China's Rising Shipbuilding Industry

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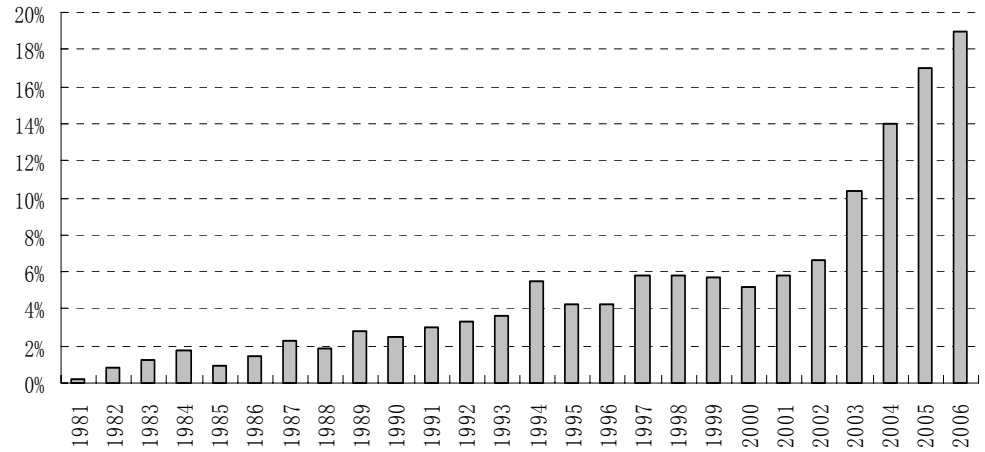
China's shipbuilding industry is the top producer of low value-added vessels. In the next eight years, it hopes to vault past Korea and Japan to become the overall global leader in ship production. The industry infrastructure is rapidly expanding. But to truly move up the value chain, Chinese shipbuilders will need to substantially improve their management and production structure, design capability, and technological applications. That will enable them to sharply raise their credibility as well as reduce delivery time.

I. Present Conditions

When China began its market reforms in 1978, shipbuilding became one of the select industries for special government attention. But in an unusual decision, officials encouraged competition rather than protect state-owned shipbuilding companies. This contrasted sharply with regulatory and licensing shelter afforded state companies in the auto, banking and communications industries. In the long run, the protective measures blunted the development of many state enterprises, but in shipbuilding industry steadily unlocked its potential.

Today, the Chinese shipbuilding trails only Korea and Japan. Since the mid-1990s, it has ranked third in terms of the number of ships built. In 2006, it built 14.52 million deadweight tons in vessels (DWT) and received orders for 68.72 million DWT, accounting for 19% and 24% of the global market, respectively. Moreover, in the first quarter of 2007, Chinese shipbuilders surpassed their Korean and Japanese peers in orders, garnering 51% of the global total.

Table 1. Trends in China's Global Market Share By Number of Vessels Built (1981-2006)



Source: Lloyd's Register and China Association of National Shipbuilding Industry (CANSI).

The most prominent state-owned ship producers are China State Shipbuilding Corporation(CSSC) and China Shipbuilding Industry Corporation(CSIC)[1] The former ranked No. 2 in the world with 6.02 million DWT built in 2006, while the latter ranked ninth. Private shipbuilding companies in the Jiangsu province and Zhejiang province also have enjoyed strong growth. The latter has seen as many as 500 shipbuilding firms established by private businessmen in the past few years. In the first quarter of 2007, private entities accounted for 45% of new orders to China.

Table 2. Number of Vessels Built, and Number of New Orders for 2006

Shipbuilding Index	China	Japan	Korea
No. of Vessels Built (Jan.–Nov.) (Ten thousand CGT)	370	840	1,080
New Orders (Ten thousand DWT)	Approx. 4,800	Approx. 2,800	Approx. 5,480
Backlog Orders (ten thousand DWT)	Approx. 9,000	Approx. 4,200	Approx. 11,600

Source: Estimation based on Clarkson data.

China's soaring economic growth and mounting global trade since 2002 has sparked a worldwide demand for ships to move raw materials and assembly parts from abroad to Chinese manufacturers and to transport finished products around the

[1] CSSC has 48 businesses and 28 research institutes under its wing with nearly 170,000 employees, while CSIC has 58 businesses with 950,000 employees.

world.

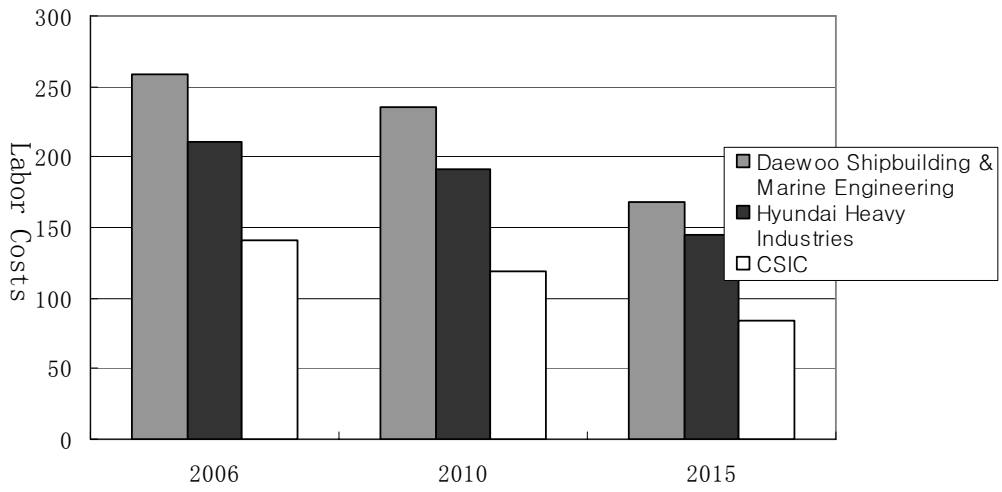
With Korean and Japanese shipbuilders focused on lucrative, value-added vessels, China's production is centered on the low end - bulk carriers, oil tankers, and container ships - accounting for 81% of the aggregate global demand for the three categories as of 2006. Backlogs for VLCC (Very Large Crude Carriers) with capacities of 30,000 tons or more account for more than 30% of the shipbuilding backlog worldwide. Backlog orders of 17,000-ton bulk carriers account for 45%.

II. Competitiveness

Shipbuilding is characterized by high dependence on labor, rather than capital and technology for profits. Abundant, cheap labor has enabled Chinese shipbuilders to gain a dominant position in low-end vessels largely vacated by Korean and Japanese rivals. Chinese companies can now charge US$ 68 million for a low value-added ship that Korea sells for US$ 83 million. Although wages at Chinese shipyards are sure to rise, they are forecast to remain lower than Korea's for the next 10-15 years. If the prediction materializes, it will give Chinese shipbuilders a strong advantage as they move up the value chain in ships.

Table 3. Comparison of Labor Costs in Korea's and China's Shipbuilding Industries

(Unit: US$/CGT)



China also benefits from numerous economies of scale as it is rich in sites suitable for construction of shipyards. Chinese officials are now promoting "shipbuilding industry clusters." In accordance with the government's plan, large modern shipbuilding sites are under construction in the Beijing/Tianjin region, the Yangtze River Delta, and the Pearl River Delta. In particular, Dalian, in northwest China facing Korea, has seen its shipbuilding industry cluster spawn a new economy in parts production. As of June 2007, the port had 15 shipbuilding companies, 32 repair firms, 65 parts manufacturers, three R&D centers and three schools. The world's No. 1 superstructure maker East Precision Group, the world's No. 2 ship engine maker Doosan Engine, and Daeyang Shipping, a major repair company, now operate in Dalian.

China's less cumbersome regulatory environment will allow easy expansion of shipyards, a fact not lost on Korea's Daewoo Heavy Industries and Samsung Heavy Industries, which have established block manufacturing factories in Yantai and Ningbo. As global demand for ships soars, China's shipbuilding industry will continue to enlarge its production scale and strengthen its shipbuilding capabilities. This will create economies of scale. In 2010, shipbuilding production capacity in China is expected be double that of 2006.

Although some shipbuilding firms, notably Dalian Shipbuilding Industry Co., have nearly attained global standards on the lower end of the value scale, they still rank low in overall technological levels, R&D, and production capacity. Inadequate R&D investment, in particular, has held Chinese ship producers well below the level of advanced nations in technology. Furthermore, some ship parts designed by Chinese companies are substandard in quality and can be used only for small domestic ships. China's own market for parts is only 40% domestically supplied, with imported diesel engines and measuring instruments having local market shares of 50% and 70%, respectively. Poor parts production capabilities in China have hindered efforts to reduce time to market and production costs.

Chinese companies also trail in design. China's largest shipbuilding firm has only 200 designers, a mere 13% of the number employed at Samsung Heavy Industries.

Production management and quality control are also below the levels found in Korea and Japan. Chinese firms undergo prolonged construction periods and

delayed delivery, hurting confidence in their reliability. Unlike Japanese and Korean firms with advanced technology, Chinese firms take excessive time to complete construction of ships.

Table 4. Technological Competitiveness of Korean, Chinese, and Japanese Shipbuilders

		Korea	Japan	China
Design Technology	Basic Design	100	100	85
	Critical Design	100	95	75
	Production Design	100	95	65
Production Technology	Cutting	100	100	80
	Welding	100	100	80
	Outfitting	100	100	70
	Loading	100	100	70
Management Technology	Cost Management	100	100	60
	Materials Management	100	100	60
	Production Management	100	100	60
	Human Resources Management	100	100	65

Source: Korea Institute for Industrial Economics & Trade.

In the use of information technology, Chinese shipbuilding firms also face a serious gap. Widespread deployment of computer technology in the design and building process and use of advanced design tools are not likely to come in the immediate future. It will likely require a substantial amount of time for Chinese builders to reach the levels of Korea and Japan in making facilities run on an automated, “intelligent” and digital basis, and online parts purchasing systems based on the nation’s electronic commerce platform and service information network remain inadequate.

Many state-owned firms that lie at the core of China’s shipbuilding industry will be unable to enhance their efficiency in a short period of time. Shielded from any urgent need to reduce costs, introduce efficient organizational management systems and improve their workforce structures, state-owned firms tend to pursue expansion

carelessly, ultimately compromising their efficiency. CSSC and CSIC maintain dozens of independent corporations with undisciplined management structures, low productivity and inefficient allocation of resources.

III. Prospects for the Future Development of China's Shipbuilding Industry

Continued government support and booming markets at home and abroad will likely ensure further growth in China's shipbuilding industry in the near term. In August 2006, China released its "Mid to Long Term Development Plan for the Shipbuilding Industry," which anticipated surpassing Korea and Japan to become the No. 1 shipbuilder in the world by 2015, led by CSSC as the global leader. Under the 11th Five-Year Plan, the corporation will make a 20 billion yuan investment in establishing large production base.

The scale of production of China's shipbuilding industry is expected to double by 2015. In light of plans to expand existing facilities and build new ones, production should easily surpass the goals set in "The Mid to Long Term Development Plan for the Shipbuilding Industry." Expansion of shipbuilding capacity is especially ambitious at provincial levels.

Since then, China has developed Bohai Bay, as well as areas at the mouth of the Yangtze and Pearl rivers into its top three shipbuilding bases. It has also encouraged major shipbuilding companies operating in coastal areas such as Shanghai and Guangzhou to restructure, transfer to other sites, and modernize facilities. At the same time, it has given financial benefits to shipbuilding firms: low-interest loans, longer maturity of loans, and reduction and exemption from import duties. Further capital is being supplied by China's soaring stock markets.

Robust global trade will help keep the order pipeline filled. Backlog orders of 3-4 years among shipbuilders worldwide suggest future orders for value-added ships may gravitate more and more toward Chinese companies as they upgrade their know-how and efficiency. Even if that is slow in taking off, domestic demand will help ensure a steady supply of orders. Unlike Korea and Japan, China's shipbuilding industry is heavily reliant on strong domestic demand. From 2006 to 2010, China's total demand for ships is likely to reach 31 million DWT, a nearly 25% increase.

From 2010 to 2020, China's total demand for ships is forecast to reach 42 million DWT.

Despite the rosy projections, concerns have also arisen that the massive facilities investment will result in overproduction from 2010. These concerns are not unfounded, as growing production capabilities are already intensifying competition with Vietnam and India for orders. Some projections predict a supply glut of 40 million to 50 million DWT, with total global demand for ships at 60 to 70 million DWT and the number of ships available at 110 million DWT (China alone plans to build 40 million DWT).

Other factors that cloud prospects for Chinese shipbuilders include appreciation in the yuan, already noticeable in the first half of 2007, as well as a shortage of skilled labor. The industry already suffers from a severe shortfall of experienced middle and upper level managers as well as a dearth of technicians, and is at risk of losing its remaining talent due to low wages. China produces only 1,000 graduates that major in shipbuilding every year, and 30-50% of them eventually drop out of the industry.

Huge domestic demand for ships in China will also act as a driver for the stable development of the country's shipbuilding industry. Unlike in Korea and Japan, China's shipbuilding industry is heavily reliant on strong domestic demand. From 2006 to 2010, China's total demand for ships is likely to reach 31 million DWT, representing a yearly 6.20 million DWT increase. Even if the world's shipbuilding industry declines after 2010, China's shipbuilding industry is likely to continue its steady growth thanks to strong domestic demand. From 2010 to 2020, China's total demand for ships is forecast to reach 42 million DWT.

Under the 11th Five-Year Plan, the state enterprise will make a 20-billion yuan investment in establishing large production bases in Waigaoqiao, Changxing and Longxue. Hudong Heavy Machinery under CSSC emerged as a megafirm by securing a 100% stake in Shanghai Waigaoqiao Shipbuilding, a 100% stake in Chengxi Shipyard Building, and a 54% stake in Guangdong Yuan Shipping through adjustment of equity holdings.

Table 5. Trajectory of Expansion for Major Shipbuilding Companies

(Unit: ten thousand DWT)

Company	Group	Output in 2006	New Output in 2007	New Output in 2008	New Output in 2010
Dalian Shipbuilding Industry Co., Ltd.	CSIC	250			250
Shanghai Waigaoqiao Shipbuilding Co., Ltd.	CSSC	300		80	
Rudong China Shipbuilding Group	CSSC	300			
New Century Shipbuilding Co., Ltd.		76	24		
Jiangnan Shipyard (Group) Co., Ltd.	CSSC	60			
Bohai Shipbuilding Heavy Industry Co., Ltd.	CSIC	60			
Nantong COSCO KHI Ship Engineering Co., Ltd.	KHI Group	70	250		
Guangzhou Shipbuilding International	CSSC	49			
Shanghai-Chengxi Shipbuilding Co., Ltd.	CSSC	50			50
Changjang Shipping Group Co., Jinling Shipyard	Changjang Shipping Group	25			33
Guangzhou Longxue Shipbuilding Industry Co., Ltd.	CSSC			212	
Qingdao Beihai Shipbuilding Heavy Industry Co., Ltd.	CSIC			318	
Tianjin Xingang Shipyard	CSIC				300
Shanhaiguan Shipyard	CSIC			72	
KHI Lushun Shipyard	KHI Group				107
Nationwide Aggregate		1,400	1,674	2,356	3,096

Source: Sinolink Securities Company.

Future expansion for shipbuilding, however, will depend on companies improving core technological capabilities themselves. Chinese companies have enlisted academia to help fortify their R&D capabilities. For example, in April 2004, 17 major shipbuilding firms in Jiangsu Province signed a contract with Huadong Institute to establish a "Public Service Platform for Advanced Shipbuilding Technology," the first of its kind in China. Such academic-university cooperation schemes continue to be pursued.

Chinese shipbuilding firms also are continuing to pursue partnerships with overseas peers to improve design capabilities and acquire expertise. Technology for mid- and high-speed diesel engines has come from Germany, France and Japan while design outsourcing and collaboration brought in advanced design technology from Korea and Japan. In 1999, Dalian Shipbuilding Industry teamed up with Korea Marine Technology Consulting Company and succeeded in designing and manufacturing their first VLCC.

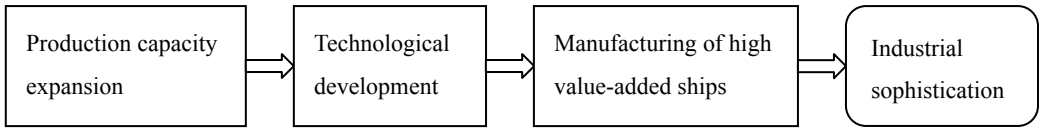
Table 6. Joint Projects Between Chinese and Japanese Shipbuilding Companies

No.	Chinese Firm	Joint Project and Area	Japanese Firm
1	Shanghai Shipyard	Shipbuilding	Sumitomo Heavy Industries, Ltd. (SHI)
2	Rudong China Shipbuilding Group	Shipbulding	Mitsui Engineering & Shipbuilding Co., Ltd.
3	Rudong China Shipbuilding Group	Shipbuilding	Osaka Shipyard
4	Dalian Shipyard	Shipbuilding	Hitachi Zosen
5	Jiangnan Shipyard	Shipbuilding	Mitsubishi Heavy Industries
6	Guangzhou Shipbuilding International	Shipbuilding	Ishikawajima-Harima Heavy Industries Co., Ltd.
7	Yuanxingang Place Shipayrd	Shipbuilding	Osaka Shipyard
8	Wuhan Machinery Plant, CSIC	Ship Parts	Kawasaki Heavy Industries
9	Bohai Shipyard	Shipbuilding	NKK Steel Sheet & Strip Corporation

10	Baoding Storage Battery Plant	Storage Battery	YUASA

Chinese shipbuilders also are focusing on raising productivity by strengthening research on technology and shipbuilding methods and facilitating deployment of information technology. For example, Shanghai Waigaoqiao Shipyard developed 50 advanced technologies and methods on its own, allowing it to reduce the time to build a bulk carrier by more than half. Again, know-how from Europe, Korea and Japan will continue to be sought.

Table 7. Development Strategy of China's Shipbuilding Industry



Such efforts by Chinese shipbuilders are expected to gradually increase dependency on ship parts and facilities made in China to 50% in 2010. As Chinese shipbuilding firms introduce advanced technologies and enter partnership with leading companies, they should see the competitiveness of their parts and facilities manufacturing steadily increase. China began producing crankshafts for ships using native technology in 2005, and also began producing low-speed diesel engines that satisfy 90% of domestic demand (some were even exported to Korea). In June 2007, Dalian Diesel Engine Factory joined Korea and Japan in diesel engine manufacturing for large ships by successfully producing 49,680-horsepower diesel engines. Chinese shipbuilding companies, however, remain weak at manufacturing facilities and parts for large ships and may have difficulty in satisfying market demand in the near future. When building deep-sea vessels, they still depend on imports for many of the core facilities, including navigation systems, communications equipment, staterooms, automation facilities, engines and electric power.

On the global market, higher value-added ships, including LNG carriers, as well as very large container ships and ships for offshore structures may be promising markets for Chinese firms. China has nine VLCC shipyards, which will increase to

30 in 2011 and surpass Korea's current 15.

The approaching boom in "green energy" is likely to greatly increase demand for LNG carriers. In 2015 and 2020, global demand for large LNG carriers was forecast to reach 110 and 140 ships, each, while Chinese demand rises to 38 and 65. China expects to begin building its first LNG carrier in October 2007. Rudong China Shipbuilding Group can produce two 147,000㎥ LNG carriers every year and has orders for six in hand.

Additionally, demand for very large container ships that help decrease transport costs will soar. China succeeded in designing and manufacturing a very large container ship on its own in May 2007, following in the footsteps of Korea, Japan and Denmark. Rudong China Shipbuilding Group has made one 8,530 TEU container ship and has orders for nine.

Ultimately, however, it will still not be easy for China's shipbuilding industry to surpass Korea's competitive advantage in high value-added ships over the short term. Building high value-added ships is accompanied by more demanding conditions for design, quality and delivery. Korean shipbuilding firms enjoy a strong position in this area, with most new orders for LNG carriers in 2007 going to them, and with most orders for high value-added ships worldwide going to Korean and Japanese firms by 2011.

Currently, all the orders for very large container ships, crude oil prospecting ships and LNG carriers from around the world are going to Korean shipbuilders. Backlog orders for LNG ships for Korean shipbuilding firms amounted to 74% of the world's total orders received.

IV. Comment

Prospects for the Chinese shipbuilding industry are mostly positive, and will be even more so if some further improvements are made. A more concerted effort is still needed in restructuring corporate governance, enhancing production management, protecting intellectual property rights of partners and reducing delivery time. Streamlining the management structures of major state-owned shipbuilders and their

affiliated businesses will help create further positive externalities by encouraging internal cooperation and goodwill among their partners.

Second, China should increase the local content of Chinese-made parts in shipbuilding by improving R&D capabilities for facilities and parts. Closer and more systematic coordination between research institutes and major shipbuilding companies is likely to reap sizable dividend. In parts, small- and mid-sized shipyards and private companies need to be more active in introducing new technical standards to gain further presence on the international market.

Third, Chinese companies will need to strengthen their risk management in preparation for inevitable changes in foreign exchange rates, raw materials prices and market demand. Rising raw material prices on the international market and yuan appreciation could severely challenge China's ambitions for global shipbuilding dominance. Chinese firms should carefully plan for the cyclical nature of the international shipbuilding market and refrain from reckless expansion. Expansion will need to be determined by a reasonable forecast of demand rather than a race with competitors, and productivity must be improved in a timely manner.

Meanwhile, Korean shipbuilding companies have to strengthen collaboration with emerging shipbuilding countries including China, Vietnam and India to compensate for the shortage of natural resources in Korea. Korean firms can overcome their inherent disadvantages of a relatively short coastline and high labor costs by outsourcing their block manufacturing overseas. In addition, Korean firms can adjust the production capacity of low value-added ships at home by transferring production sites for these vessels to low-wage nations. They may also generate revenues by providing emerging nations with designs and parts where they excel.

Furthermore, they need to maintain their core competitiveness by continuously strengthening their competitive advantage in high-tech ships. Korean firms now boast shipbuilding capabilities that will not be easily achieved by emerging nations in the near future, and this advantage should be carefully nurtured and maintained.