 million new houses. This figure is expected to see double-digit growth in the next 10 years. It is followed by speciality industries (electrical appliances, furniture, etc.) and the transportation industry.

The automotive industry is a rising consumer of flat glass, especially safety glass. Chinese car production was expected to reach three million vehicles in 2002, up nearly 30 per cent over the previous year. The industry is

expected to grow by 30-50 per cent in the next few years to come.

IMPORT AND EXPORT

China's foreign trade in flat glass saw a surplus of US\$ 41 million in 2001. Exports totalled 58.66 million square metres, valued at US\$ 145 million; imports totalled 24.47 million square metres, valued at US\$ 104 million. Compared with the previous year, the export value increased by 8.7 per cent and the import value decreased by 15.8 per cent. This indicated that domestic market pressure had impacted upon foreign trade. On the other hand, China's competitiveness in the world market was growing thanks to its increasing technological level and qualitative improvements of flat glass products.

Despite the trade surplus, foreign trade had not yet achieved any significant breakthrough. Moreover, the price difference between imported and exported products remained significant. The average price of imported products was US\$ 4.24 per square metre, over 70 per cent higher than that of China's exported products.

FLAT GLASS CONSUMPTION BY PRODUCT (unit: million WCs)

TOTAL CONSUMPTION	PROCESSED GLASS						GLASS PLATE
	SUB-TOTAL	LAMINATED	IG	TEMPERED	COATED	OTHER	
168.685	37.040	2.015	7.208	7.774	12.712	7.240	131.646
100%	21.9%	1.20%	4.28%	4.62%	7.56%	4.3%	78.04%

FLAT GLASS CONSUMPTION BY INDUSTRY, 2001 (unit: million WCs)

TOTAL	CONSTRUCTION	TRANSPORTATION	SPECIALITY INDUSTRIES	OTHER	INCL. IMPORT
168.685	135.611	8.930	21.623	2.521	5.395
100%	80.39%	5.29%	12.82%	1.5%	3.2%

MAIN PRODUCERS

In terms of output, the largest flat glass production province is Henan, with a share of nearly 14 per cent. The other main provinces are Hebei, Jiangsu, Shandong and Liaoning. In total, over half of the flat glass output comes from these five provinces. All these provinces are located in coastal regions or central China, where the economy is relatively more developed than other regions.

Jiangsu Farun Group Co. Ltd. is China's largest flat glass producer, based in Zhangjiagang City, Jiangsu Province. It started to produce flat glass in 1980. Today it owns six float glass production lines with capacities ranging from 300 tons a day to 700 tons a day. It has a well-equipped processing unit, producing various kinds of glass products. Since 1999, the company has produced more value-added products by introducing a 300-tons-a-day extra-thin float glass production line and a production line for coloured micro-crystallized decorative plates with an annual production capacity of 800,000 square metres.

With an annual output capacity of 20 million weight cases of float glass and six million square metres of processed glass, the compa-

ny became the largest glass producer in China with an output of 12.4 million weight cases, or 6.1 per cent of the nation's total in 2001.

As one of the three bases for producing and processing float glass in China, the company produces 1.5- to 19-millimetre float glass in various colours, coloured micro-crys-



PROVINCE	OUTPUT (MILLION WCs)	% OF NATIONAL TOTAL
1. Henan	27.94	13.72
2. Hebei	23.28	11.43
3. Jiangsu	22.24	10.92
4. Shandong	18.09	8.88
5. Liaoning	15.38	7.55
6. Zhejiang	10.05	4.93
7. Hunan	8.58	4.21
8. Sichuan	7.74	3.80
9. Shanghai	7.56	3.71
10. Hubei	6.78	3.32

Source: State Statistics Bureau

CHINA'S 10 LARGEST FLAT GLASS PRODUCERS

COMPANY	OUTPUT AND SHARE (MILLION WCs)
1. Jiangsu Huarun Group	12.4 (6.1%)
2. China Yaohua Glass Group Corp.	9.12 (4.5%)
3. China Luoyang Float Glass Group Co. Ltd.	7.69 (3.8%)
4. Zhejiang Shaoyang County Guangyu Group	6.34 (3.1%)
5. Henan Jianhua Glass Factory	5.92 (2.9%)
6. Shanghai Yaohua Pilkington Glass Stock Co.	5.76 (2.8%)
7. Shanghai Lanxing (Blue Star) Group Co. Ltd.	5.55 (2.7%)
8. Shandong Glass Group	5.42 (2.7%)
9. Henan Shangqiu Zhenghua Glass Factory	5.35 (2.6%)
10. Hebei Beifang (North) Glass Group Co. Ltd.	4.62 (2.3%)

Source: China Architectural and Industrial Glass Association

tallized glass decorative plates and lamination, bullet-proof glass, toughened glass, hot-bent glass, insulating glass, sandblasted glass, coated glass, high-grade windshield glass, inlaid-glass doors and other processed products. These products sell well in the domestic market and are also exported to the Middle East, Europe and America, Africa, South-east Asia and other countries.

China Yaohua Glass Group Corporation, founded in 1922, was the first enterprise to produce glass with machinery in China and the whole of the Far East, earning itself the title of the 'cradle' of the Chinese glass industry. Today it is comprised of eight branch companies, nine subsidiaries and eight shareholding companies. With seven float glass lines and a total production capacity of over 16 million cases (including 14.48 million cases of float glass), its total output of flat glass reached 9.12 million cases, making it China's second largest flat glass operation. It produces 140 kinds of product in thicknesses of 1.6-19 millimetres and sheet sizes of up to 6,000 x 3,660 millimetres.

China Luoyang Float Glass Group (CLFG) was the birthplace of the Luoyang float process. Preparations for the setting-up of CLFG were started in 1956. Today, CLFG possesses two

affiliated companies, 11 majority-controlled sub-companies (excluding secondary majority-controlled companies), three share-holding sub-companies and one collectivized sub-company.

CLFG has 12,000 employees and total assets of RMB 3.91 billion. With six float glass production lines, CLFG now has an output capacity of over 13 million weight cases, 4.2 million square metres of processed glass and 2,000 tons of fibre glass. Its products are sold throughout China and are exported worldwide.

FOREIGN TECHNOLOGY SUPPLIERS

For decades, global flat glass production has been controlled by a handful of glassmaking giants, all of whom started to show interest in China in the 1980s, following the introduction of economic reforms. They all entered the Chinese market by setting up joint ventures with Chinese glass producers. They usually have several joint ventures to produce different types of glass product, or focus on a certain regions, given the huge geographical size of China.

Pilkington

UK glass group Pilkington has been active in China since 1983, and now has an extensive sales and manufacturing operation in China, Hong Kong and Taiwan. Pilkington owns shares in five glassmaking joint ventures in the People's Republic. These are located throughout the country and manufacture float, architectural and automotive glass products.

Shanghai Yaohua Pilkington Glass Co. Ltd. (19 per cent owned by Pilkington), also known as SYP, is a famous Shanghai-listed company with three float glass manufacturing lines in Shanghai and Guangdong. SYP also manufactures a wide range of processed glass products for architectural applications.

Guilin Pilkington Safety Glass Co. Ltd. (60 per cent owned by Pilkington) was established in 1994 in the southern tourist city of

Guilin. This company manufactures laminated and tempered automotive glass products for the domestic Chinese and export markets.

Changchun Pilkington Safety Glass Co. Ltd. (51 per cent owned by Pilkington) was established in 1994 in Changchun, the northern city that is home to the First Automobile Works Group. This company also manufactures laminated and tempered automotive glass products for the domestic Chinese and export markets.

Wuhan Yaohua Pilkington Safety Glass Co. Ltd. (45 per cent owned by Pilkington) was established in 1995 in the central Chinese city of Wuhan. This company manufactures laminated and tempered automotive glass products for the Citroen joint venture plant in Wuhan, and also exports replacement auto-glass products to North America and Europe.

SYP Autoglass Company Limited (25 per cent owned by Pilkington), formerly owned by *Ford Glass Division*, and called *Shanghai Fuhua Glass*, was acquired by Pilkington and SYP in 2000, and is located adjacent to the SYP float glass plants in Shanghai. It is a major supplier of automotive glass products to the Shanghai area OE vehicle manufacturers, and also exports glass products to Australia, Europe and North America.

PPG

US-based PPG has invested in several glass projects in China since the early 1980s. These include *Guangdong Float Glass Co. Ltd.*, *Dalian Float Glass Co. Ltd.* and *Beijing Fanhua Glass Co. Ltd.* However, as the company has become a comprehensive company with its primary business focus shifting away from glass to other industries, PPG has cut its investment in the Chinese glass industry, selling its shares in Guangdong Float Glass Co. Ltd. and Beijing Fanhua Glass Co. Ltd. to Shanghai Yaohua Pilkington Glass Co. Ltd.

Asahi

The Japanese group Asahi has invested in four glass enterprises in China, including Guangdong Float Glass Co. Ltd., Dalian Float Glass Co. Ltd., Qingdao Float Glass Co. Ltd., and Tianjin Riban Float Glass Co. Ltd. Three of these enterprises are invested together with Pilkington and PPG.

Saint-Gobain

France's Saint-Gobain entered the Chinese market by setting up a joint venture in Beijing producing special RO99 E-glass. Over 80 per cent of its output is exported. More recently, it has set up a joint venture with *Hangzhou Glass Group*, which became fully operational in December 2001. Its maximum capacity amounts to 9,000 tonnes. Current production is mainly textile and reinforcement products such as roving and chopped strand mat.

OBSTACLES TO PROGRESS

Although the Chinese glass industry has experienced fast growth, there exist some obvious problems standing in the way of further development.

Decentralized production

China's flat glass production has ranked first in the world since 1990. However, production is quite decentralized, with nearly 1,000 companies involved in glass production. By August 2002, there were 91 float glass production lines in China, used by some 60 companies. In western countries, for instance, the United States has only six float glass producers, the United Kingdom has two, and both Japan and Italy have only one. The largest glass producer in China has a market share of only six per cent. This decentralized production has greatly hindered the international competitiveness of the Chinese glass industry.

In the flat glass industry development programme of the tenth five-year plan, the Chinese government sets out to eliminate a considerable number of small companies by fixing the minimum production scale at two million weight cases, three times current average capacity. The government has also encouraged industrial restructuring so as to form larger but fewer glass producers.

Repeated low-level construction

Domestic investments in the glass industry feature repeated low-level construction, as most of the investments are poured into low-technology flat glass production, even when the market has shown signs of oversupply. Some funds are even used to erect out-of-date vertical glass production lines. This kind of situation is especially true in some state-owned

CHINA - ECONOMIC DEVELOPMENT

In the last two decades, China stood out as the world's star performer in economic growth, thanks to the market-oriented reform that started in 1978. China has been developing at an unprecedented growth rate, its gross domestic product (GDP) rising from RMB 362.4 billion in 1978 to RMB 9,593.3 billion in 2001, an annual growth rate of 9.4 per cent, considerably higher than the world average during the same period (3.3 per cent).

This growth has effectively strengthened China's economic power and raised its people's standard of living. The country was listed last year as the sixth biggest economy in the world in terms of total economic scale - in 1990, it ranked tenth. China has stood the tests of the Asian financial crisis and the recessive world economy and acquired rich experience at the same time.

China appears to have moved quite smoothly from a centrally planned command economy to a socialist market economy, operating increasingly along capitalist lines. Particularly, since its accession to the World Trade Organization (WTO) in November 2001, China has been improving its market economic system and legal system in accordance with WTO rules and the nation's actual conditions, further transforming government functions and establishing a unified domestic market for fair competition. Efforts are also being made to adjust the industrial structure and introduce foreign capital, technology and management expertise while giving full play to its rich human resources. China is expected to maintain 7-8 per cent annual economic growth rate between 2002 and 2005.

MAIN ECONOMIC INDICATOR 1994-2001

	1994	1995	1996	1997	1998	1999	2000	2001
GDP growth (%)	12.6	10.5	9.7	8.8	7.8	7.2	8	7.3
Consumer price inflation (%)	24.1	17.1	8.3	2.8	-0.8	-1.3	0.4	0.7
Merchandise exports FOB (US\$ bn)	103	128	151	183	184	195	249	266
Merchandise imports FOB (US\$ bn)	95.3	110	132	136	133	159	225	244
Realized FDI (US\$ bn)	33.8	37.5	41.7	45.3	45.5	40.4	40.8	46.8
Exchange rate (RMB:\$)	8.6	8.4	8.3	8.3	8.3	8.28	8.27	8.27
Foreign reserves (US\$ bn)	52.9	75.4	107	143	145	158	166	212

Source: China Statistical Yearbooks

enterprises that care more about market shares than about profits. Investments in the value-added processed glass sector remain small because of high technological requirements.

Irrational product structure

The product structure of Chinese glass industry is irrational, with non-float glass production still amounting to 25 per cent of the

total. Moreover, the current processing rate is only 22 per cent, much lower than 50-80 per cent in the West. China still relies heavily on imports to meet domestic demand for high-grade float glass.

SECOND PART IN ISSUE N. 1/2004