

EMGT 835 Field Project:
Global Shipbuilding, Who will be the leader?
South Korea or China?

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Executive Summary

Shipbuilding is an industry that most developing countries strategically choose as a long term development plan. South Korea has also developed the shipbuilding industry as a part of governmental plan. Since 2000, South Korea has kept the leading position in the industry and seems to be dominant until in the middle of the 2010's.

South Korea's biggest strength is design capability and technological superiority which should enable them to promptly reflect customer needs. In addition, a relatively abundant workforce, openness to innovation, strong R&D investment and the development of the related industries will also play key roles to remaining competitive in the industry.

Meanwhile, China has become the second largest shipbuilder in the industry since 2006. A China's soaring economic growth has been a big push for the shipbuilding and related industries as well. As of January 2007, China has 51% of orders place worldwide, which includes an 81% share of the low end vessel market. China is now threatening not only South Korea but also all shipbuilding countries with its price competitiveness, aggressive capacity expansion and technological cooperation with western countries.

However, there are factors that may impact the two countries in a severe manner. World shipbuilding overcapacity is clearly forecast which may cause fierce price competition and a lack of a skilled workforce is expected to be a negative impact in the future. In spite of this, the future outlook for the industry is still positive. An expected boom in the LNG market is a good sign for both South Korea and China. The cruise ship market is another opportunity for South Korea to remain competitive in the future. Consequently, South Korea and China may have bright futures. The intense competition may start from the middle of the 2010's and the key to survive and to be more competitive through technology development. A country with superior technology will be more likely to lead the shipbuilding industry in the future.

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Introduction

Shipbuilding is a capital-intensive process that requires extensive resources. It is labor-intensive because it requires a skilled workforce who has experience in mechanics, electronics, electrics and steel engineering. Its technology also has the convenience to transfer to more complicated industries, strong chance to induce more development, and the great advantage of providing many jobs and generating hard currency. Because of these powerful impacts on a nation's industry, shipbuilding has often been one of strategic long term development plans among developing countries, and this was not an exception for either South Korea or China.

Project Approach

The shipbuilding industry is one of seven industries that South Korea has been a leading position in the world. Shipbuilding industry has been playing an important role to the South Korean trade surplus (69% of the trade surplus in 2006 came from the shipbuilding market). Therefore, any changes in the industry, whether good or bad, can serious impact the entire South Korean economy. In addition, China is seeking to increase their shipbuilding industry which could threaten the South Korean shipbuilding industry. Therefore, this paper will focus on strategies South Korea will need to consider in order to maintain the leading shipbuilding presence.

There are many research articles regarding the world shipbuilding industry, especially about South Korea and China. However, there are not any articles that directly compare strengths, weaknesses and unstable factors in the future that impact these countries.

It is my conviction that this paper will help everyone understand what has happened to the world shipbuilding industry, specifically in South Korea and China. The author will explore the state world shipbuilders are currently facing, address instability impacting the two countries' future and explore future trends.

Literature Review

“World Shipyard Monitor”, Clarkson Services Limited, August-2007, Volume 14, No. 8

The ‘World Shipyard Monitor’ provides data on new orders of vessels and types of them received by each shipyard in the world. Specifically, it provides data that differentiates new orders and deliveries by vessel type and country/region. It also provides ordering, delivery and ship-price trend for the past three years together. Data provided is widely used for a number of research institutes to conduct a market analysis and to foresee economic trends in the related industries. This research provides basic information which is helpful in analyzing trends and strategies in future world shipbuilding market.

“S. Korea’s Key Factors to become world number. 1” Lectured by Mr. Kim, Jing Wan (CEO of Samsung Heavy Industry), April 19 2006

As a CEO of a large shipbuilder, SHI, Mr. Kim, Jing Wan presented a viewpoint of South Korean and Chinese shipbuilding industries. This lecture was mainly centered on the strengths of South Korean shipbuilders and indicated what South Korea had to do in order to keep the leading position in the industry. Mr. Kim is optimistic that South Korea will still lead the shipbuilding market until 2020, even 2030. However, only half

of CEOs of large shipyards in South Korea agree with this opinion. The author partly agrees with his opinion. South Korea seems to manage the leading position until 2015 because of the superior technology. Afterward, it entirely depends on how South Korean and China develop technologies. Within the next eight years, Chinese shipbuilders should accumulate the experience and technology needed to enter into and compete with South Korea in the most valuable shipbuilding markets. Thus, serious competition between China and South Korea may start from the middle of the 2010's to be the worlds largest shipbuilder.

South Korea's shipbuilding history

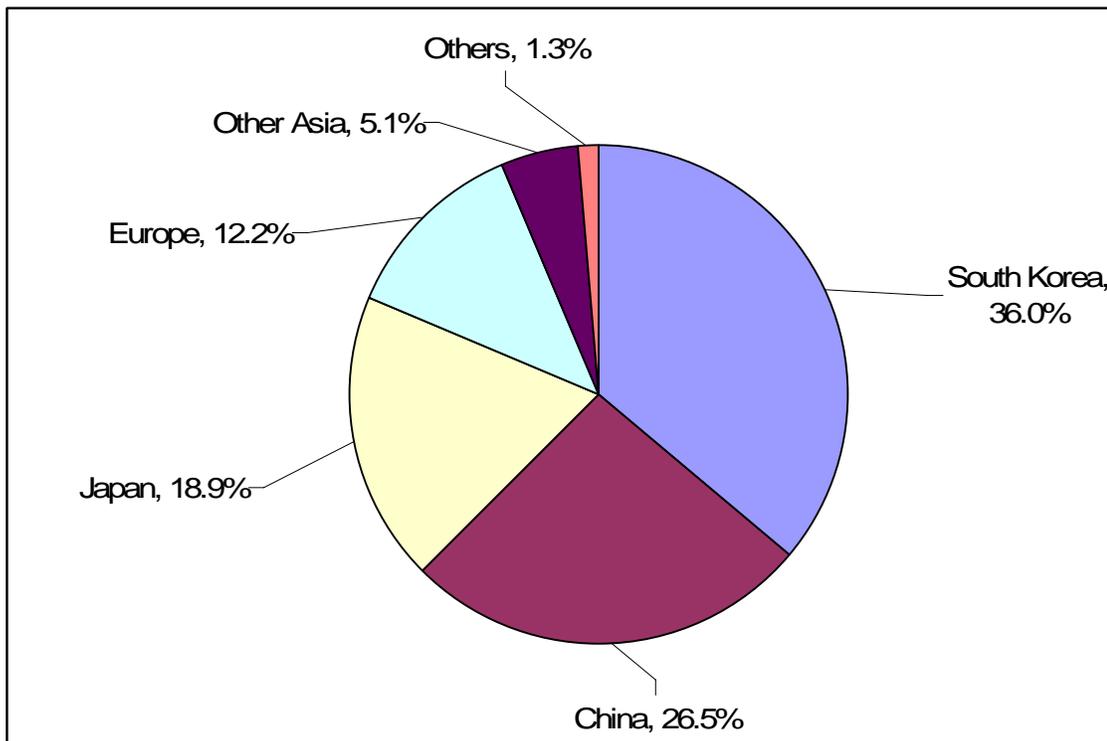
The start of the history of South Korean shipbuilding industry was very unique so called 'started with nothing'. Founded in 1973, HHI (Hyundai Heavy Industries, the first and largest shipbuilder in South Korea) has an unprecedented record in the world shipbuilding history. HHI's first order, a 260,000 DWT VLCC (Dead Weight Ton, Very Large Crude oil Carrier), was completed concurrently with the grand opening of the shipyard. Under strong support from the South Korean government's industrial policy which put heavy industry first in 1970's and 1980's, HHI has been able to expand its capability both in quality and quantity, as well as emphasizing workforce training. The world's second and third largest shipyard, SHI (Samsung Heavy Industries) and DSME (Daewoo Shipbuilding & Marine Engineering) were also founded and expanded their facilities during a similar period of time.

In 2000, South Korean shipbuilders finally achieved status as the world's number one shipbuilder surpassing their Japanese peers in terms of orders received and backlog orders. As of today, despite fierce challenges from China, South Korea has maintained and leading position due to superior technology, strong R&D investments and quality management systems.

South Korea's Present Conditions

As of July 1st 2007, South Korea has been dominant in the global shipbuilding industry for eight consecutive years. South Korea maintains a 36% share of whole global ship orders, followed by China and Japan, respectively, with shares of 26.5% and 18.9% (See Figure 1).

Figure 1 Global Orderbook 2007 by CGT



Source: Clarkson Research Services, World Shipyard Monitor August 2007

At the same time, six of the world's top ten ranked shipbuilders, based on orders received by CGT (Compensated Gross Tonnage), were South Korean shipbuilders. (See Table 1)

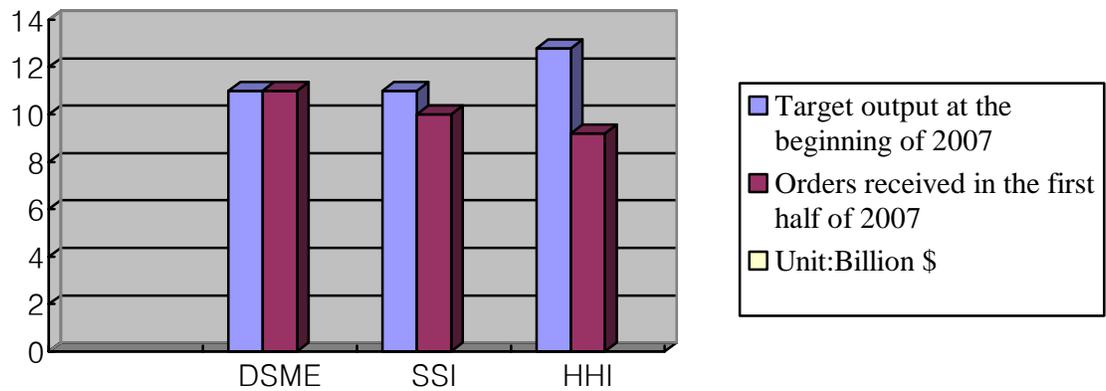
Table 1 Shipbuilders Rank**Unit: Thousand**

Rank	Shipyard	City	Country	Dock #	CGT(TH)
1	Hyundai H.I	Ulsan	South Korea	9	14,474
2	Samsung H.I	Koje	South Korea	3	9,190
3	Daewoo SB	Okpo	South Korea	2	8,804
4	Hyundai Mipo	Ulsan	South Korea	4	4,936
5	STX Shipbuilding	Jinhae	South Korea	1	3,404
6	Dalian Shipbuilding	Dalian	China	5	3,166
7	Hyundai Samho Shbd	Samho	South Korea	2	3,154
8	Waigaoqiao S/Y	Shanghai	China	2	2,363
9	Jiangnan Changxing	Changxing	China	4	2,257
10	Hudong Zhonghua	Shanghai	China	1	2,175

Source: Clarkson Research Services, World Shipyard Monitor August 2007

In 2007, South Korea's three largest shipyards have secured new orders that met or surpassed their target for yearly output (See Figure 2). In spite of large backlog orders, as much as 41.4 Million DWT; customers are still paying 20 to 30 % more for ships made by them than those by China (CEO Kim, Jing Wan). This phenomenon is especially outstanding when it comes to highly complicated vessels such as LNG carriers (Liquefied Natural Gas), ultra large container ships and drill ships. South Korea has already secured a sufficient volume of orders for the next three years (Alfa Laval International Customer Magazine).

Figure 2 Yearly Output of the Three Largest Yards in Korea



Source: Korea Shipping Gazette

South Korea's Strength

Technical Competitiveness and Design Capability

Three of the largest shipbuilders in South Korea have a dominant position in production of highly lucrative vessels. In determining technological competitiveness, design, production and management technologies are key areas of measurement. Table 2 scores components of these areas for South Korea, Japan and China. South Korea leads all of these key technologies.

Table 2 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

Note: 100 as current most advanced technology

Source: Korea Institute for Industrial Economics & Trade

South Korea is the world's leading LNG building country. All 13 new orders in 2007 have been sent to South Korea's shipyards. Backlogs for LNG carriers are 42 for SHI, 38 for DSME to be delivered between 2007 and 2011 representing 78% of the LNG market. This result comes from the unusual efforts for customization by the three biggest shipyards; especially DSME has the best technology for the market. Recently DSME built a new LNG carrier that prevents any loss from natural-gas leakage on the ship by re-liquefying the leaked gas (Lim, Young-Mo).

Currently, seven out of ten ultra large containerships are built in South Korea. Worldwide, 160 ultra large container ships (with a typical capacity of 10,000 TEU (Twenty-foot Equivalent Unit)) were built of which 117 were built in South Korea, indicating 73.1% market share. South Korea has the ability to design up to 14,000 TEU containerships.

SSI, in fact, dominates the drill ship market. Each drill ship costs over 0.5 billion dollars and SHI has received 100% of orders (three total) placed in 2007. Because of the impact of high oil prices, interest in drill ships has surged since 2005. These drill ships are designed for deep sea drilling and exploration. As of July 2007, all orders of drilling ships for the last three years have been received by South Korea's shipyards.

As the price of these vessels is far higher than any others, it has become necessary to have more design capability in order to reflect customer needs and special demands on the vessels. South Korea's shipbuilders always strive to keep up with customer needs and are open to change. Today, they are satisfying their customers by taking advantage of their higher technologies and the world's best design personnel. This is the reason that customers still look to South Korea despite higher ship prices.

Abundant Skilled Workforce and Talented Graduates

Shipbuilding, not only requires high technology but is also a very labor intensive process requiring highly skilled workers. In order to develop a skilled workforce, South Korea implemented a governmental industrial policy in the 1970's which emphasized workforce training. As a result of three decades of training, South Korea has developed skilled welders, pipe-fitters, electricians and other labors suitable for shipbuilding or other industries. Competitively, South Korea is well prepared to enter other industrial markets.

When it comes to well educated professionals, Japan, once a dominant country in the shipbuilding industry, is today ranked third behind South Korea and China. Japan produces only 300 graduates annually from six educational institutions. Of these graduates, only 21 % of them are working in shipbuilding industries. In contrast to Japan, South Korea has a strong supply of marine engineering graduates. South Korea produces 630 graduates annually from 11 educational institutions. More than 60 % of these graduates are working in the shipbuilding or related fields, however, a number of highly educated graduates are still needed by most shipbuilding firms. These firms have greatly invested in higher education. For instance, HHI invested in the National Ulsan University with a full tuition support and a guarantee of five year job security after

graduation. SHI, DSME and other big shipbuilders also provide various benefits to those students who major in marine engineering or related fields.

Innovative Methods of shipbuilding

The generally accepted mode of shipbuilding is that a ship is assembled in a dry dock, which is then flooded with water allowing the completed vessel to sail out to sea. Thus, building a larger ship requires a larger dock. South Korean ship-makers therefore have an inevitable disadvantage of a shorter coastline than any other competitors. During 2002 to 2004, in spite of a limited number of docks, there were still a large number of demands for value-added ships. HHI required a need to be innovative in order to meet the customer needs. HHI started to build VLCCs on land and then propelled the completed hulls on to a submersible barge with hydraulic jacks. Vessels are then towed into deep water about 2.7 miles out to sea where the barge sinks beneath them before returning to their mooring for final touches. This unprecedented trial was successfully performed in October 2004 and greatly benefited HHI. Shipyard capacity was improved by one eighth (from 65 to 73 vessels) by utilizing increased space available around vessels built on land and production efficiency was improved the construction period from 85 to 65 days.

SHI, the world's second largest ship maker, also has another innovative method of shipbuilding. A general ship built on a dry dock requires 80 to 85 ship blocks and a crane to shift them. However, using a 3,000-ton goliath crane enables to build a 100,000 DWT crude oil tanker with only 10 to 11 mega blocks that weigh 400 to 500 tons respectively. These mega blocks are built in China and instead of being loaded onto a ship 'floated' directly to the shipyard. At the shipyard, these blocks are assembled on a floating dock, rather than a dry dock where it was once thought to be impossible since the floating dock was unstable owing to waves. This increases efficiency by eliminating the step of loading and unloading of the mega blocks. This mega block method is now progressed to a so called 'Giga block method' and then to 'Tera block method'. (Mega blocks are welded together to become Giga and Tera blocks.) This Tera block method was performed successfully in September 2007 using only two blocks (Marinetalk). This new method maximizes production efficiency, reducing the construction period from typically 100 days to as low as 45 days. SSI now has the world best dock turnover rate, launching a new vessel every three to four working days.

DSME, like SHI also developed floating-dock construction and launched their first LNG carrier from a floating dock and increased their capacity up to 50 vessels per year without additional facility expansion.

New Types of Vessels

The three largest South Korean ship makers are capable of accommodating customer needs. They are enthusiastic about improving their competitiveness in newly emerging fields, such as ships for deep exploration and extreme environmental conditions. In addition, this has spurred the development of new technologies for existing vessels. HHI plans to develop LNG-FSO (LNG Floating Storage and Offloading), while SHI developed FPSO (Floating Production Storage and Offloading), FDPSO (Floating Drilling Production Storage and Offloading), and LNG-FSRU (Floating Storage Regasification Unit) (Eddy Wong). DSME is the first shipbuilder to develop the new concept LNG carrier, called the sLNGc (Sealed LNG Carrier). The sLNGc is designed to run a laden voyage without BOG (Boil Off Gas) and will open a new road for the sLNGCs market to a number of ship owners (The Korean Gas Union).

Continuous Investment in R&D

Early in the Korean shipbuilding industry, shipyards had to be dependent on technological cooperation with both Japanese and European shipbuilders. However, as they became less dependent on foreign technology, they recognized the importance of the investment in R&D. Furthermore, HHI, SHI and DSME are strongly cooperating with

both internal and foreign universities such as Seoul National University, Busan National University, Massachusetts Institute of Technology and the University of Texas (Robert Hassink and Dong-Ho Shin).

Most of vessels built in South Korea now are domestically sourced with internal sourcing rate reaching up to 95%. However, a LNG carrier hull and cargo design is entirely dependent upon outsourcing. South Korea is paying ten million dollars to GTT France for each LNG design. Shipyards are putting a great emphasis on gaining technical independence for hull and cargo tank design of LNG carriers by 2009 under strong governmental support.

Five shipyards including HHI, SHI and DSME are eager to participate in the emerging cruise ship market which is supported by The Ministry of Commerce, Energy and Industry (Korean Ministry of commerce, Energy and Industry, news). The cruise market accounts for 15 to 20 % of world shipbuilding industry and each cruise ship costs three to five times more than a LNG carrier or a VLCC. Twice failed by a Japanese firm, Korean shipyards are carefully approaching the cruise market with a strong R&D investment.

Equipment Industry

Shipbuilding industry requires a wide variety of industries, such as steel, material, mechanical, petroleum and chemical. Under strong support from the governmental industrial policy which put heavy industry first between the 1970's and 1980's, large scale infrastructures were under construction in Pohang, Goomi and Changwon which are located near HHI, SHI and DSME. These key infrastructures became more competitive through a painful restructuring during the Korean financial crisis. In addition, the boom in the shipbuilding industry was a big push for these related industries to become more competitive (Lim Young-Mo). Presently more than 90% of ships parts are internally sourced from these industries.

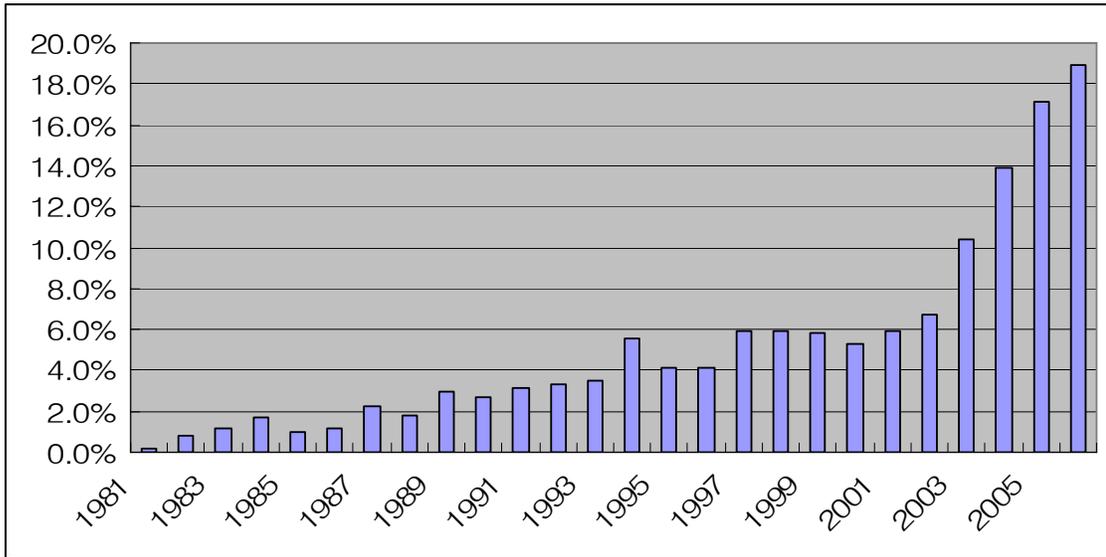
When it comes to the steel industry, for instance, the price of a ship's hull backboard has skyrocketed since 2003 and demand has exceeded supply. Most shipyards have trouble securing sufficient amounts of steel for new construction. POSCO (Pohang Steel Company), DongKuk Steel Company, Hyundai Steel Company and others are located near HHI, SHI and DSME to help remove the bottlenecks of supply-chain.

Hyundai Heavy Industries has dominated the marine diesel engine industry for 18 consecutive years. Acquiring technology and know-how from Wärtsilä Cooperation Finland and Man B&W for more than two decades, Hyundai introduced a newly designed Hyundai HiMSEN engine in July 2000, which achieves cost efficiency by reducing millions of dollars of royalty. Along with Doo San Heavy Industries and STX Heavy Engines, South Korea provides more than 65% of ship's heavy diesel engines in the world. Demand for marine plants' and ships' engines is expected to steadily increase until 2015.

Rise of China' Shipbuilding Industry

China also chose the shipbuilding industry as part of the governmental strategic plan when their market was reformed in 1978. The Chinese government encouraged market competition instead of control by the state for the shipbuilding industry. With strong and steady support from governmental subsidies, China has ranked third for ten years since the middle of the 1990's, following South Korea and Japan, in regards to the number of ships built (See Figure 3).

Figure 3 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)

China’s soaring economic growth fuels the world shipbuilding industry. Existing fleets were not capable of importing all raw materials and assembly parts into China or exporting finished goods from China. Therefore there has been a big push for new ship orders worldwide. In addition, an immediate ban on carrying heavy oil in a single-hulled tanker (IMO Regulation, International Maritime Organization)) has accelerated new orders of double-hulled crude oil carriers. Some ship owners have decided to remodel a single-hull tanker to a bulk carrier out of convenience and lower cost.

China is now the world largest shipbuilding nation for low profit vessels. While

South Korea and Japan have been focusing on lucrative vessels such as LNG carriers, China's shipbuilding has been centered on cheap vessels – bulk carriers, small to mid size oil tankers and containers.

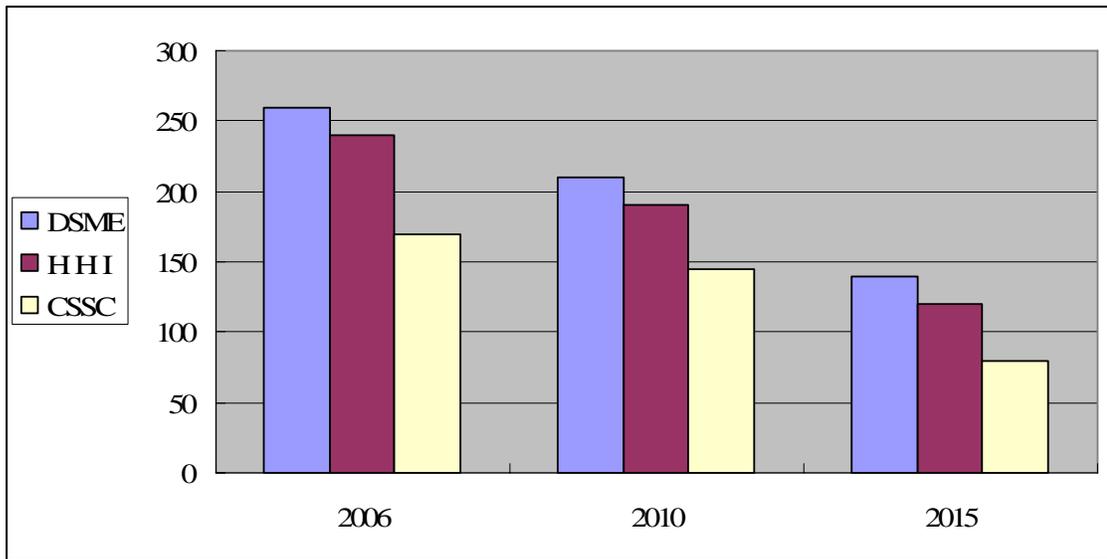
In August 2006, China claimed that it would be number one in the shipbuilding industry by 2015. The Chinese government's incessant support and booming markets appears to encourage further expansion of production capacity for years to come. The facility expansion in China is aggressive and now threatening its biggest rival, South Korea.

China's Strength and Potentiality

Cheap and Abundant Workforces

Shipbuilding is a very labor-intensive process. There are a number of experienced workers in South Korea and Japan, but the wages are far higher than those in China (See Figure 4).

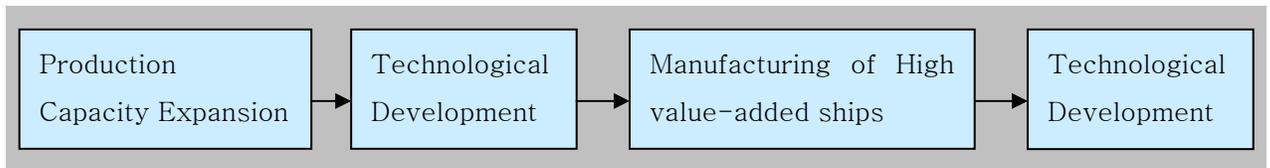
Figure 4 Labor Cost comparison between Korea and China Unit: Dollar/CGT



Source: SERI, Samsung Economic Research China

In contrast, China has an abundant supply of young and cheap labors; this price competitiveness will provide a strong advantage to Chinese shipbuilders until they progress to produce more value added vessels (See Figure 5). This will require more experienced and therefore more expensive labor force.

Figure 5 Development Strategy of china’s Shipbuilding Industry



Source: SERI, Samsung Economic Research Institute, China

In China, labor costs account for 10 % of the total cost to build a new ship; on the other hand, South Korea and Japan labor costs average 30%. This price gap represents a strong competitiveness that ships built in China are 20 to 30 % cheaper than those built in South Korea. While South Korea and Japan have been focusing only on highly lucrative vessels, China, with the strong price competitiveness, has swept 51 % of world total orders and nearly 81 % of low end vessels in January and February 2007 (Samsung Economic Research Institute and Clarkson Research Institute).

Rapid Increase of Production Capacity

Shipyards in South Korea, Japan and China have reached full volume of work for next two to four years. Therefore, the shipbuilding industry anticipates increasing profit by expanding production capacity. The appearance of a new large dock will instantly attract customers who in the past would have had to wait for years. While South Korea and Japan have limited abilities to expand its facilities because of short coastlines, China's two largest shipbuilding groups, CSSC (China State Shipbuilding Corporation) and CSIC (China Shipbuilding Industry Corporation) have been aggressively enlarging their production capabilities. Under the 11th Five-Year Plan (2006 to 2010), CSSC will

invest 2.4 billion dollars to expand its production bases in Waigaoqiao, Changxing and Longxue (EBN Industrial News). CSSC's production capacity will reach up to 14 Million DWT from 5 Million, when their facility expansion is completed in 2010. (This is as great as China's nation-wide production capacity in 2006.) Notably, the new facilities are strategically aimed to produce all vessels including LNG carriers, FPSO and ultra large containers, in order to compete with South Korea. CSIC's annual production reached 4 Million DWT in 2006 and a new production facility in Qingdao will produce 2 Million DWT in September 2009. At this point, China is going to have 30 docks in 2011, surpassing South Korea's current 15 docks.

The production capacity expansion in China is so intense that it will reach 40 Million DWT by 2015, which will cover nearly 60 % of whole worldwide demand (Korea Shipping Gazette).

Strong Domestic Demands and Technical development

Unlike South Korea, Chinese shipbuilders are strongly reliant on the volume of domestic shipbuilding. This has been a stable driving force for Chinese development and certainly will continue to be, even if the world shipbuilding market declines in the future. By 2010, it is expected that the domestic demands in China will reach 31 Million DWT. From 2010 to 2020, China's total demand for ships is forecast to reach 42 Million DWT (Samsung Economic Research Institute).

Chinese shipbuilding firms have secured technical cooperation with overseas companies to improve their basic and core technologies. To sharpen the competitive edge of its shipbuilding industry, China introduces foreign investment through equity-for-technology and market-for-technology deals (NEWSGD).

China has also adapted advanced design technology through design outsourcing from Japan and South Korea. For instance, the Dalian Shipbuilding Industry is capable of doing basic to production design of VLCCs, however, outsourcing has proven to be more cost efficient and will eventually eliminate the technology gap. In addition, a booming shipbuilding industry boosts China's overall manufacturing industry as well, for instance in the production of iron ore and steel, electronic and mechanical products (Terry Macalister). China began producing crankshafts for ships, using native technology in

2005, and also began producing low-speed diesel engines that satisfied 90 % of domestic demand as well as exporting abroad. In June 2007, the Dalian Diesel Engine Factory joined Korea and Japan in diesel engine manufacturing for large ships by successfully producing 49,680 HP diesel engines (Samsung Economic Research Institute).

The first Chinese LNG is being built by the Hudong-Zhonghua Shipbuilding (Group) Co Ltd and expected to go into operation at the end of 2007. Though the orders of LNG are domestic, 4 more LNG carriers are going to be produced in the same shipyard; which indicates Hudong-Zhongjua now is moving forward with international standards.

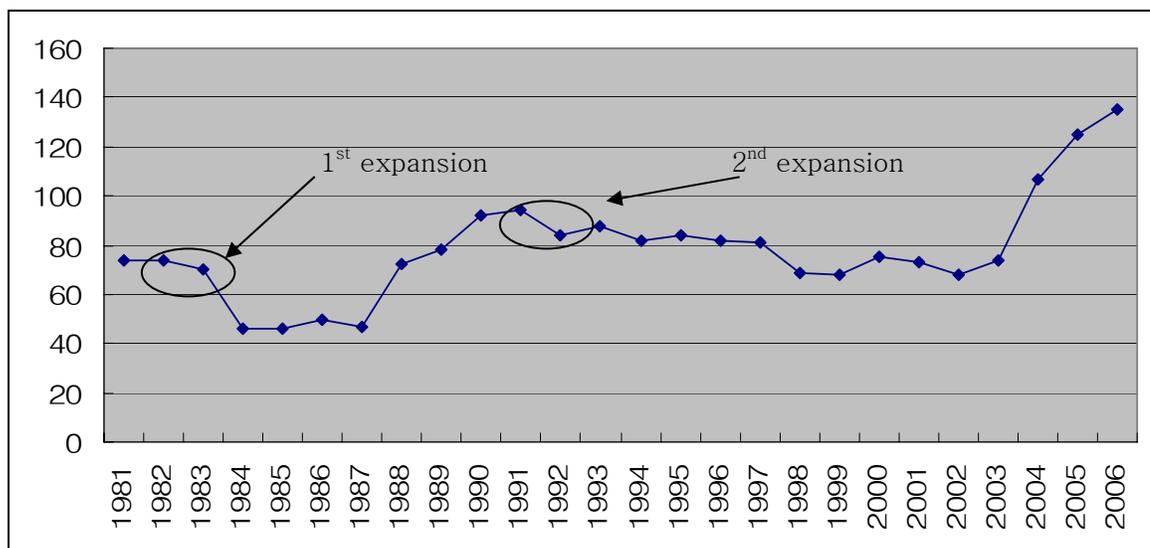
Unstable factors in the future

World Ship Demand Cycle

China's intense quantitative expansion could make the world shipbuilding industry decline beginning in 2012. China's over capacity will trigger fierce price-competition in 2010 when China completes its first facility expansion and doubles its 2006 capacity.

Also, Vietnam has claimed that it will be the fourth largest shipbuilding nation by 2015; in addition, India and Brazil have invested in the shipbuilding industry as part of their strategic plans. By 2015, world shipbuilding yearly capacity will reach 115 Million DWT whereas world total demands will be only 70 Million DWT (Clarkson Research Services). At this point, the shipbuilding industry might arrive at its peak and could decline due to fierce competition. A clear phenomenon, the cyclical demand of global shipbuilding demand warns both countries that overcapacity will cause serious troubles in the near future (Christian Schmidli, See Figure 6.).

Figure 6 South Korea’s facility expansion and ship price change Unit Million Dollar



Note: Price based on VLCC

Source: Korea Shipbuilders’ Association

Workforces

Managing highly skilled workforces will be another challenge for both countries.

South Korea has relatively abundant workforces in local yards and R&D centers As opposed to China and Japan. On the other hand, it is also true that South Korea is concerned with the lack of craftsman such as welders, pipe-fitters and electricians. An experienced welder is always needed in every shipyard because of the lengthy training required to develop a qualified welder. Therefore, each shipyard has its own technical education facilities to produce more skilled labors. In 2007, demand for the workforce increases up to 10,413; however, supply is limited to 7,825. This dearth of supply is expected to last for years.

It seems South Korean shipbuilders' biggest issue is now to prevent brain drain. There are abundant numbers of R&D and design experts in South Korea with extensive experience. The world shipbuilding market will be so competitive that even large firms may have to reconstruct themselves in the future. During this process, those highly educated and experienced experts may be heavily recruited by China. Currently experienced retirees in South Korea are offered jobs in China with double to or even quadrupled increases in salary. Some of them have already relocated.

Although China has been focusing on workforce training, additional years are required to have sufficient numbers of skilled labors such as welders, pipe-fitters and electricians. With strong governmental support and a lower labor cost advantage, China's shipbuilding industry is planning to develop both in qualitative and quantitative manners. The number of craftsman will increase as the quality level of the industry increases. Along with the development, craftsman may request higher salaries and, ironically, they might move to South Korea or Japan where they can be paid far higher.

Union Problem

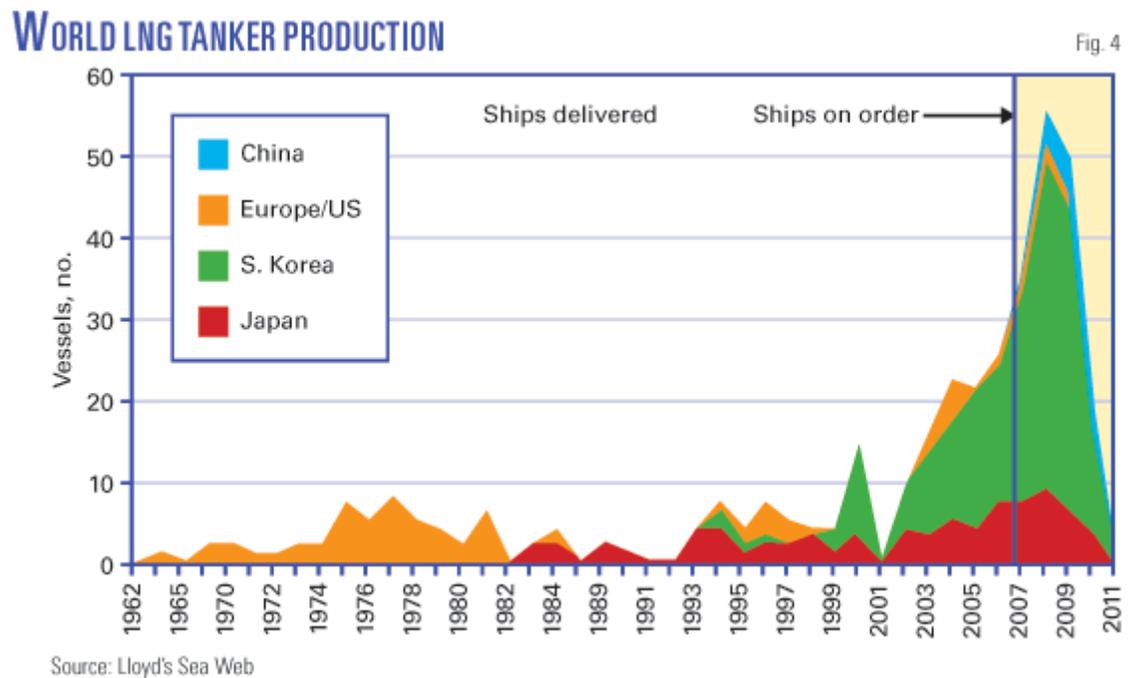
Hyundai is very well known for its long lasting-aggressive strikes against management and even political parties. Though Hyundai, Samsung and Daewoo have been playing in this industry without a strike for 12 to 16 consecutive years, one can hardly conclude that there will be no more conflicts between management and unions. This will be a potential threat to South Korea when the competition in the industry mounts up around 2015.

Positive Outlooks

LNG Demand Expected To Increase

The world shipbuilding industry is expected to be more competitive after 2012, especially in the low end vessel market. Currently, this is a good sign for South Korea and also a great chance for China that the LNG demand will increase in the future (See Figure 7).

Figure 7 World LNG Tanker Productions



Source: Lloyds' Sea Web and Gabe Collins 'China making bid to lead LNG carrier building

With environmental issues getting more attention, demand for cleaner energy arises and is expected to boost more orders of LNG carriers steadily for years. As of today, South Korea is the dominant nation that produces and has the most advanced technology to build LNG carriers. Capturing nearly 78% of world orders, South Korea is strategically emphasizing LNG carriers based on higher technology, shorter construction periods and highest credibility.

China has also made inroads in LNG carriers and in the long run, plans to lead the market. Hudong Zhonghua, Jiangnan Changxig, Nantong COSCO KHI, and Dalian New Shipyard, all have LNG carrier building ambitions. As LNG requires advanced technology and more man hours per DWT to build, China's strategy for LNG carrier production is to build LNG for its own domestic supply before they embark on competing in the international market with South Korean and Japanese peers (Gabe Collins).

Cruise Market for South Korea

With threatening challenges from China, South Korea has been emphasizing on collecting data in building cruise ships. A cruise ship is the most expensive vessel to produce accounting for 15 to 20 % of the shipbuilding industry; only a few countries in Europe such as Italy, Germany, France and Finland currently build cruise ships. Joining in the cruise market will be strategic for South Korea to secure its position and even to survive in the industry. Since a Japanese peer has tried but resulted in failure twice in 1990's, South Korea has been approaching very carefully. With support and cooperation from The Korean Ministry of Commerce, Energy and Industry, Korean shipbuilders plan to enter into the ship market by 2015.

Conclusion

It is a complicated issue to forecast who will be the leader in the shipbuilding industry after the 2020's. It seems that South Korea would probably be more dominant than the competitors until 2015. During this period, world shipbuilding industry seems to be driven by the two countries; China is expected, without doubt, to dominate lower end vessels such as bulk carriers and tankers and South Korea may lead the more value-added ship market

The key to determine a future leader seems to be the technology. It has been the technology that enables former and present leaders in the shipbuilding, such as Britain, Japan and South Korea to keep a dominant position. New entries in the shipbuilding industry always start with inexpensive and relatively simple vessels and later move on to complicated vessels in order to increase market share. China will inevitably face strong challenges from Vietnam, India and Brazil who have showed their ambition to enter into low end vessel market.

Consequently, China has to improve its production efficiency and design capability. Also, China should prove their technological capabilities and acquire international credibility to accomplish their long-term goal to be the world's largest shipbuilder number one.

It is clear that South Korea should increase their work focus on R&D and work towards improving retention of their highly skilled workforce. This should allow South Korea to leave their competitors behind and to enter into the cruise ship market, an ultimate goal for shipbuilders.

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