

COMPANY PROFILE

LIUGONG

OCTOBER 2002

<u>CONTENTS</u>	<u>PAGE</u>
INTRODUCTION	1
SUMMARY	1
HISTORICAL DEVELOPMENT	2
COMPANY STRUCTURE	5
FINANCIAL DATA	8
MANUFACTURING FACILITIES	9
CORPORATE STRATEGY	11
RESEARCH AND DEVELOPMENT	13
COMPONENT SOURCING	14
<u>EQUIPMENT ANALYSES</u>	
• WHEELED LOADERS	15
• CRAWLER EXCAVATORS	19
• COMPACTION EQUIPMENT	21
• BACKHOE LOADERS	22
MARKETING AND DISTRIBUTION	23
EXPORTS	26

COMPANY PROFILE

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INTRODUCTION

This is the first company profile in Off-Highway Research's subscription Service on the Construction Equipment Industry in the People's Republic of China. The subject is Liugong, one of the largest wheeled loader manufacturers in the country.

In the company's name 'Liugong', **Liu** refers to Liuzhou City in Guangxi Zhuang Autonomous Region (GZAR) where the company is located, and **gong** refers to the construction machinery. The name of Liugong has two associations: one is Guangxi Liugong Machinery Co. Ltd., the subject of this report; the other is the Liugong Group Co. Ltd., which has been the parent company of Guangxi Liugong Machinery since it went public in 1993.

In this report, with regard to the period starting from 1993, 'Liugong' invariably refers to Guangxi Liugong Machinery Co. Ltd., as listed on the Shenzhen Stock Exchange, and its parent company is called 'Liugong Group'.

SUMMARY

Table 1. Liugong: Statistical Summary, 1993-2002

	Sales (RMB Mn)	Net Profit (Loss) (RMB Mn)	Employees	Production (units)		
				Wheeled Loaders	Crawler Excavators	Compaction Equipment
1993	988.03	206.92	5,940	3,436	5	-
1994	568.64	37.62		2,044	5	-
1995	620.07	39.06		2,400	6	-
1996	633.98	23.98		2,450	15	-
1997	714.29	(6.07)		2,700	30	-
1998	788.31	20.71		2,800	16	-
1999	736.74	2.50		2,478	61	-
2000	764.78	0.14		2,825	143	135
2001	977.57	21.45		3,988	168	208
2002*	1,490.00	60.00	3,530	6,800	180	280

* Off-Highway Research's estimates based on mid-year data.

Source: Off-Highway Research

HISTORICAL DEVELOPMENT

Over more than 40 years Liugong has become one of the largest wheeled loader manufacturers in China, and has more recently extended its product range to compaction equipment and crawler excavators. Liugong traces its history back to 1958, when it was named Liuzhou Metal Structure Plant and made steel components for the oilfield development in the adjacent Guangdong Province. In 1960 it developed 80 horsepower crawler dozers and tower cranes, which were its first entry into manufacturing construction equipment. The annual production of crawler dozers stayed at under 200 units until the early 1970s, when it turned to wheeled loaders.

In 1961 the central government formulated a master plan for the country's construction equipment industry, by which Liugong, along with Xiamen's and Chengdu's construction machinery plants were designated to focus on wheeled loaders. Liugong started in 1966 with the model Z435, which was a design from a Japanese manufacturer with a 135 horsepower engine. In 1971, it added a 220 horsepower articulated wheeled loader – the Z450. Both models, however, were produced only in very small numbers.

In 1971, Liugong developed the wheeled loader model ZL50, in conjunction with the Tianjin Construction Machinery Institute. The ZL50 was based on Euclid's 72-51 model and became a basic design of the ZL-series wheeled loaders, consisting of the ZL20, 30, 40, 50 and 90, which were developed in the 1970s. In 1976, Liugong launched the largest model ZL90, at 400 horsepower. In 1978, out of the country's total production of 1,315 units, 307 wheeled loaders were made in Liugong. At the same time, Liugong also produced loaders for underground mining.

From 1963 to 1985, Liugong was directly led by the Ministry of Machinery. In 1986, the Ministry gave its powers over the state-owned construction equipment manufacturers to the local government and Liugong was given to the GZAR (Guangxi Zhuang Autonomous Region). The GZAR gave Liugong financial support for updating its technology and products. In 1989, by integrating a number of local companies, the Liugong Group was established. The Group is now controlled by the local government and focuses on wheeled loaders. Thanks to updating the manufacturing technology and reforming its management system, Liugong witnessed rapid growth and in 1992, the year before it went public, production amounted to 2,350 wheeled loaders, and sales reached RMB520 millions.

In 1984 to 1986, the Ministry of Machinery organised co-operation between 12 domestic manufacturers and Caterpillar for introducing CAT's manufacturing technology for wheeled

loaders, crawler dozers, logging machines and the relevant key components. CAT wheeled loaders were introduced to Liugong, Xiamen and Yichun through a number of licences. Employing Caterpillar's design of its models 996E and 988B, Liugong developed the ZL60E and ZL100 in 1989, the latter being one of the largest models produced in China. The project lasted until the mid-1990s and both the models were launched to the market in that decade.

Liugong became a public company in 1993, with 75 per cent of the shares held by the Liugong Group and the remaining 25 per cent by the public. They are quoted on the Shenzhen Stock Exchange. Since then Liugong has gradually moved into the era of market-oriented operations, instead of depending on central government plans. In other words, it is now exposed to the effects of market trends and is supposed to operate by making its own decisions.

In its initial year as a public company Liugong witnessed such a strong market for wheeled loaders that production could hardly meet demand. The price for a ZL50 went up to RM480,000, almost double the current price. With total sales of 3,436 units in 1993, Liugong made a net profit of more than RMB200 million on almost RMB1 billion, a ratio that has never been achieved again.

In 1994-1995, the country suffered currency inflation and price escalation. The central government adopted a deflation policy and cut investment. Weak demand for construction equipment caused Liugong's sales to fall by 42 per cent in 1994, and profits were dramatically reduced.

In November 1994, Liugong established Shanghai Liugong Machinery Co., Ltd with Shanghai Pudong Mingren Industrial Company, with Liugong controlling 51 per cent. Shanghai Liugong was set up for the assembly, sale and servicing of construction equipment but the actual performance was far below expectations. It made losses in its first year and was terminated in 1995.

In 1995 Liugong established a joint venture with Case for making backhoe loaders and one with ZF for making axles and transmissions. However, both made losses, so that Liugong had to terminate Liuzhou Case in 1998, and transferred its shares in Liuzhou ZF to its parent company Liuzhou Group in 2001.

Imported technology helped China in the 1990s to upgrade its manufacturing capability for the production of wheeled loaders, resulting in a significant growth in output. Liugong remained as

the largest manufacturer, with a production of 2,879 units in 1998, accounting for about 17 per cent of the country's total.

Since 1998, the central government has enormously increased investment so as to stimulate domestic demand and sustain economic growth. This has brought with it a flourishing market for construction equipment. Liugong has enjoyed rapid growth in the sales of its wheeled loaders, from 2,830 units in 2000 to 3,814 units in 2001 (including 1 – 2 per cent of exports), and maintaining a share of around 13 per cent in the domestic market. In 2002, its sales are expected to exceed 6,400 units.

On the other hand, market conditions have changed. The number of domestic wheeled loader manufacturers has risen to over 100 since 2000 and the fierce competition has resulted in a price war that is still continuing in 2002. The selling price for a typical ZL50 wheeled loader has fallen from RMB330,000-340,000 in early 2001 to the current RMB230,000-250,000 in mid-2002, while the manufacturing cost amounts to around RMB200,000.

Given the slump in retail prices, it has been common to see manufacturers losing money while they increase production. On average, Liugong's sales revenue from each unit sold fell by about RMB40,000 between 2000 and 2002. From 2000 to 2001 the operating income per unit sold dropped by about 10 per cent, but in 2002 it increased by 19 per cent, thanks to reduced unit costs associated with better economies of scale.

With prices falling some of the smaller manufacturers will soon withdraw from the market, which will eventually be controlled by a handful of major manufacturers as Liugong, Xiamen Construction Machinery Group and a few others. Among the leading manufacturers, Liugong lost its first place to Xiamen in 2001. In such a market, however, it is more important to sustain profitable growth than to be in first place every year.

Over the long period of the planned economy, Liugong was directed to focus on middle to large wheeled loaders. However, in 1996 it started to produce compact wheeled loaders, the ZL15 (68 horsepower) and then the ZL18A (78 horsepower). In 2002, Liugong changed the name of its subsidiary Liuzhou Construction Machinery Gear Company to Liuzhou Liugong Compact Loader Co. Ltd., to open up a specialised area for production of compact equipment. This was a bold recognition of likely future trends.

Meanwhile, Liugong has been aware that severe competition in the wheeled loader market is making its position as a specialist increasingly difficult, and it has been broadening its interests

by adding other products and operations. Its investments in Jiangyin Liugong, Liuzhou Kangda and Beijing Guiliugong have generated good profits and it is increasing its participation by increasing investment.

Liugong acquired control of Jiangyin Liugong Road Machinery Co. Ltd., the compaction equipment specialist, in 2000, a move which has proven successful. Jiangyin's production in 2002 should amount to between 250 and 300 units, with revenues exceeding RMB50 million.

In 1990 Liugong developed 40 tonne crawler excavators using domestic components, but they proved to be unable to compete with imported or joint venture products. In 1996, it launched a range of 20 tonne crawler excavators with foreign components, which saved the product line. While Liugong excavators have difficulty in competing with international brands, production has been increasing and the plan for 2002 is 200 units. Excavator production was in the hands of Liugong Kangda before 2002. In 2001 Liugong purchased a new site in Labao Town, in the adjacent Liujiang County and opened a specialised excavator factory there. In 2002 it set up a subsidiary excavator company to replace the previous Liuzhou Kangda operation.

In August 2002, Liugong Group acquired Shanghai Forklift Truck Plant with an investment of RMB40 millions and Shanghai Liugong Forklift Truck Co., Ltd. came into existence.

With the strength gained from its successful operation in the domestic market, Liugong is now continuing to broaden its interest to other product lines such as backhoe loaders, mini excavators, motor graders and concrete machinery, and is also exploring overseas markets for increasing its exports.

COMPANY STRUCTURE

Before it went public in 1993 Liugong was a wholly state-owned enterprise. It is now the principal member of the Liugong Group. When it was listed on the Shenzhen Stock Exchange, Liugong Group held 75 per cent of its 200 million shares. By mid-2002, of the total assets amounting to RMB 1.49 billion, the Group's share had reduced to 63.47 per cent, the other shares being public. The Board of Directors consists of directors appointed by the largest shareholder, the Liugong Group and independent directors elected by the shareholders, with the latter making up one-third of the total.

In the initial year of its founding, Liugong was a single company focusing solely on wheeled loaders. Since then, it has been taking control of, and changing its holdings in, a number of

subsidiary companies, mostly by exchanging with its parent company, Liugong Group. Since 2000, especially, given the desperately competitive market for wheeled loaders, Liugong has been spreading its interests by purchasing shares in other companies.

Two joint ventures, established with Case and ZF in 1995, and both based in Liuzhou City are no longer part of the Liugong structure. The JV with Case was terminated in 1998 and Liugong transferred all its shares in the ZF joint venture to the Liugong Group in 2001.

The companies currently associated with Liugong are as follows:

The Subsidiary Sales Company of Guangxi Liugong Machinery Co. Ltd: This company is responsible for selling final products and components, and providing repair and service. Before it was established in November 2000, Liuzhou Liugong Machinery Sales Co. Ltd., shared between Liugong (93 per cent) and its parent company Liugong Group (7 per cent), performed this task. In November 2000 the current company was formed and the previous sales company liquidated.

Liugong Foundry Co. Ltd: This company was established in April 2000 by combining Liugong's foundry centre with Liuzhou Liugong Iron Foundry Plant, and is located in Liuzhou City with a covered area of 31,400 m². It produces components such as gearbox housings, axle housings, wheel hubs, and other axle components, which are mainly supplied to Liugong and Liuzhou ZF. Liugong holds 98.84 per cent of the company.

Liuzhou Kangda Construction Machinery Co. Ltd: Based in Liuzhou, this company produces buckets for wheeled loaders and structural components for excavators, sells spare parts, and provides repair services. Liugong acquired 40 per cent of shares from the Liugong Group in December 1995. The company was originally classified as a Sino-foreign joint venture because of the 25 per cent share owned by a Hong Kong company. In April 2002, the Hong Kong company transferred its share to the Liugong Group and accordingly Liuzhou Kangda became a domestic enterprise. The registered capital changed from USD12 million to RMB91.88 million. Liugong then acquired a further 35 per cent of the shares and now controls 75 per cent in total.

Jiangyin Liugong Road Machinery Co. Ltd: The former Jiangsu Jiangyin Transport Construction Machinery Plant based in Jiangyin City, Jiangsu Province. In August 2000 Liugong invested RMB11.22 million to purchase 55.27 per cent of its shares, thus broadening its product range to include compaction equipment. The company has since shown rapid growth. In

December 2001, Liugong increased its shareholding to 84.18 per cent with a total investment of RMB5.87 million.

Beijing Guiliugong Machinery Co. Ltd: This company was established in September 2000 between Liugong and Liuzhou Kangda, with Liugong taking 80 per cent of shares. In 2001, the registered capital was increased from RMB2.25 million to RMB13.35 million, while the shares between the two holders remain the same. The company is based in Beijing, selling Liugong products and providing after sales service to customers around Beijing, as well as the R&D of scientific products.

Liuzhou Liugong Machinery Parts Co. Ltd: This company was established in 2000, based on the earlier Liugong Parts Centre. Liugong controls 51 per cent and the Liugong Group, 49 per cent. The company provides parts for Liugong wheeled loaders and excavators.

Liuzhou Construction Machinery Gear Company/Liuzhou Liugong Compact Loader Co. Ltd: The Liugong Group founded this company in 1994. Liugong took over 62.49 per cent of shares in 1995 and in December 2001, increased its share to 95 per cent, with the remainder owned by the Liugong Group. The company, with a registered capital of RMB 13.64 million, produces gears and steel parts, as well as Liugong's small wheeled loader models such as the ZL30F, ZL18A and ZL15C. In March 2002, the company was renamed as Liuzhou Liugong Compact Loader Co. Ltd.

Guangxi Liugong Industrial Investment Co. Ltd: This company was established in June 2002, with a registered capital of RMB29.60 million. Liugong controls a share of 39.19 per cent and the Liugong Group, 33.79 per cent. Apart from the rental of construction equipment, the company will cover a wide range of activities which include real estate development, investment and the trading of industrial commodities.

Joint Ventures

Liuzhou Case Liugong Construction Machinery Co. Ltd: This company operated from 1995 to 1998. Liugong held 30 per cent and Case controlled 70 per cent. In the first half of 1996, it manufactured 10 units of Case 580L backhoe loaders. Production never reached more than 50 units a year and the venture suffered losses until 1998 when Liugong decided to cease production altogether.

Liuzhou ZF Machinery Co., Ltd: The venture was established in December 1995, with Liugong taking 49 per cent and the German **ZF Friedrichshafen AG** 51 per cent. The registered capital is DM56 million while the total investment plan amounts to DM96 million. The purpose of the joint venture is to manufacture drivelines and parts of drivelines for construction machinery. Currently it provides ZF WG200 powershift transmissions and the Series AP400 Planetary rigid axles for high quality construction equipment products made in China.

Production began in 1996, and its service network has now extended to nine major cities around China. The management is shared between a German general manager who concentrates on the production and engineering aspects, and his Chinese deputy general manager who takes responsibility for marketing, after-sales service, finance and executive administration.

In 2001, Liugong transferred its shares to its parent company Liugong Group at a price of RMB72.99 million. This, however, does not mean Liugong no longer plays a role in the joint venture, given its inherent relationship with the Group and the close trading relationship with Liuzhou ZF. The transfer should help Liugong improve its own financial performance by avoiding a share of the venture's losses in its early years.

FINANCIAL DATA

Table 2. Liugong: Financial Highlights, 1993-2002
(RMB million)

	Sales					Net Profit (Loss)
	Total	Wheeled Loaders	Crawler Excavators	Compaction Equipment	Spare Parts	
1993	988.03					206.92
1994	568.64					37.62
1995	620.07					39.06
1996	633.98					23.98
1997	714.29					(6.07)
1998	788.31					20.71
1999	736.74					2.50
2000	764.78	685.77	10.40	12.31	56.30	0.14
2001	977.57	850.84	11.80	47.12	67.81	21.45
Jan-Jun 2002	828.91	711.31	27.82	39.24	50.53	38.70
2002*	1,490.00	1,250.00	100.00	55.00	85.00	60.00

Notes: For 1993-1999, wheeled loaders accounted for at least 95 percent of total sales. No compaction equipment was sold before 2000.

* Off-Highway Estimates

Source: Company Information

Since 1995 Liugong has recorded steady growth in sales, although the profit level has varied, as a result of losses in its shared companies, share transfers, and changes in the selling prices for its products.

Currently, sales consist of wheeled loaders (86 per cent), crawler excavators (three per cent), compaction equipment (five per cent) and spare parts (six per cent).

Liugong registered its lowest profit in 2000, partly because of the slide in prices in the wheeled loader market, and partly because of the losses it shared in Liuzhou ZF. In the next year, Liugong transferred its share in ZF to its parent company and record sales generated much better profits, and Liugong has been improving its profitability since then. In 2002, with better control over costs and the great expansion of the sales volume, the net profit earned in the first half has already passed the total earned in the whole of 2001. In the six months ended June 2002 sales increased by 66 per cent over the same period of last year, which resulted in an operating income of RMB 174.83 million, a 100 per cent growth over the corresponding period of 2001.

In 2002, Liugong has updated its crawler excavators completely from the WY Series to the CLG Series that uses such imported key components as Cummins engine and Seiki hydraulics. Revenues from excavators should grow, compared to 2001, while the units sold remain at a similar level.

To retain its profitability, Liugong will try to win greater market penetration for its traditional product, wheeled loaders. Meanwhile, it is also improving its ability to react to the changing market condition by broadening its product range and exploring overseas markets, thus reducing the risk from fierce competition in the domestic market.

MANUFACTURING FACILITIES

Liugong is based in Liuzhou City in the southern province of Guangxi Zhuang Autonomous Region, GZAR. The main facility, at the heart of its wheeled loader production, was built in 1966. Recently, it has broadened its product range by opening or purchasing new factories, hence extending the manufacturing facilities both at the nearby sites for compact loaders and crawler excavators, and in Jiangyin City of Jiangsu Province for compaction equipment.

The main facility for manufacturing wheeled loaders is located in Liutai Road in Liuzhou City, consisting of seven buildings with a total covered area of about 600,000 m². The employees total 2,680 people, including 360 engineers. It produces a very high percentage of the wheeled loader

in-house, and only key components are bought in. The factory has been substantially upgraded since the mid-1990s, introducing foreign technology with a huge investment (probably \$50 million) and is now very well equipped with machine tools, robotic welding centres and paint booths. A new assembly hall is now under construction, with a target completion date of the end of 2002, which will increase the production capacity for wheeled loaders to 10,000 units a year.

Table 3. Liugong: Manufacturing Facilities, 2002

Location	Product Range	Covered Area ('000 m ²)	Employees	Comments
Liuzhou, GZAR	Wheeled loaders except ZL15 and 18	600	2,680	Also Head Office
Liuzhou 1	Compact wheeled loaders	20	380	
Liuzhou 2	Axles and transmissions	25	220	Joint venture with ZF. Shares transferred to Liugong Group in 2001
Liujiang County, GZAR	Crawler excavators	40	230	20 km from the main facility
Jiangyin, Jiangsu Province	Compaction equipment	10	240	

Source: Company Information

Currently the production of hydraulic excavators takes place in a factory located in Labao Town of Liujiang County, about 20 kilometres from Liugong's main facility. The factory has a covered area of 40,000 m² and was purchased in 2000 from a bankrupt elevator manufacturer for RMB20 million. Production began there in 2001. Liugong plans to upgrade the facility with RMB45 million being spent by the end of 2003, with the main items of expenditure being on the fabric of the building and the installation of robotic welding.

The compact machinery factory is located on the same site as that of the main factory, but is completely independent in terms of electricity, water supplies and operation. The 20,000 m² (covered) factory was built in 1993 and used to be the site of the Gear Company, where Case's backhoe loader was manufactured. It was the original home of the company's excavators that were moved out in 2001, thus freeing up capacity for the compact (under 120 horsepower) range of wheeled loaders. Production of these smaller wheeled loaders has risen rapidly, from 165 units in 2001 to a forecast 1,200 in 2002 and 2,500 units in 2005.

Liugong acquired a road machinery factory in Jiangyin City of Jiangsu Province in 2000, thus adding a production base out of the GZAR. Jiangyin Liugong has a total area of some 30,000 m², including a covered area of 10,000 m². Although the factory is located far away from Liuzhou, it sources axles and roughcast components from Liugong. The main output is vibratory rollers.

The joint venture with ZF is located in Heping Road in Liuzhou City and occupies a total area of 72,000 m² with an initial construction of some 25,000 m², producing axles and transmissions with German technology.

CORPORATE STRATEGY

Ever since it went public in 1993, Liugong has been a leader in the domestic wheeled loader industry. In contrast, it has been a weak or modest performer in other product lines, although recently it has enjoyed rapid growth in sales of compaction equipment at Jiangyin, even though this growth has been from a very low base. To achieve sustainable and long term growth, Liugong is now trying hard to become more flexible and competitive in reaction to the changing market by investing in its manufacturing capacity and improving its sales and service network. The goal for 2005 is to reach annual sales of RMB3 billion, which is more than double that forecast for 2002. This growth will be largely funded by the much better performance in 2001 and 2002, and profits will be reinvested into the strategic development of the company.

For its traditional core products of wheeled loaders, Liugong has been fielding a full model range from compact types to the very largest; and from low-cost machines to the most sophisticated G Series, in a bid to meet the needs of different levels and thus retain its leading position.

The goal for 2005 is to achieve an annual production of 10,000 wheeled loaders, equivalent to a 20 to 25 per cent domestic market share and to become competitive in terms of quality with the leading international manufacturers operating in the global market. Looking to its future market needs, Liugong plans to reshape its logistics systems for supplying the production process, and to upgrade the machine tools for key components such as structural components, axles and hydraulic systems. These will definitely improve its capability in manufacturing high quality products, while simultaneously increasing the efficiency and production output of less sophisticated models.

For the last decade, Liugong has been working hard to broaden its product range, either by cooperating with international manufacturers, or by acquiring domestic factories. Liugong is now one of the few domestic hydraulic excavator manufacturers to enjoy an increase in production levels but it lags far behind the various joint ventures in the domestic industry. The strategic goal is to keep pace with the Japanese producers' products in manufacturing technology and key component sourcing, and to reach production levels of 1,000 units by 2005.

Liugong has been growing fast in compaction equipment since it acquired Jiangyin. Although it is yet to match the levels of XCMG or Luoyang, Liugong expects to win third place in the market with the new JC model. The goal for 2005 is to achieve a production level of 800 units.

Although accounting for only a small percentage of revenues, the products beyond wheeled loaders should become increasingly important as additional sources of profit. Liugong is going to launch mini-excavators, backhoe loaders and more compact wheeled loaders in 2002. The target for the mini excavators is to produce 2,500 units per year by 2006; that of the compact wheeled loaders is 2,500 units by 2005.

In 2003 the company will begin building a 'Western' type backhoe loader, of modern design and inspired by its past relations with Case. The target is to reach an annual production of 250 units by 2005.

With regards to the sales network, the subsidiary sales company has placed great emphasis on the aspect of service support. Currently some 70 per cent of sales are made through 120 independent dealers around the country, but the strategy is to further increase the ratio to 100 per cent and foster the dealers' ability to perform all types of customer service.

Liugong has long been aware of the significance of customer support as a competitive strength. In the domestic market, the local manufacturers can do better than foreign suppliers in China at providing convenient customer care and can be competitive in certain markets like wheeled loaders. In view of the rapid growth in market demands in the current year, Liugong is putting forward a strategy to enhance the sales through better customer support.

Liugong is now actively involved in international market research with a view to targeting selected export markets. While domestic sales are currently soaring, exports are limited to wheeled loaders, and there is a realisation that overseas sales will become important when domestic markets become saturated. At the same time, managers know that it will be very difficult for Chinese manufacturers to compete effectively with the market leaders on the international stage.

Liugong is keen for co-operation with international partners to broaden its product range, and to upgrade its manufacturing and management expertise. However, it sees it as unwise to compete head-on with the high profile international manufacturers that are penetrating China through localised production. It is regretted that as one of the largest local manufacturers, Liugong has not yet seen significant success in co-operation with major international players, although it is

well experienced in dealing with them. Currently it is a particular focus for Liugong to introduce more types of product through international co-operation, the target areas being those yet to be developed in the country – and will probably focus on compact equipment.

RESEARCH AND DEVELOPMENT

The R&D capability of Liugong is among the best in the construction equipment industry in China. Each year, Liugong invests three per cent of its turnover into R&D, which is mainly undertaken by **Liugong Enterprise Technology Centre**. This centre has three major divisions - Technology Development, Manufacturing Technology and Information Technology. It has made substantial investments in its facilities, such as a Vickers test facility which cost RMB5 million, and a transmission testing system which cost RMB3.7 million.

In 2001, eight new products with 28 variants were created at this centre. It is the holder of 15 patents and has developed more than 100 new products including wheeled loaders, excavators and compaction equipment, as well as dozens of components. Examples are:

- Wheeled Loaders:**
- ZL30G
 - ZL40G
 - ZL50G
 - ZL80G
 - ZLG30G
 - ZLG40G
 - ZLG50G
 - ZL100C

- Hydraulic Excavators:**
- WY20-2
 - WY22
 - WY30

- Vibratory Rollers:**
- YZ08C
 - YZ10C
 - YZ14C
 - YZ16C
 - YZ18C

- New Products:**
- Rotary drilling machines
 - High speed wheeled loaders
 - ZL60G wheeled loaders
 - CLG40 mini excavators
 - CLG120 hydraulic excavators
 - Backhoe Loaders

New Components:

- Axles for the 30G and 80G wheeled loaders
- Wet braking systems for axles
- Anti-skid differential
- Automatic fuel controls for excavators

Attachments:

- Hydraulic hammers
- Hydraulic shears
- Hydraulic piling rigs

It has also created several 'firsts' in China. For example, it developed a new model of wheeled loader, the ZL100C, with a 5.4 m³ bucket capacity in August 2001, which is the largest wheeled loader in China.

In 2002, it will complete work on some new products destined for very large infrastructure projects in China, expand its hydraulic excavator product range, and develop another G-series wheeled loader, the model ZL60G. Several types of components and attachments for wheeled loaders are also on its research agenda.

COMPONENT SOURCING

Like most large state-owned enterprises, Liugong is able to produce in-house every part that it needs except engines, and these are mostly provided by Shanghai Diesel Engine and Dongfeng Cummins. It has been supplying from its own resources a very high percentage of the components in its lower technology products including buckets, cabs, undercarriages, hydraulics and transmissions, and it intends to keep that policy. New, advanced technology products, such as the ZL50G and ZL80G wheeled loaders and the new CLG series of excavators use imported Cummins engines, ZF transmissions, Casappa and Kawasaki hydraulics and tracks from Italtractor.

All key outsourced components needed are purchased by Liugong in consolidated orders. Liugong even provides structural parts to its factories in other sites, including Jiangyin, unless they can find more competitive local suppliers.

The future challenge in component sourcing is the same as for all domestic manufacturers - to find reliable and reasonable suppliers of small components, like hydraulic cylinders and valves, for all domestic manufacturers will lose their price competitiveness if they go abroad for every

single part they require. On the other hand, these small, high value, high technology components determine the quality and performance of the final product, and ultimately influence its success in the domestic market and penetration of overseas markets.

Table 4. Liugong: Major Component Suppliers, 2002

	Wheeled Loaders	Crawler Excavators	Compaction Equipment	Backhoe Loaders
Engines	Weifang, Shanghai, Cummins USA, Dongfeng Cummins	Cummins USA	Shanghai, Cummins USA	Cummins USA
Transmissions	In-house, ZF	-	In-house	ZF
Axles	In-house, ZF	-	In-house	In-house
Hydraulics	In-house	Seiki, Kawasaki	Sawa, Seiki	Rexroth, Sauer-Danfoss
Cabs	In-house	In-house	In-house	In-house
Undercarriages	In-house	In-house	In-house	In-house
Tracks	-	ITM	-	-

Source: Company Information

EQUIPMENT ANALYSES

WHEELED LOADERS

Production and Sales

For many years Liugong has been the largest producer of wheeled loaders in China, and was so until 1999. Its wheeled loader production varied between 2,500 and 3,000 units each year in the late 1990s after a peak of 3,436 units in 1993.

Table 5. Liugong: Wheeled Loader Production, 1997-2001

	Units	Share of Company Production (%)
1997	2,700	97
1998	2,800	99
1999	2,478	93
2000	2,825	91
2001	3,988	91
2002*	6,500	94

* Forecast

Source: CCMA & Off-Highway Research

Sales increased steadily after 1994 and in 1998 Liugong launched its G series wheeled loaders. While it was focusing on the more sophisticated G Series which cost 25 per cent more than the standard C Series, Xiamen started a price war within the wheeled loader sector by cutting prices across the board by 15 to 30 per cent in April 2000. Liugong quickly responded by launching two models of low-cost wheeled loaders – ZL40A and ZL50B – with the aim of winning back market share through competitive prices.

Fierce competition among the existing 130 domestic manufacturers and the ongoing price war has reduced the overall profitability of all wheeled loaders by five to 10 per cent. In 2001, the leading 16 manufacturers in the sector increased their combined turnover by 25 per cent, while their total profits dropped by nine per cent.

At the heart of Liugong’s wheeled loader range is the model ZL50, accounting for more than 50 per cent of total output, followed by the ZL40 and ZL30. The ZL30 is now overtaking the ZL40 to assume second place in order of importance. In this sector of the market models of three, four and five tonnes account for 96 per cent of total demand. Large models over eight tonnes used to be exclusively imported but Liugong changed the situation by launching its 10 tonne model, the ZL100C.

Table 6. Liugong: Sales and Market Shares of Wheeled Loaders, 1997-2002

(Units)

	Total Market	Liugong	
		Units	%
1997	18,400	2,750	15
1998	17,310	2,752	16
1999	18,690	2,380	13
2000	22,420	2,792	12
2001	30,430	3,772	12
2002*	45,000	6,500	14

* Off-Highway Research estimates based on mid-year data.

Source: CCMA & Off-Highway Research

It might be another three to five years before the price war ends and the large number of very small wheeled loader producers disappears, so Liugong must deal with the problem of losing sales to competitors willing to sell apparently similar products to those of Liugong. To win back market share and improve product profitability, Liugong has made great efforts in lowering costs and improving productivity. Management overheads were reduced by RMB40 million, and expenses by RMB15 million between 1999 and 2001. Thanks to the application of information

technology, the average production cycle of wheeled loaders has been shortened to 45 days from the previous 60 days. The annual capacity of wheeled loader production rose from 3,000 in 1999 to 4,500 units in 2001, and will be raised to 10,000 units a year with the completion of the new extension to the main assembly hall.

Table 7. Liugong: Domestic Wheeled Loader Sales by Model, 1998-2001

Model	1998		1999		2000		2001	
	Units	%	Units	%	Units	%	Units	%
ZL15	-	-	70	3	109	4	99	3
ZL18	-	-	0	-	1	-	19	-
ZL20	3	-	8	-	-	-	-	-
ZL30	181	6	138	6	407	14	745	20
ZL40	1,161	42	897	37	744	27	810	22
ZL50	1,406	52	1,266	53	1,531	55	2,099	55
ZL60	1	-	1	-	-	-	-	-
Total	2,752	100	2,380	100	2,792	100	3,772	100

Source: Company Information & CCMA

Increasing numbers of private companies and individuals are now becoming end users of wheeled loaders, and creative financing has started to play an increasing important role in developing marketing and sales. On December 30 2001, for the first time China Construction Bank (CCB) designated six manufacturers, including Liugong, whose products can be purchased from their specified dealers with a loan provided by CCB. Because of that initiative and the expanding infrastructure projects in China, Liugong sold 3,772 wheeled loaders in the first six months of 2002, representing a 75 per cent increase over the same period of 2001.

In view of the turnover of RMB824 million for the first half of 2002, Liugong expects to see a 200 per cent growth in profit and a record high sales of 6,800 units in 2002. To achieve this extraordinary growth, in busy months where Liugong had large orders, employees have been working two or three shifts, and the company has had to move part of the production temporarily to two other small factories of Liugong Group.

Outlook

Like a life-long commitment, Liugong has always been and will always remain a leading player in this sector. Given its quite mature technology and products, as well as the local component supply, Liugong does not feel that there is any threat to it from foreign manufacturers. Though several private manufacturers have been very successful, it is hard to tell how long they can keep growing without Liugong's key driving force, R&D. Therefore, in the eyes of Liugong, its only

serious competitor has been, and is still, Xiamen. The short-term goal is to exceed Xiamen in terms of turnover and sales, and win back its leading position in the domestic market.

Table 8. Liugong: Wheeled Loader Product Range, 2002

Model	Engine HP	Operating Weight (Tonnes)	Bucket Capacity (m³)
ZL15CH	68	1.5	0.78
ZL18A	78	1.8	0.86
ZL20D	90	2.0	1.0
ZL30E	125	3.0	1.7
ZL30G	125	3.0	1.7
ZL40A	165	4.0	2.0
ZL40B**	165	4.0	2.2
ZL40G	165	4.0	2.3
ZL50B	210	5.0	2.7
ZL50C***	210	5.0	3.0
ZL50CX***	210	5.0	3.0
ZL50D***	209	5.0	3.0
ZL50E	210	5.0	3.0
ZL50F***	209	5.0	3.0
ZL50G***	215	5.0	3.0
ZL60F**	254	6.0	3.3
ZL80G	310	8.0	4.5
ZL100C	440	10.0	5.4

*Available in side-dump version. ** Available as a log loader. *** Available as a snowplough

Source: Company Information

Liugong does not believe that low price is the key to winning customers in this sector. Instead, its strategy for wheeled loaders can be summarised as follows:

- Never give up the low technology end of the market and try to expand the share of the available business with traditional products and the newly developed ZL50B.
- Keep a leading position in the high technology end of the market, and maintain reasonable profit margins by promoting its G-series products. These account for around 10 per cent of production at the moment and will probably rise to 25 per cent in two to three years' time.
- Cultivate customer loyalty by continuously improving customer services.
- Encourage the replacement of old machines through the development of new products, as well as offering options as extra.
- Undertake a thorough product development plan with the first priority being its core products – all models of four and five tonnes, followed by G-series versions of the ZL15, ZL18, ZL30, ZL60, ZL80 and ZL100.

- Adopt a more aggressive approach to building up its image in the global market, and explore overseas market potential.

CRAWLER EXCAVATORS

Production and Sales

Table 9. Liugong: Hydraulic Excavator Production, 1997-2001

	Units	Share of Company Production (%)
1997	30	1
1998	16	1
1999	61	2
2000	143	5
2001	168	5
2002*	180	3

* Forecast

Source: Off-Highway Research

Liugong entered this market in 1993 but the volume since then has been quite low, with only a modest market share being achieved. After unsuccessful dialogues on excavator production with several foreign manufacturers with world class reputations, Liugong instead decided in 1995 to develop its own range of excavators and came out with the WY series excavators of modest specifications.

The hydraulic excavator market has been growing rapidly in the last five years, and a very large percentage of sales have been accounted for by joint ventures set up with foreign manufacturers. Their mature products, supported by sophisticated technology and excellent reliability combined to deny any domestic manufacturer – including Liugong – the opportunity to establish itself as a mainline supplier of hydraulic excavators. Indeed, before 2000 Liugong struggled to sell more than 100 units a year.

After a slight increase of sales in 2001, Liugong launched the new CLG-series of hydraulic excavators including the CLG60, CLG300, CLG230 and CLG200-3. The old models WY-20 and WY-30 have been upgraded to the CLG200-3 and CLG300, while two new models CLG200-6, and CLG120 are being developed. In addition, a 4 tonne mini excavator, the CLG40, is likely to be launched in the future.

The production of Liugong has been somewhere between 100 to 150 units during the past two years, and it currently wins only one to two per cent of the market.

Outlook

After moving its excavator operation to a new site and making a considerable investment into the production facility, Liugong is one of the few domestic manufacturers that have decided to stay in the excavator market and compete with the dominant joint venture companies which are backed by foreign capital.

After setting a sales target of RMB100 million in 2002 and RMB300 million in 2003, Liugong is doing its utmost to improve the recognition of its excavators among the end users and dealers. It uses international component sourcing for all CLG products, including imported Cummins engines, Toshiba hydraulic pumps, Toshiba or Seiki motors, ITM tracks, Manuli hydraulic pipes and VDO electrics.

Given the considerable investment into its new range of CLG machines, as well as into new manufacturing facilities, Liugong is confident that ambitious targets can be reached: 200 units a year by the end of 2002, 700 units in 2004, and 1,000 units a year by 2005.

The CL40 model, the four tonne mini excavator, is being developed now, and the prototype will be launched in November 2002. This programme underlines Liugong's commitment to diversification, and to its belief that the mini excavator sector will grow very substantially in the future. Liugong is known to be very ambitious about its future in this sector.

Table 10. Liugong: Crawler Excavator Product Range, 2002

Model	Bucket Capacity (m³)	Weight (Tonnes)	Engine HP
CLG60	0.25	7.2	59/62
CLG200-3	0.8/0.88	19.8	136
CLG230	1.0	22.5	154
CLG300	1.2	30.0	215

Source: Company Information

Besides benchmarking the Japanese and Korean products in order to improve its overall product quality, Liugong believes that its distribution network and level of after sales service will be able

to attract more customers who are looking for machines with medium technology, but are more competitively priced than those of the current market leaders.

COMPACTION EQUIPMENT

Production and Sales

Table 11. Liugong: Compaction Equipment Production, 2000-2001

	Units	Share of Company Production (%)
2000	135	4
2001	208	5

Source: CCMA

Before its acquisition, the Jiangyin factory produced 126 units in 1999, winning about five per cent of the market. The compaction equipment market in China is around 6,000 units a year but is very likely to exceed 6,500 units in 2002. The most popular models are vibratory rollers between 14 and 18 tonnes, taking 50 per cent of all sales. Therefore the first thing Liugong did after it took control of the Jiangyin factory was to reorganize its product range. Relying on Liugong's R&D capability, it was able to eliminate some old models, focus on the more popular models and develop a new JC series of rollers. The three models which Liugong is very keen to promote are the YZ18C, YZ18JC and YZ20JC.

Table 12. Liugong: Sales and Market Shares in Compaction Equipment, 2000-2001

	Total Market	Liugong	
		Units	%
2000	5,467	99	1.8
2001	6,090	168	2.8

Source: CCMA

After Liugong brought its management expertise to this factory, and started to market the compaction equipment range through its well established distribution network, the company has progressed from number seven to number five among the top 10 manufacturers. Production and sales during the first quarter of 2002 were over 30 per higher than in the same period in 2001. Its

turnover growth rate of 71 per cent ranked first in the sector and generated sales of RMB21 million for Liugong.

Outlook

The target for 2002 is to sell 250 rollers and reach a turnover of RMB45 million and a profit of RMB2 million. Given the fact that 185 units were sold in the first half alone of 2002, this target is very modest. The plan for 2003-2004 is to win additional market share, in the medium term to become the third largest roller manufacturer in China.

Liugong is currently providing products with high specifications, and using imported Cummins engines, Vulkan axle connectors, ZF transmission and axles, Sauer-Danfoss hydraulics, and those with more modest specifications, including Shanghai engines, Steyr clutches, Liugong ZL40G axles, Liugong transmission boxes, and Sauer motors. Differential prices and specifications will offer more options for the customer, and give greater flexibility to Liugong's products in the market place.

Table 13. Liugong: Compaction Equipment Product Range, 2002

Type	Model	Operating Weight (tonnes)	Engine HP
Static	3YZ18×21	18-21	98
	3YZ21×24	21-24	120
Fully Hydraulic	YZ10C	11	120
	YZ12C	12	120
	YZ14C	14	100
	YZ16C	16	154
	YZ18C	18	186
Mechanical Drive	YZ14JC	14	118
	YZ16JC	16	154
	YZ18JC	18	172
	YZ20JC	20	172

Source: Company Information

BACKHOE LOADERS

Liugong is now planning its re-entry into the backhoe loader market. The sector represents a more or less unexploited area, with a tiny population of very modest products, most of which are based on a wheeled loader chassis. A prototype 'Western' style WZ25-30 model has been

developed by Liugong and will be fine-tuned for the launch at Bauma China in Shanghai in November 2002. Like its high technology products, all key components for this new product will be sourced internationally, and include imported Cummins engines and ZF transmission. Production is due to begin in 2003.

MARKETING AND DISTRIBUTION

Independent dealers account for over 70 per cent of sales, and direct sales for less than 30 per cent. The company has decided that over a period of time it will stop direct sales and leave everything to its dealers. The distribution network of Liugong is one of the most sophisticated and mature structures in China, and has a multi-layer structure consisting of the following:

- **Subsidiary Sales Company** of Liugong located in Liuzhou, responsible for all marketing and sales of Liugong.
- **Beijing Sales Company** and **Guangzhou Sales Company**, under the leadership of Liugong’s Subsidiary Sales Company, to sell products and provide local support to dealers located respectively in Beijing and Tianjin region, as well as Guangdong province.
- **Five Regional Offices**, responsible for each geographic region, managing and supporting 33 representative offices.
- **120 independent dealers** supported by all subsidiaries, regional offices and representative offices. All stock parts, with 60 of them are certified for maintenance and have full workshops.

Table 14. Liugong: Domestic Sales Structure, 2002

Layer 1:	Subsidiary Sales Company	
Layer 2:	Beijing Subsidiary Sales Company Guangzhou Subsidiary Sales Company	North Regional Office North-West Regional Office South-West Regional Office Coastal Regional Office Middle Regional Office
Layer 3:		33 representative offices
Layer 4:	120 independent dealers	

Source: Company Information

Liugong has made great efforts in building up its distribution network. Ideally, each dealer should be able to provide a full range of services from complete product and spare parts sales to repair and maintenance. After major investments were made in computer systems, service vans,

workshops and other facilities, a new service system was launched recently, which guaranteed on-time delivery of new products, spare parts and service teams.

Table 15. Liugong: Representative Offices: 2002

Region	Location	Coverage
North	Shijiazhuang	Hebei
	Baotou Chifeng	Inner Mongolia
	Taiyuan	Shanxi
	Harbin	Heilongjiang
	Changchun	Jilin
	Shenyang	Liaoning
North-West	Xi'an	Shaanxi
	Lanzhou	Gansu
	Xi'ning	Qinghai
	Yinchuan	Ningxia
	Urumqi	Xinjiang
South-West	Kunming	Yunnan
	Chengdu	Sichuan
	Chongqing	Chongqing
	Guiyang	Guizhou
	Lhasa	Tibet
Coastal	Nanjing	Jiangsu
	Jinan	Shandong
	Hefei	Anhui
	Shanghai	Shanghai
	Jinhua	Zhejiang
	Wenzhou	
	Fuzhou	Fujian
	Nanning	Guangxi
Central	Zhengzhou	Henan
	Changsha	Hunan
	Wuhan	Hubei
	Dalian	Liaoning
	Chifeng	Inner Mongolia
	Qingdao	Jinan
	Lanzhou	
	Tianshui	Gansu
	Jiuquan	
	Golmud	Qinghai
	Kuerle	Xinjiang
	Shizuishan	Ningxia

Source: Company Information

Besides the dealer network and the 78 maintenance centres throughout the country, spare parts can also be obtained from nine subsidiary companies of Liuzhou Liugong Machinery Parts Co., Ltd. which as mentioned above, provides spare parts for Liugong and its subsidiary companies.

Sales Performance by Region

Table 16. Liugong: Market Shares in Wheeled Loaders by Region, 2001

	Market Share (%)
<u>Municipalities</u>	
Beijing	21
Chongqing	40
Shanghai	15
Tianjin	12
<u>Provinces</u>	
Anhui	10
Fujian	2
Gansu	25
Guangdong	23
Guangxi	62
Guizhou	15
Hainan	13
Hebei	21
Heilongjiang	14
Henan	8
Hubei	9
Hunan	32
Inner Mongolia	26
Jiangsu	5
Jiangxi	9
Jilin	17
Liaoning	8
Ningxia	15
Qinghai	28
Shaanxi	40
Shandong	1
Shanxi	20
Sichuan	20
Tibet	22
Xinjiang	21
Yunnan	30
Zhejiang	20

Source: Company Information

Besides winning 62 per cent market share in GZAR, where Liugong is located, it has won strong market shares in Chongqing, Shaanxi, Hunan, Yunnan, Qinghai and Inner Mongolia, all with more than 25 per cent of the market. Not surprisingly, Liugong does not have a strong presence

in those areas where other major wheeled loader manufacturers are located, such as Fujian province with XEMG, Shandong with Shandong Engineering Machinery Plant, and Jiangsu with Xuzhou Construction Machinery Group.

EXPORTS

Liugong exported 517 units between 1986 and 2001, nearly all of them being wheeled loaders, with the volume for excavators being less than 20 units. Liugong's products have been sold to more than 30 countries, including Cuba, Zimbabwe, Burma, Nepal, Morocco, Philippines, Tanzania, Guinea, Mali, Australia and Iraq. 2002 is very likely to be a record year, for in the first six months exports reached a record of \$3 million. Liugong has recently entered into India, a new market for it, with 55 units of its latest technology ZL50G model.

Table 17. Liugong: Wheeled Loader Exports, 1998-2002

1998	1999	2000	2001	2002 (Estimated)
46	27	38	42	120

Source: Company Information & CCMA

There is little doubt that a focus on exports will be one of Liugong's priorities, but this will require substantial investment into developing an overseas distribution network.