

INVESTMENT  
OPPORTUNITIES  
IN KOREA

# OFFSHORE PLANT



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Most figures in this report are converted from KRW into USD based on yearly average exchange rates. But growth rates (e.g. CAGR and YoY growth rate) are calculated based on KRW to prevent any distortion caused by changes in exchange rates.

INVESTMENT OPPORTUNITIES IN KOREA

# OFFSHORE PLANT



# 01 INDUSTRY OVERVIEW



## Definition of the Industry

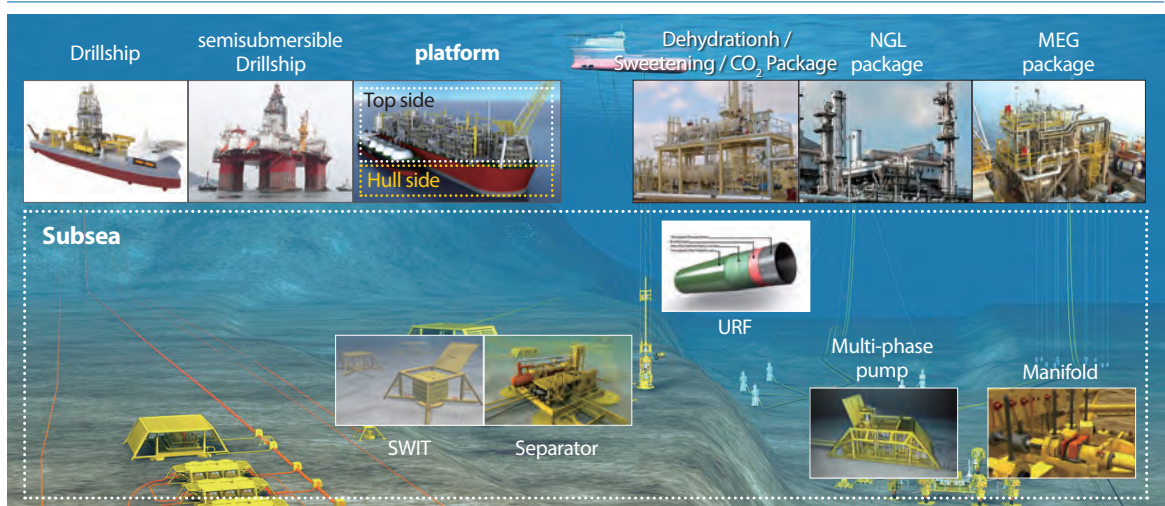
### Definition of the offshore plant industry

The “offshore plant industry” refers to the industry that builds various structures offshore, including facilities for developing offshore sources of oil, gas, and mineral resources, and for producing wind, tidal, wave power, and other forms of renewable energy. Recently, most offshore plant markets involve marine energy-related facilities.

In a narrow sense, an offshore plant consists of a platform (topside and hull), used for the exploration, drilling, and production of oil and gas, a subsea production and processing system, as well as URF (umbilical, riser and flowline) equipment. Korean shipbuilding and marine engineering companies build such offshore plants as a major part of their business, along with the building of ships.

- Floating platforms, or floaters, include drillships, semi-submersibles, and FPSO (floating, production, storage, and offloading) and LNG-FPSO vessels, are floating structures mounted with facilities for drilling, refining, storing, and unloading oil and gas offshore. Subsea production and processing systems are for processing and producing oil and gas from the ocean floor.

### Main Offshore Plant Components



Source: Ministry of Trade, Industry and Energy (2015)

### Industrial Characteristics and Connections

The offshore plant industry values expertise and safety. Only first-hand experience compiled over an extended period of time can assure a company’s technological prowess and product quality, making it practically impossible for new companies to participate in the industry without prior experience in a major project.

- Especially, as the area of operation for offshore plants expands to the deep sea and polar regions, the values of expertise and safety have become even more important, while shipbuilders are exerting a greater influence as the demand for floating platforms rise.

Originally developed for the purpose of producing oil and gas, the offshore plant industry has a high entry barrier, having been led by specialized global companies closely associated with oil majors.

- Offshore plant manufacturers have maintained close ties with oil majors for decades<sup>1)</sup>, but now with safety being a major concern in deep sea and polar region development, the manufacturing capacity and credit level of shipbuilders have also become key measures of competitiveness in the industry.

Of all segments of the offshore plant industry centered on plant manufacturing, the engineering segment, involved in feasibility studies, drilling, exploration, and design, creates the highest added value, and is dominated by a few oil majors and global offshore engineering companies that lead projects throughout their entire process.

- The recent trend in ordering plants to be made by integrated EPC (engineering, procurement and construction) contractors, rather than dividing plants into separate orders for design, building, and installation. In particular, as more offshore plants are being ordered to be built on a turnkey basis, increasing the contractual risk, engineering capability is also becoming more important.

## ■ Status of the Industry

### Global and Korean Markets

The offshore plant industry is divided into a hierarchy of segments, where oil majors developing offshore energy resources occupy the top tier, followed by shippers, shipbuilders, equipment manufacturers and engineering firms, all of which are closely interconnected in a market network.

Offshore plant operators are mostly oil majors. In terms of drillship fleet size, the largest operator is Brazil's national oil company Petrobras, which has been aggressively undertaking oil exploration and drilling projects off the coast of Brazil. Exxon Mobil, Shell, Pemex, ONGS, and BP also have been operating offshore plants, including drill ships and FPSO vessels.



1) U.S.-based multinational drilling solutions corporation National Oilwell Varco (NOV), another U.S.-based subsea equipment company, and Italian oil and gas industry contractor Saipem were founded in 1841, 1884, and 1957, respectively, and have since accumulated extensive business experience and knowhow.



- Drilling equipment is mostly used in major offshore oil fields, such as the shores off Brazil, North Sea, and West Africa, as well as in the Gulf of Mexico and the Persian Gulf.

Shippers that own offshore plants include Transocean, Noble, ENSCO, and China National Offshore Oil Corporation (CNOOC), while national and global oil companies are in charge of their operation.

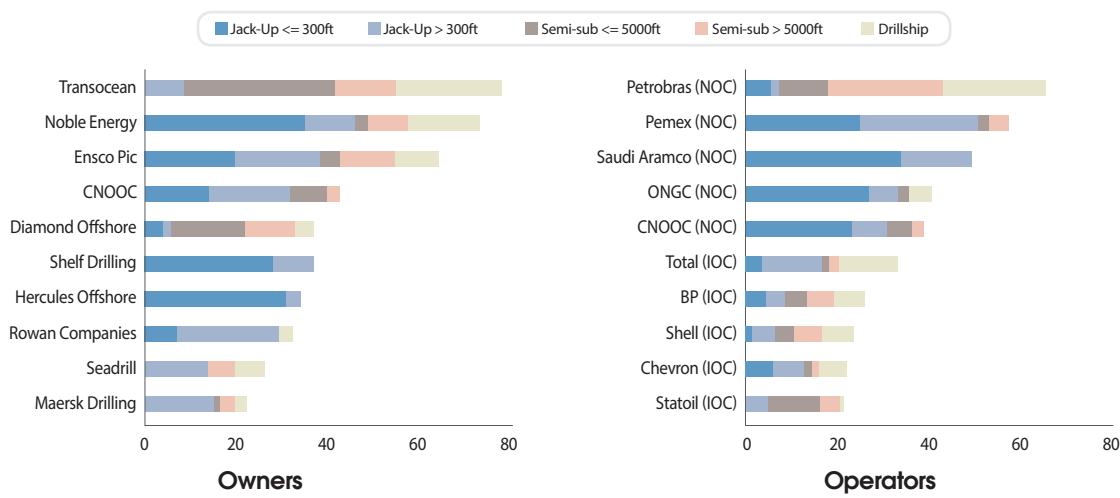
### World's Offshore Plant Companies by Industrial Segment

Indirect Demand	<p>Oil majors and offshore energy developers (oil exploration, etc.)</p> 
Direct Demand	<p>Europe      US      Asia      Others</p> 
Shipbuilders	<p>South Korea      Asia      US      Europe</p> 
Direct Suppliers	<p>Equipment and Material</p> 
Indirect Suppliers	<p>Design and Engineering      Steel Mill</p> 
Installation, Appraisal and Practices	<p>Installation and Commissioning      Certification, Test Evaluation, and Standard</p> 

- Transocean has the highest number of offshore drilling equipment, followed by Noble, ENSCO, and CNOOC, while major operators of offshore drilling equipment include Petrobras, Pemex, Aramco, Total, BP, Shell, and Chevron.

Drillship Owners and Operators (2015)

(no. of units)

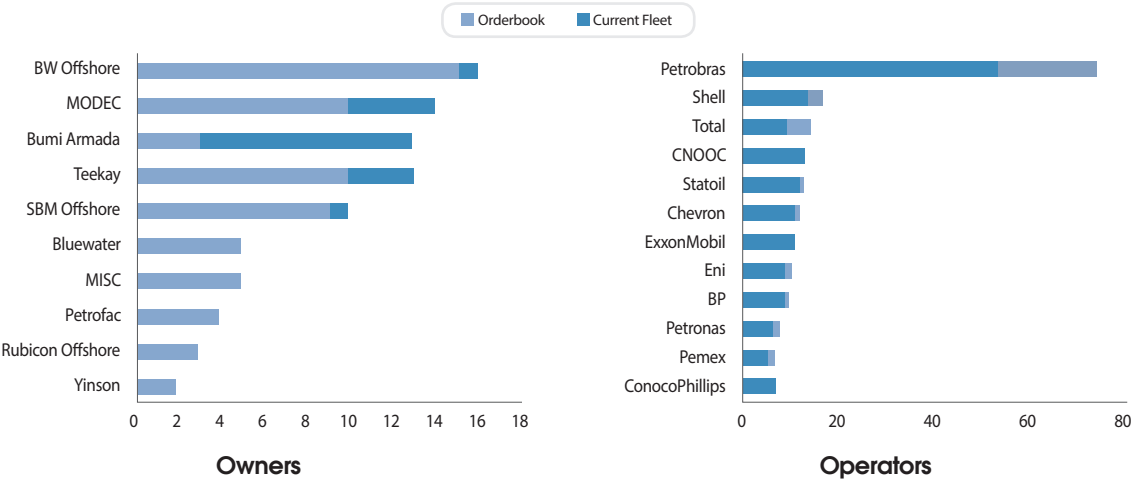


Source: Clarkson (2015)  
\* NOC = National Oil Company  
\* IOC = International Oil Company

- The Monaco-based Dutch company BW Offshore has the largest FPSO fleet, with 16 vessels including backlog orders, followed by Japan's MODEC with 14 vessels. In fifth place is SBM Offshore with 10 vessels. Meanwhile, Petrobras is the biggest FPSO operator, followed by Shell, Total, CNOOC, and Statoil.

FPSO Fleet Owners and Operators

(no. of units)



Source: Clarkson (2015)

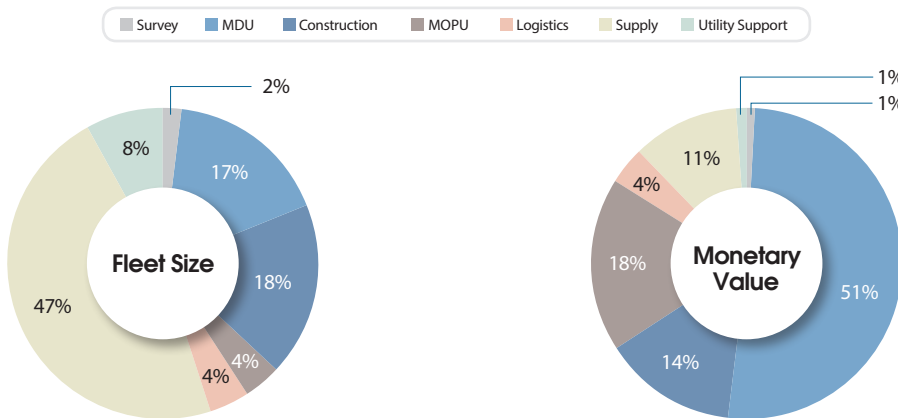


Since the latter half of 2014, low oil prices have caused the offshore plant industry to cool down, resulting in MDUs (mobile-drilling units) accounting for about 51% of all order backlogs, of which 18% consisted of MOPUs (mobile offshore production units) in 2015.

- Given that the demand for production and utility support vessels move with the demand for drillships, markets are expected to expand in the future. Currently, however, they are yet to show signs of recovery while oil prices, a major influence in the industry, stay low.

Order Backlogs by Fleet Size and Monetary Value (2015)

(order backlogs proportion)



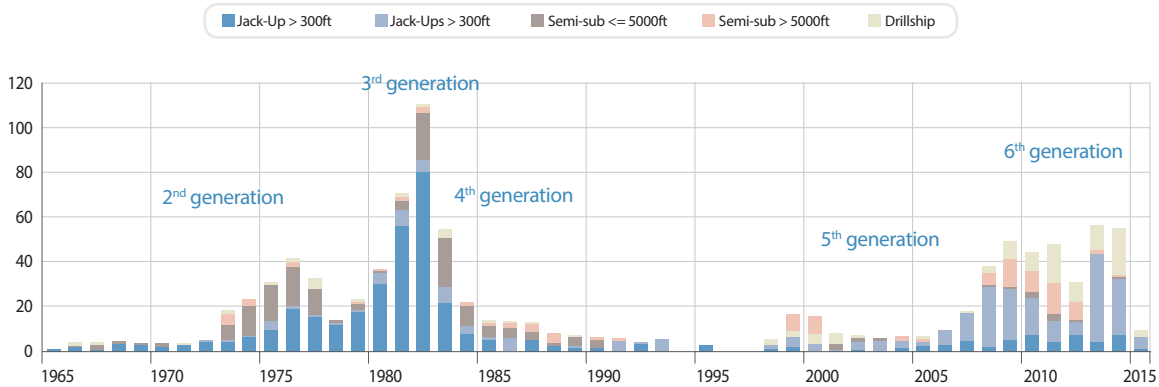
Source: Clarkson (2015)

With drillship demand being highly sensitive to oil prices, the 1970s saw a sharp increase in drillship orders during the global oil crisis, and has recently stagnated following a boom in the mid-2000s.

- In particular, the deepwater floating drillship sector, where Korean companies maintain a leading position, was in decline since 2014, while China has exceeded Korea in terms of order volume due to a sharp increase in jack-up rig orders.

Offshore Floating Rig Orders

(no. of orders)



Source: Clarkson (2015)

Order Backlogs by Country

(unit, %)

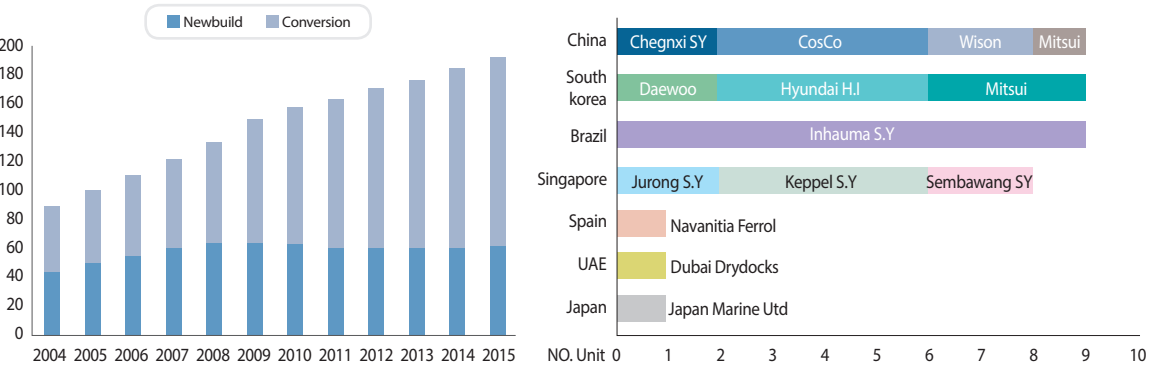
Country	Development							Production		Support						Total	
	Survey	Mobile Offs. Drilling	Construction Vessel/Barge	Lift Boat/ Installation	Accommodation	MSV/DSV/ ROV Support	Dredgers	Mobile Offs. Production	Logistics	AHTS >8,000 bhp	AHTS <8,000 bhp & AHT	PSV/Supply >3,000 dwt	PSV/Supply <3,000 dwt	Rescue & Salvage	Utility Support	Total all Types	% of Total
China P.R.	2	93	28	12	31	34	3	10	2	51	107	162	9	12	13	569	44.5
Brazil		29	2			4		9	7	7		34	11	2	12	117	9.1
South Korea		37	1	2	1	2		13	21	2						79	6.2
Singapore		37	1		3	4		10	5		1	3		2	1	67	5.2
United States	4	2		1		10				1		34	13			65	5.1
Netherlands			8		1	3	2	1	2			13	18		6	54	4.2
Norway	2		3			19				16		11				51	4.0
U.A.E.		9		6	1			1	1					5	10	33	2.6
India	1	4				4				4	11	1	8			33	2.6
Vietnam		1		8		2			1		2	6	7		6	33	2.6
Total Top 10	9	212	43	29	37	82	5	44	39	81	121	264	66	21	48	1,101	86.1
Total 11-20	9	4	2			12	4	6	2	9	20	27	4	16	12	134	10.5
Others(19)	2	1	6	2	2	4		4	8	1	1	4	4		5	44	3.4
TOTAL	20	217	51	31	46	98	9	54	49	91	142	295	74	37	65	1,279	100

Source: Clarkson (2015)

Demand for FPSO vessels, which move with drillship orders, was high during the period of high oil prices, but has remained low due to low oil prices until recently, as the market is beginning to show signs of recovery.

FPSO Vessels Worldwide by Year and Order Backlogs by Major Country

(no. of units)



Source: Clarkson (2015)

- By FPSO order backlog, Korea, China, and Brazil topped the list with nine orders each, closely followed by Singapore, known for its repair and upgrade segment, with eight orders in 2015.

The break-even point of oil prices has been decreasing due to efforts, such as to standardize offshore equipment and procedures, led by global energy companies and the three major Korean shipbuilders.

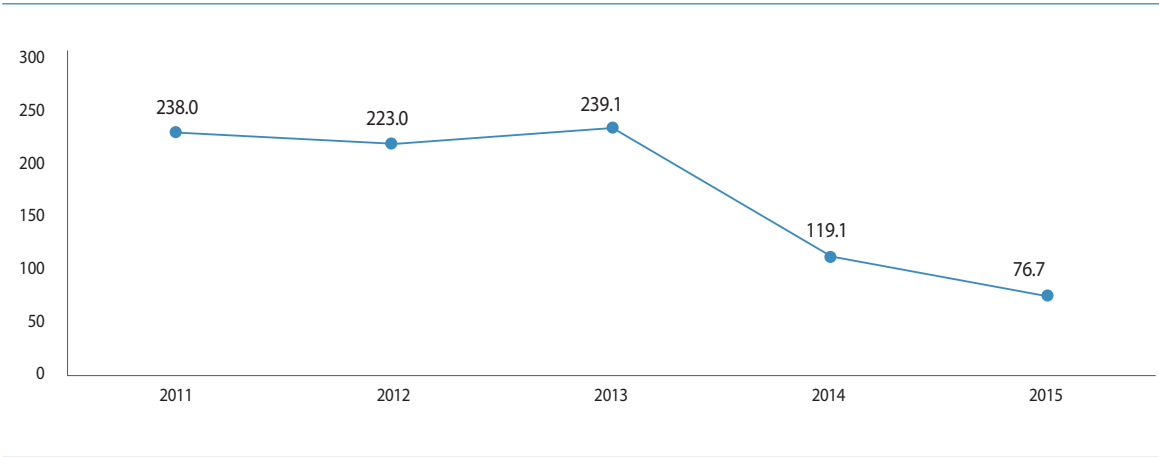
- The Norwegian energy firm Statoil changed plans for its Johan Castberg Project to develop oil fields in the North Sea, from using a semi-submersible platform and pipeline method to deploying an FPSO vessel, and was thereby able to lower the breakeven point of its oil prices from USD 70 to USD 40 per barrel.
- Royal Dutch Shell was also able to lower its oil price break-even point to USD 45 per barrel by reducing production costs, and is currently in the process of selecting a shipbuilder to make a semisubmersible platform so that it may resume its Vito Project in the Gulf of Mexico.

In the aftermath of the 2008 financial crisis, Korea’s three major shipbuilders—Hyundai Heavy Industries, Samsung Heavy Industries, and Daewoo Shipbuilding & Marine Engineering—saw a rapid decline in their commercial vessel businesses, and have since shifted their focus onto the offshore plant industry, when market growth was being fueled by high oil prices.

- The three shipbuilders are currently in a period of adjustment, trying to decide how much weight to give their shipbuilding and offshore plant manufacturing businesses each, and how to deal with the losses caused by an increase in man-hour and contractual risk.

Scale of Orders Received by Three Major Korean Shipbuilders

(USD 100 million)



Sources: Hyundai Heavy Industries IR, Samsung Heavy Industries IR, Daewoo Shipbuilding & Marine Engineering IR

## Foreign Direct Investment

Foreign investment in the Korean offshore plant industry jumped after 2005, when the commercial vessel market stagnated, and the offshore plant market started to take off thanks to high oil prices. Since mid-2014, however, the scale of new investments has gone down, caused by the decline in offshore plant markets.

- The Korean shipbuilding industry started to attract foreign investment in the mid-2000s, when its three major companies—Hyundai Heavy Industries, Samsung Heavy Industries, and Daewoo Shipbuilding & Marine Engineering—started to emerge as global leaders in the medium and large offshore plant markets. In particular foreign investments were concentrated in the engineering and equipment segments, where Korean companies had a weak presence.

Foreign Direct Investment in the Korean Offshore Plant Industry

Year	Country	Investor	Segment
2002	Singapore	GE Energy Korea	Offshore process control equipment
2003	China	Geum Jung ENG	Offshore structures
2005	UK	CATHELCO Korea	Offshore structure anticorrosive equipment
2007	Spain	ACCIONA Energy Korea	Engineering services
2009	Germany	IGUS Korea	Bearing, cable, energy chain, and pipe production
2010	Singapore	E-Marine Logix	Offshore information system development
	Canada	ALL-SEA Asia	Marine technology services
2012	Australia	PNL	Offshore plant pipes
	Germany	Schultz Korea	Sales of marine material and Offshore equipment sales.
2013	Netherlands	Heinen & Hopman Korea	Offshore structure air conditioning systems.
	Austria	Palfinger Dreggen Korea	Offshore crane and structure design and production.
	Germany	SIEMENS Energy Solutions	Engineering services
2014	France	PARIFEX Oil & Gas Engineering	Offshore plant facility design, verification, management and equipment sales
	Netherlands	Kyungnam Energy	Gas production and pipe supply
	UK	MRC Global Korea	Energy-related products such as pipes, valves and fittings
	Norway	Kolon Fjords Processing	Offshore plant equipment design and manufacturing
2015	Germany	Hunger Hydraulics Korea	Hydraulic equipment, system, and special cylinder manufacturing

Source: Ministry of Trade, Industry and Energy

More recently, Kolon Fjords Processing, a joint venture established in July 2014 between Kolon Group and Aker Solutions, has been designing and manufacturing offshore plant equipment used for the highly advanced dehydration process of separating water from oil and natural gas at the drilling stage.

- This is one of many cases in which Korean companies attracted foreign investment into less-developed areas. Aker Solutions is a global leader in the dehydration plant sector, where Korea has to rely on foreign vendors due to lack of technology.

In March 2015, Hunger Hydraulics Korea, the Korean branch of the German Hunger Group, opened its headquarters at the Shipbuilding Material and Equipment Engineering Hall in Noksan Industrial Complex in Busan, and has started manufacturing hydraulic systems, and special-purpose cylinders.

Competitiveness of the Industry

The offshore plant industry can be divided into feasibility studies on target sites, exploration, drilling and appraisal, designing based on key variables and environmental conditions, offshore platform construction, transport, installation, and commissioning.

- Korean shipbuilders are widely known to have a competitive edge in building offshore plants.
- The major shipbuilders of Korea, with abundant experience in designing and building ships to fit the specific needs of different manufacturing or installation environments, have the greatest competitive edge.

Offshore Plant Fabrication by Major Country

Country	Details
Korea	<ul style="list-style-type: none"><li>• Semi-submersible drilling ships: Korea's three major shipbuilders have a track record in building semi-submersible drilling ships.</li><li>• Drillships: Samsung Heavy Industries has won the largest number of orders and a relatively stronger construction capacity.</li><li>• FPSOs: Korea's three major shipbuilders have a track record in building FPSOs, for both mid-to-large and super-large segments.</li><li>• LNG-FPSOs: Samsung Heavy Industries is building an LNG-FPSO unit for Shell, while another is being built by Daewoo Shipbuilding &amp; Marine Engineering for Petronas.</li><li>• LNG-FSRUs: Most orders go to Hyundai, Samsung, Daewoo, and STX.</li></ul>
China	<ul style="list-style-type: none"><li>• COSCO Nantong received one CFPU order from KNOC and two drillship orders from S-Drill (USA). Dalian Shipbuilding Industry Company (DSIC) received one FPSO order from China National Offshore Oil Company(CNOOC). The CSSC-affiliated Shanghai Shipyard received four drillship orders from Reignwood Group. The global jack-up market has been led by China since 2013, and before that by Singapore. China has announced its aims to further develop its marine industry in 2017.</li><li>• With strong government support, state-run oil companies have aggressively entered the global natural resource development market, especially in Africa and South America through direct investment or M&amp;A.</li><li>• When Chinese companies such as CNOOC (China National Offshore Oil) conduct overseas oil development projects, they are required to construct and procure equipment such as FPSO and drilling rigs from China (China Shipbuilding Industry Corporation). It is mandatory that they use equipment made in China.</li></ul>
Japan	<ul style="list-style-type: none"><li>• The government provides policy support for Mitsui and Mitsubishi to expand in the global offshore market. Mitsubishi has emerged as the third-largest LNG producer in Australia and Southeast Asia. Mitsui has a profitable subsidiary MODEC, which specializes in offshore personnel management and FPSO leasing.</li><li>• Key companies include Mitsui, Mitsubishi, E&amp;S, IHI, Tokyo Gas, and Osaka Gas.</li></ul>
Singapore	<ul style="list-style-type: none"><li>• In the global FPSO market, Singapore accounts for 70% of the upgrade segment and 20% of the repair segment. There are more than 1,000 global equipment and engineering service companies in Singapore.</li><li>• Key companies include Keppel (specializes in jack-up, semi-submersible Ensco 8501, AHTS, and PV Drilling I, II, III) and Jurong (jack-up, FPSO conversion, and semi-submersible).</li></ul>

- Korean companies have a competitive edge in offshore plant construction and fabrication, having developed knowhow and technologies through various projects. Key offshore plant market segments include floating semi-submersible, drillship, FPSO, LNG-FPSO, and LNG-FSRU.

The major Korean companies are among the most competitive players in the construction and fabrication segment, but lag behind in feasibility study, engineering, installation, commissioning, operation, and maintenance segments.

By country, the U.S., U.K. and France are among the most competitive across the supply chain of offshore plants, except for the construction and fabrication segments.

- While Korea ranked in the top tier in terms of competitiveness in construction and fabrication, the country ranked in the mid-tier in most other parameters.

## ■ Prospect for the Industry

### Offshore Plant Market Demand Prospects

Demand for offshore plants has greatly decreased due to low oil prices, but it is expected to slowly recover beginning in 2020, as the demand for energy in developing countries increases due to further depletion of onshore and offshore resources.

- Until recently, drilling plant orders were made on a considerable scale. The current rate of drilling operations, however, is declining, lowering the possibility for Korean companies to receive new drilling unit orders.

Demand for FPSOs, meanwhile, is expected to increase significantly as follow-up measures to existing orders for drilling units.

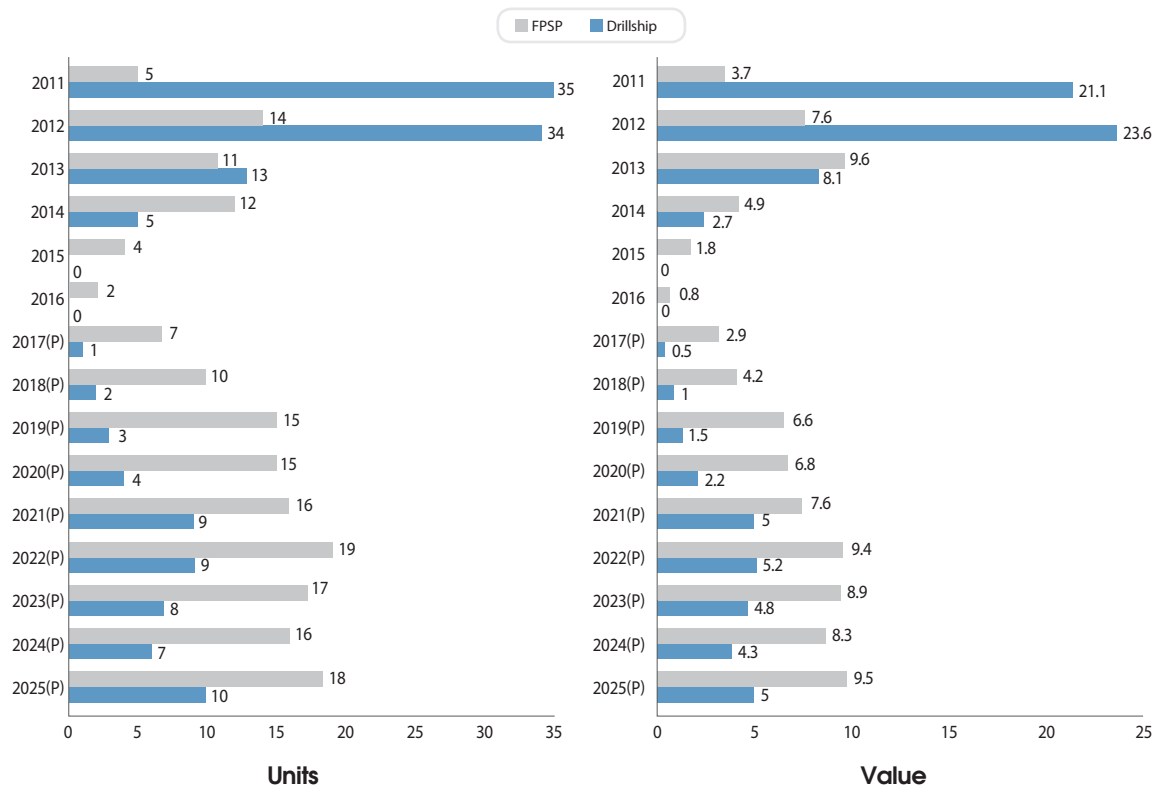
- Efforts to reduce the cost of offshore plants resulted in a decrease in the breakeven point of oil prices. However, the cost of producing shale oil, a crude oil substitute, also went down significantly, influencing some oil majors to expand their investments in shale oil instead of in offshore plants.

The offshore plant projects that were suspended due to extremely low oil prices, may resume some point in the future. At present, however, there are no signs of new orders being made due to the delay in demand recovery and low shale oil prices.



Offshore Plant Demand Status and Prospect

(no. of units, USD billion)



Source: Clarkson, The Newbuilding Market (Sep. 2016)

Future Prospects

The Korean offshore plant industry showed rapid growth at the time the three major Korean shipbuilders—Hyundai Heavy Industries, Samsung Heavy Industries, and Daewoo Shipbuilding & Marine Engineering—started to expand their businesses in the industry. The continuing trend of low oil prices and ensuing market downturn made the industrial outlook less promising, but marine equipment and engineering are still attractive segments for Korean companies.

In terms of total monetary value, Korean companies have sold the greatest amount of offshore plants in the world. However, only 20% of the equipment constituting platform topsides is made in Korea. Despite efforts to increase the use of Korean made platform equipment, the companies still have to rely on foreign supplies.

- Considering the characteristics of the offshore plant market, the dependence on foreign equipment is inevitable as it is difficult for smaller companies in Korea to build a track record through domestic R&D efforts alone.
- As offshore plant equipment and parts are being imported into Korea in proportion to the number of offshore plant orders received, increasing investment to make the equipment in Korea is expected to help Korean shipbuilders further sharpen their competitive edge.

Share of Domestically Produced Offshore Plant Equipment by Type

Type	Share of Domestic Equipment	Details
Machinery equipment	15–20%	<ul style="list-style-type: none"><li>· Most machinery equipment is imported.</li><li>· Simple fabrication and equipment such as vessels and heat exchangers are domestically procured.</li></ul>
Piping materials	15–20%	<ul style="list-style-type: none"><li>· Bulk materials and general-purpose valves are domestically procured.</li><li>· High-pressure and special-material valves are imported.</li><li>· Instrumentation equipment such as control valves and shutdown valves are entirely imported.</li></ul>
Electric equipment	35–45%	<ul style="list-style-type: none"><li>· Most electric panels are imported due to Underwriters Laboratories(UL) and certificate issues.</li><li>· Electric motors are mostly imported.</li><li>· Bulk materials such as cables and trays are domestically procured.</li></ul>
Instrumentation equipment	10–15%	<ul style="list-style-type: none"><li>· Most instrumentation equipment is imported.</li><li>· Only bulk materials such as tubing and tube fittings are domestically procured.</li></ul>
Safety equipment	about 5%	<ul style="list-style-type: none"><li>· Most of the safety equipment is imported.</li></ul>

There still appears to be promise for foreign companies involved in the production of offshore plant parts and equipment, as well as in Front-end Engineering Design (FEED) and basic design engineering, to enter the Korean market.

- Korean companies have been trying to procure offshore plant parts and equipment in Korea, but it will take a long time for domestic companies to meet the international standards necessary for offshore plants. As the three major Korean shipbuilders make offshore plants based on detailed designs, they have to rely on foreign companies for FEED and basic design engineering.
- In spite of the recent trend of low oil prices, some oil majors are showing results through cost reductions. If they were to shift their production and design centers to Korea and join in Korea’s offshore plant supply chain, their projects would benefit from the increase in focus, and the resulting synergy would make their businesses more successful.

# 02 LOCATIONAL COMPETITIVENESS



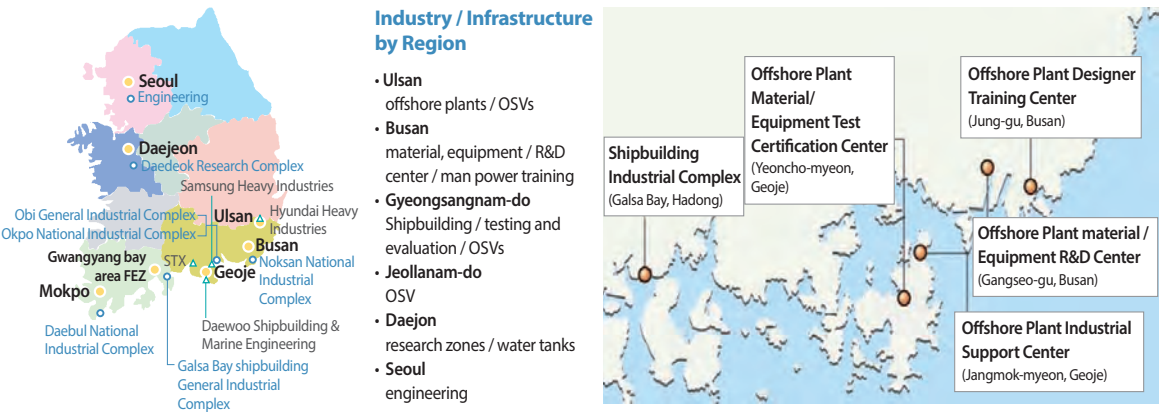


## Geographical Distribution of the Industry

Korea's offshore plant clusters are concentrated in Gyeongsangnam-do. These areas coincide with areas where major shipbuilders make large offshore plants for global customers.

- Offshore plants are mostly concentrated in Ulsan (Hyundai Heavy Industries) and Geoje in Gyeongsangnam-do (Samsung Heavy Industries and Daewoo Shipbuilding & Marine Engineering). Related equipment production and engineering is conducted in Seoul, Busan, and Ulsan.

### Korean Offshore Plant Industry Locations and Infrastructure



Sources: The Maritime Korea (2012), The Busan Ilbo (2013)

- Hyundai Heavy Industries, headquartered in Ulsan, reported order receipts worth USD 1.57 billion in 2015, including for semi-submersible rigs (USD 620 million), fixed offshore plants (USD 720 million), and floating offshore plants (USD 660 million). As of November 2016, the company received additional orders for floating offshore plants worth USD 250 million.
- As of September 2016, Samsung Heavy Industries, which has a shipyard in Geoje, had an order backlog for offshore plants worth USD 19.18 billion, accounting for 68% of the company's total order receipts, while production facilities accounted for 47.0%, or USD 13.25 billion.
- Daewoo Shipbuilding & Marine Engineering, which has a shipyard in Geoje, saw an increase in order receipts prior to the market slowdown in 2014. As of November 2016, the company received orders worth USD 13.95 billion for 13 offshore plants, accounting for 40.4% of its total order backlog.

## ■ Locational Conditions and Benefits

Research institutions, testing and demonstration equipment for offshore plants are also concentrated in Gyeongsangnam-do and Jeollanam-do, giving the shipbuilders nearby another competitive edge in the global offshore plant industry.

- In 2015, the installation of an ocean engineering basin began in the western part of Busan. In the Galsa Bay Shipbuilding Industrial Complex in Hadong, a demonstration bed will be established to test the performance of deepwater energy production facilities. The Korea Marine Equipment Research Institute for the testing of maritime equipment is also located in Busan.
- The ocean engineering basin in Busan will test the performance of deepwater offshore plant designs. It is the world's largest of its kind and can simulate actual environmental conditions such as waves, winds and tides, enabling related companies and research institutes to develop various deepwater facility technologies and test performances.
- In addition, the Advanced Technology Engineering Center (ATEC) for offshore plants is being constructed near the ocean engineering basin, along with an R&D center for offshore plant equipment and a marine equipment performance enhancing center, making Busan—the second largest city in Korea with the country's biggest sea port—a key base for the Korean offshore plant industry.

### Ocean Engineering Basin in Busan



Wave Generation System



Wind Generation System

- An offshore plant industry cluster is set to be built in Geoje, in connection with Samsung Heavy Industries, Daewoo Shipbuilding & Marine Engineering, the National Industrial Complex for Offshore Plants, Support Center for the Offshore Plant Industry (to be completed by 2017), and the Testing and Certification Center for Shipbuilding and Offshore Plant Equipment.

# 03 GOVERNMENT POLICIES AND REGULATIONS





■ Government Policies and Incentives

The Korean government has continuously improved the country’s investment environment by promoting concrete partnerships such as joint research between foreign investors and Korean companies, and joint advancement to overseas markets, while striving to attract foreign companies to free economic zones and the special R&D zones.

- In 2012, the Ministry of Trade, Industry and Energy (then the Ministry of Knowledge Economy) established a Development Plan for the Offshore Plant Industry, and launched 26 accompanying tasks to systematically promote the offshore plant industry as a future growth industry.
- Global offshore plant manufacturers, related equipment manufacturers and the government will lead the effort to establish research infrastructure in Korea for the creation of a world-class offshore plant ecosystem.

In particular, the Korean government has set a policy agenda for increasing the domestic production of offshore plant equipment and improving competitiveness. Accordingly, the government has taken measures to develop core technologies, promote the domestic production of offshore plant equipment and support overseas market expansion, while providing a variety of support and pursuing institutional improvements to attract foreign investment.

- The Korean government established the Offshore Plant Technology Roadmap, and has aggressively pursued the gradual development of 100 core technologies in four segments identified by the roadmap since 2014.

Government-driven Development of Core Offshore Plant Technologies

100 Core Technologies	Drilling (28 technologies), FPSO (21), FLNG (26), and Subsea/OSV (25)
Technology Development Projects	<ul style="list-style-type: none"><li>• (Deepwater) Development of environment-friendly offshore plant technology for deepwater resources (July 2012 – 2017, KRW 65.7 billion).</li><li>• (Equipment) Nine tasks including the development of a turret system for FPSOs, and high-pressure mud pumps for deepwater drilling (2012–2020, KRW 26.31 billion).</li><li>• (Processing technology) Opportunity crudes production &amp; processing technologies and organic acid and calcium removing technology (June 2013 – May 2018, KRW 3.8 billion).</li><li>• (IT conversion) Development of predictive maintenance system to deliver integrated offshore plant operation, maintenance, and repair services (May 2013 – April 2017, KRW 13.9 billion).</li></ul>

- Regional research facilities and collaboration between institutions will be enhanced to lay the groundwork for offshore plant research.

Efforts to Enhance Regional Offshore Plant Research Facilities

Region	Research Facility Expansion Details
Busan / Geoje	<ul style="list-style-type: none"><li>• Ocean Engineering Basin (Busan, 2013-).</li><li>• Offshore plant R&amp;D special zone (Busan, 2012-).</li><li>• Equipment R&amp;D center (Busan, 2012-).</li><li>• Equipment Test &amp; Certification Center (Geoje, 2012-).</li><li>• Advanced Technology Engineering Center (ATEC) for offshore plants (Busan, 2018-).</li><li>• Offshore Plant Industry Support Center (Geoje, 2013-; Ministry of Oceans and Fisheries).</li><li>• Shipbuilding and Maritime Equipment Performance Upgrade Support (Busan).</li></ul>
Hadong, South Gyeongsang Province	<ul style="list-style-type: none"><li>• Explosives and Fire Testing Center (Hadong, 2011-).</li><li>• Establishment of a Demonstration Bed for Deepwater Energy Production Facilities (Western Gyeongsangnam-do).</li></ul>
Mokpo / Gunsan	<ul style="list-style-type: none"><li>• Shipbuilding and offshore plant industry conversion district (Mokpo, 2012-).</li><li>• Green Vessel Testing &amp; Certification Center (Gunsan, 2013-; Ministry of Oceans and Fisheries).</li><li>• Establishment of an offshore plant cable test and research center (West South Region).</li></ul>

The Korean government seeks to attract investments from leading global companies in areas such as offshore plant equipment and engineering, where it takes a long time to develop technologies domestically, and to build partnerships for joint advancement into global markets.

- The central government, together with regional authorities, strives to attract research institutes, specialized equipment manufacturers and engineering firms to invest in free economic zones and special R&D districts. In particular, major international industry fairs are considered good opportunities to discuss investment potential with major global equipment and engineering companies.
- Strategic cooperation between global leading investment companies and domestic companies can be strengthened through partnerships. The government provides policy supports for joint R&D and joint advancement into global markets between foreign investors and domestic companies (from 2014 onward).
- Continuous institutional improvements will be made to attract foreign investment. Policy support has been expanded for the attraction of major foreign institutions and companies in free economic zones (August 2013, revised guideline for state-subsidized projects to support the attraction of foreign institutions).

A number of universities are designated as universities specializing in the offshore plant segment, developing a skilled workforce for the industry and promoting academy-industry cooperation. These universities will serve as a channel for exchange with global companies.

- Seoul National University, Inha University, and Korea Maritime and Ocean University were named universities specializing in offshore plants in April 2013. The government plans to designate three more such universities by 2020, and to provide support for the enhancement of research and education in engineering, especially front-end engineering design (FEED), project management and consultancy (PMC), and practical design engineering.
- Pohang University of Science and Technology (POSTECH) established the Graduate School of Engineering Mastership in September 2012. The number of such universities will be gradually increased to 10 in 2020. The establishment of an engineering and development research center is underway to enhance engineering education at universities (supporting curriculum design, industry-academy cooperation, and overseas studies).
- Sophisticated design capabilities are enhanced through exchanges, cooperation and networking between domestic and foreign offshore plant companies. For example, the U.K.-based JEE and the Korea Offshore & Shipbuilding Association (KOSHIPA) signed an MOU on November 5, 2013. Discussions are underway with the U.S.-based Campbell for bilateral cooperation.

## — Related Laws

### Legislature on Foreign Investment Companies

Foreign investors are entitled to tax reliefs on corporate income and dividend income on stocks and equity stakes earned from industry-related services and high-tech businesses, which are eligible for tax benefits, and contribute to enhancing the global competitiveness of Korean industries.

Foreign investors are entitled to lower acquisition and property taxes for operating assets related to areas such as offshore plant engineering and equipment businesses, which are subject to tax cuts.

- Tariffs, individual consumption tax and value added tax are exempted for certain capital goods that are reported as necessary for the business by foreign-invested projects that are entitled to tax cuts.

The Korean government reorganizes relevant systems to attract global enterprises as well as to strengthen tax benefits.

- Foreign employees working at a foreign company headquarters are eligible for a special income tax relief. Currently, foreign employees are subject to a flat income tax rate of 17%, regardless their income (applicable to foreign employees working at a foreign company headquarters from 2015).
- The transfer pricing calculation of intangible assets has been streamlined, and the D8 visa for foreign employees working at a foreign company headquarters can be extended for up to five years.

The Korean government also focuses on promoting offshore R&D centers. Currently, foreign technicians are entitled to a 50% cut in income tax for the first two years (the tax benefit has been extended to 2018).

- The government has expanded its lease subsidy for foreign investors to include buildings as well as plant sites. The Ministry of Trade, Industry and Energy provides full support when foreign-invested R&D centers seek partnerships with universities in Korea.

In addition, the Korean government takes job creation effects into consideration when estimating the tax cut limit for foreign-invested companies. The amount of the lease payment can be reduced for foreign companies that have contributed significantly to creating jobs in Korea.

# 04 COST





■ Cost and Labor

Cost breakdown of the offshore plant industry: The cost of an average offshore plant breaks down to materials (56.6%), labor expenses and outsourced processing (26.8%), and expenses (16.5%).

- In terms of labor force, the share of in-house technical staff has declined, but the share of subcontracting has increased. Accordingly, the share of labor expenses has gradually declined, but the share of outsourced processing has significantly increased.

Cost Breakdown of the Offshore Plant Industry

Item		Share (%)
Materials		56.62
Labor expenses		8.45
Expenses	Outsourced processing	18.4
	Depreciation	1.8
	Recurrent R&D expenses	0.07
	Other	14.63
Total		100.0

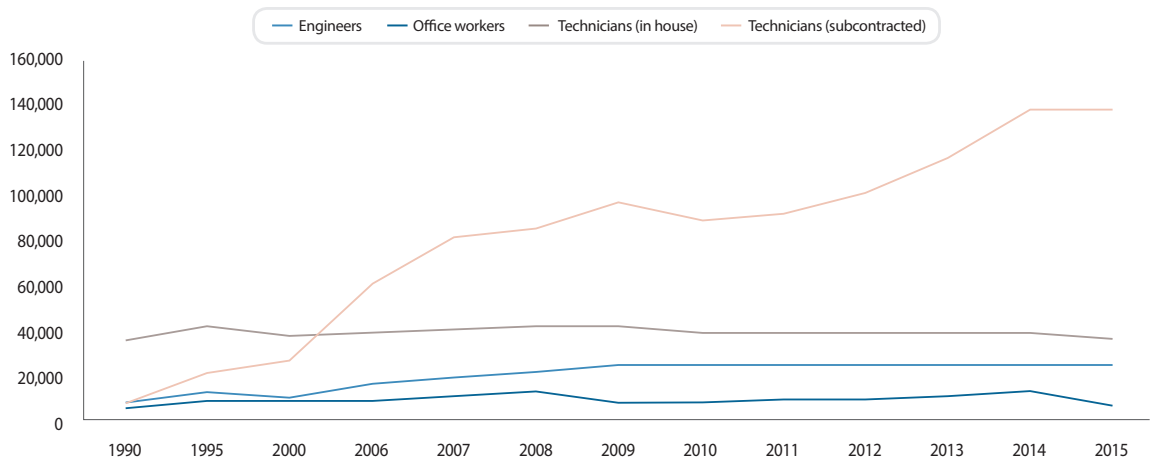
- Material costs accounted for the largest share of offshore plant costs. By item, steel products take up about 4% of total material costs, equipment and devices about 20 - 30%, pipes 3 - 11%, and electrical materials 2 - 4%.
- However, the material cost structure varies depending on the type of offshore plant. For example, pipes account for a larger share of material costs for FPSO (floating production, storage and offloading) vessels than drillships.
- Expenses regarding transportation, post-delivery adjustment and labor can be reduced for foreign-invested companies if equipment is produced domestically for Korean companies.

Human resources

The number of people employed in the offshore plant and shipbuilding industry reached 168,048 in 2013, marking a 3.1 fold increase from 2000 thanks to a continued boom in offshore plant markets. However, employment numbers failed to grow any further since 2014, due to shrinking order backlogs and low oil prices, and started declining in 2016.

Changes in Skilled Labor in the Offshore Plant and Shipbuilding Industry

(no. of employees)



Source: Korea Institute for Industrial Economics and Trade (KIET)  
Note: Data based on Korea Offshore & Shipbuilding Association (KOSHIPA) statistics

Demand for skilled labor remained stagnant until 2005 but recovered soon after thanks to an increase in offshore plant orders and product convergence. Following another period of stagnation that lasted until 2015, demand is expected to continue to fall after 2016.

In terms of the supply of skilled labor, the number of university departments related to shipbuilding and marine engineering has jumped nationwide to 36 compared to 11 in 2005, driven by a market boom, but the increase has turned into an oversupply situation as both shipbuilding and offshore plant markets are failing to show any sign of recovery.

- Along with an increase in the number of related university departments, the number of freshmen and graduates stood at 2,807 and 1,773, respectively, as of 2013. As students started to graduate from the newly established departments, the number of graduates has significantly increased, but an increasingly smaller number of graduates have been able to find jobs in the industry due to the prolonged industry recession.

Offshore Plant and Shipbuilding Industry Employment by Job Type

(no. of employees, %)

Job Type		2008	2010	2011	2013	2015	CAGR (2010-2015)
Office workers		9,388	7,448	7,592	8,974	7,786	0.9
Engineers		19,388	22,936	22,806	23,095	23,903	0.8
Technicians	In-house	38,576	36,575	36,444	36,786	35,808	-0.4
	Subcontracted	83,979	86,810	90,008	114,167	135,785	9.4
	Subtotal	122,555	123,385	126,452	183,022	171,593	6.8
Total		151,331	153,769	156,850	183,022	203,282	5.7

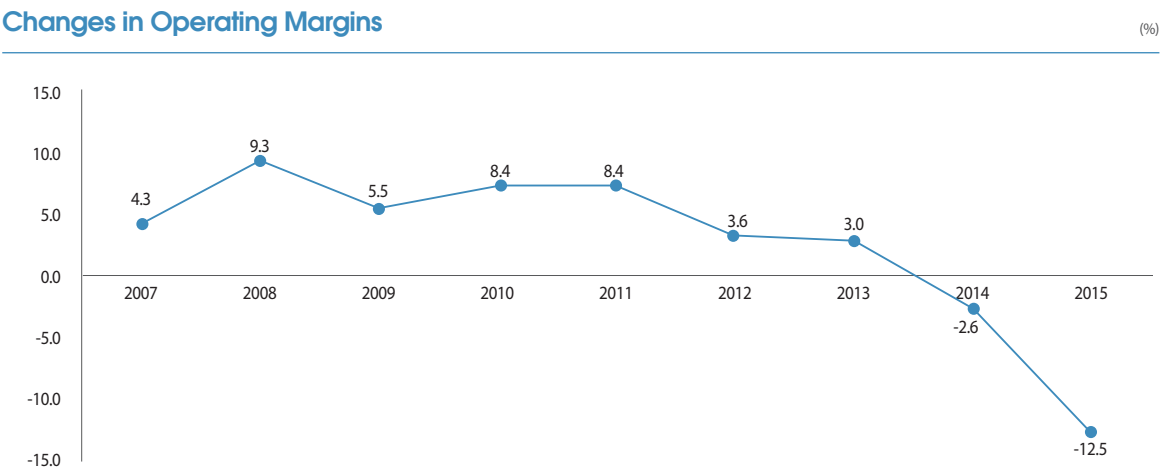
Source: Korea Offshore & Shipbuilding Association (KOSHIPA)  
Note: Based on data from nine KOSHIPA member companies and six non-members



- Meanwhile, there was a constant shortage of skilled labor during the market boom. The shortage eased during a market contraction, then widened again, but currently an increasing number of skilled workers, and at an alarming rate, are unable to find employment due to the fast decline in order volume.

## ■ Profitability

In terms of profitability of the offshore plant industry, the operating margin has dropped significantly in 2014, due to a decline in order prices and an additional building burden. In 2015, the operating margin fell by 12.5%.



Source: Korea Offshore & Shipbuilding Association (KOSHIPA)

# 05 SUCCESS CASES OF FOREIGN INVESTMENT



## Foreign Investment Overview

Not long ago, the emerging Korean offshore plant industry started to attract foreign investment, but conditions have worsened at present due to the recent market slowdown.

- Despite successful efforts to attract foreign investment in Korea, the industry is in its early stage, and thus it is premature to determine whether the industry can continue to generate desirable results in the future. Shipbuilders that have already succeeded in attracting investments are also expected to perform poorly for the time being as they have recently suffered significant losses and are undergoing comprehensive restructuring.

## GE Oil & Gas Korea

GE's investment is a good example of Korea attracting investment through efforts to create a favorable ecosystem for the offshore plant industry and to improve investment conditions. As a result, General Electric (GE) established the global headquarters of its offshore and marine division in Busan (in May 2015), as well as an education and training center (in October 2013).

### Investor : GE (USA)

Invested Company : GE KOREA\*, GE Oil&Gas Korea

\*global headquarters for GE's offshore and marine businesses

Investment region : Busan, Korea

Investment type : Stand-alone

Investment scale : USD 2 million

Year of report : 2013, 2014

GE established its Korean subsidiary GE Korea in 1976 and has undertaken various projects in areas such as health care, engineering procurement construction (EPC), airline and shipbuilding, and offshore plants.

- The company reported an annual sale of USD 1.8 billion, of which USD 1.44 billion came from the manufacturing segment. The company employs about 1,400 persons and creates more than 200 jobs every year.
- In the manufacturing division, ultrasonic devices are being manufactured in Seongnam, Gyeonggi-do, sensors in Pyeongtaek, chemicals in Iksan, Jeollanam-do, and valves in Ulsan. Its R&D centers are divided into appliances, advanced sensors, and control systems in Pangyo, and a healthcare IT center is located in Songdo, Incheon.
- The offshore engineering business division at GE headquarters is engaged in operational businesses related to its various offshore support vessels (OSV) such as PSV, AHT/AHTS, and CSV, along with other businesses such as marine energy production solutions, shipbuilding design, and project operation.
- GE Oil & Gas is a key division of GE's infrastructure business, which deals with drilling equipment, deep-sea development systems, rig instrumentation, and rotating equipment in some 100 countries. The company currently supplies drilling and rotating equipment in Korea, for shipbuilding, construction, steel, and petrochemical industries, as well as oil and gas-related solutions and services.

**Investment Incentives**

In establishing the global headquarters of its offshore and marine division in Korea, GE benefits from greater tax relief, as its investment meets government qualifications as the headquarters of a global company.

- Foreign employees working at the global headquarters of GE’s offshore and marine division are entitled to a special income tax rate.
- Taxation issues are expected to be improved in line with the new system, and the D8 visa (foreign investment visa) can be extended up to five years for foreign employees working at the headquarters.

**Investment Results**

Through the global headquarters of its offshore and marine division and the Power Conversion Training Center in Busan, GE has been developing a pool of experts, and pursuing related businesses in the country.

- Established in October 2013, the headquarters employs 10 experts and a number of related engineers, who work full-time to provide services to its shipyard customers.
- The GE Power Conversion Training Center, opened in October 2013, is equipped with drillships and LNG carrier simulators, and specialized instructors and engineers, including an instructor from France, who train shipyard employees.

**GE Power Conversion Training Center**

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- Location and Size: Busan, 660 m<sup>2</sup>
  - Subjects: Equipment produced by GE Power Conversion
  - Instructors, trainees, courses: Two instructors (including a French instructor), minimum five trainees per course/year, total of 50 courses
  - Training devices: Drillships and LNG carrier simulators
-

## Siemens' Investment in Korean Power Engineering

### Investor : Seimens (Germany)

The Ministry of Trade, Industry and Energy signed an MOU with the German engineering group Siemens on March 27, 2013, in which the company agreed to invest in Korea's power engineering industry. Expected to help develop Korea's energy and plant engineering industries, Siemens is considered to be one of the most important cases of foreign investment in the field.

The company established its Energy Solutions Asia headquarters (in charge of power generation solution markets in the Asia Pacific, the Middle East, and North Africa) in Seoul, Korea, in 2013, as well as its Asia headquarters for power and gas businesses.

Date of report / investment scale: 2013, EUR 60 million (approx. USD 70 million) investment (energy solution business expansion)

Siemens' investment in its Energy Solution Asia Headquarters was initiated in October 2013, and has continued across different stages.

- Siemens Energy Solutions headquarters for Asia-Pacific and the Middle East has helped highly-skilled Korean professionals find jobs.
- Siemens dispatches employees from Germany to transfer design and operating technology to its Korean workforce, helping the local energy industry sharpen its competitive edge.
- The company chose Seoul as the site for its Asia headquarters in consideration of the city's high standard of living for its employees, including its foreign employees, the presence of a German school in the city, and the need to expand its workforce.

### Investment Incentives

In establishing its energy solutions Asia headquarters in Korea, Siemens benefits from greater tax relief, as its investment meets government qualifications as the headquarters of a global company.

- Foreign employees working at Siemens Energy Solutions Asia headquarters are entitled to a special income tax rate.
- Taxation issues are expected to be improved in line with the new system, and the D8 visa (foreign investment visa) can be extended up to five years for foreign employees working at the company's Energy Solutions Asia headquarters in Seoul.

### Investment Results

Siemens Energy Solutions Asia headquarters in Seoul currently employs 150 professionals. The investment not only creates new jobs, but also connects other related local companies to a greater global supply chain, allowing them to expand their sales volume and gain a competitive edge in their fields.

- Siemens Energy Solutions Asia headquarters opened in October 2013. It employs about 150 engineers, including 45 professional engineers.
- Its headquarters is expected to act as an energy solution hub, connecting Korea, Japan, Taiwan, Australia, Singapore, and other countries in the Asia Pacific and the Middle East. The company plans to expand the role of the new headquarters in Seoul to include R&D, which is expected to have a positive effect on local companies involved in the power engineering industry.



# 06 RELATED COMPANIES AND ASSOCIATIONS



■ Related Companies and Associations

Related Companies

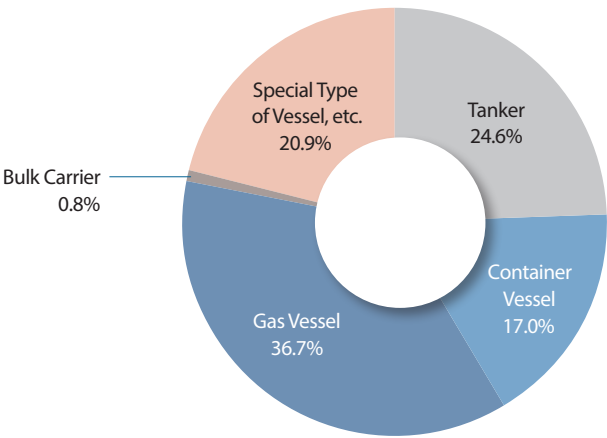
The Korean offshore plant industry is composed of the three major shipbuilders—Hyundai Heavy Industries, Samsung Heavy Industries, and Daewoo Shipbuilding & Marine Engineering—as well as numerous subcontractors and suppliers.

Company	Main Items	Website	Location
Hyundai Heavy Industries	Offshore plants, ships, engines, pumps, motors, heavy electrical machines, and heavy equipment	www.hhi.co.kr	(682-813) 1000, Bangeojin Ring Road, Dong-gu, Ulsan
Daewoo Shipbuilding & Marine Engineering	Offshore plants, ships	www.dsme.co.kr	(100-180) 125 Namdaemun-ro, Jung-gu, Seoul
Samsung Heavy Industries	Offshore plants, ships, and steel structures	www.shi.samsung.co.kr	(137-857) 4, 74-gil, Seochodaero, Seocho-gu, Seoul

Hyundai Heavy Industries

Hyundai Heavy Industries is the world’s largest shipbuilder and has an order backlog of 93 vessels, amounting to USD 11.77 billion, as of November 2016 (including Gunsan Shipyard). The company has been conducting various offshore plant projects, manufacturing drillships, FPSOs, and FPU’s.

Hyundai Heavy Industries’ Order Backlog for Vessels



Source: Hyundai Heavy Industries IR (Dec. 2016)

New Orders for Offshore Facilities

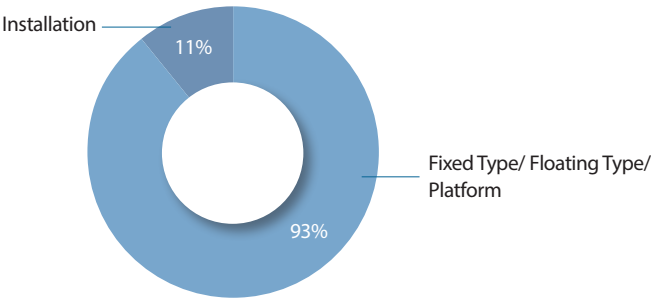
(USD million)

Facility	2009	2010	2011	2012	2013	2014	2015	2016.11
Fixed type	2,188	1,501	2,121	1,621	454	4,406	718	-20
Floating type	47	1,303	1,819	412	5,735	1,470	657	249
Pipeline	108	252	539	31	292	129	197	8
Others	9	13	1	8	22	0	0	0
Total	2,352	3,069	4,480	2,072	6,503	6,005	1,572	237

Source: Hyundai Heavy Industries IR (Dec. 2016)

- Of the company's offshore products, drillships are built by the shipbuilding division, while the offshore division is in charge of building offshore plants. As of November 2016, there were no remaining drillships on the order backlog, and new orders for floating offshore facilities have reached a scale of USD 250 million.
- As of November 2016, the order backlogs for shipbuilding and offshore facilities reached USD 11.77 billion and USD 11.82 billion, respectively, indicating that the company's offshore business is slightly larger than its shipbuilding business. However, the company incurred losses of 8.2% in 2014 and 6.9% in 2015, due to losses in the offshore division.

Offshore Division Sales



Source: Hyundai Heavy Industries IR (Dec. 2016)

Hyundai Heavy Industries Sales and New Orders

(USD million)



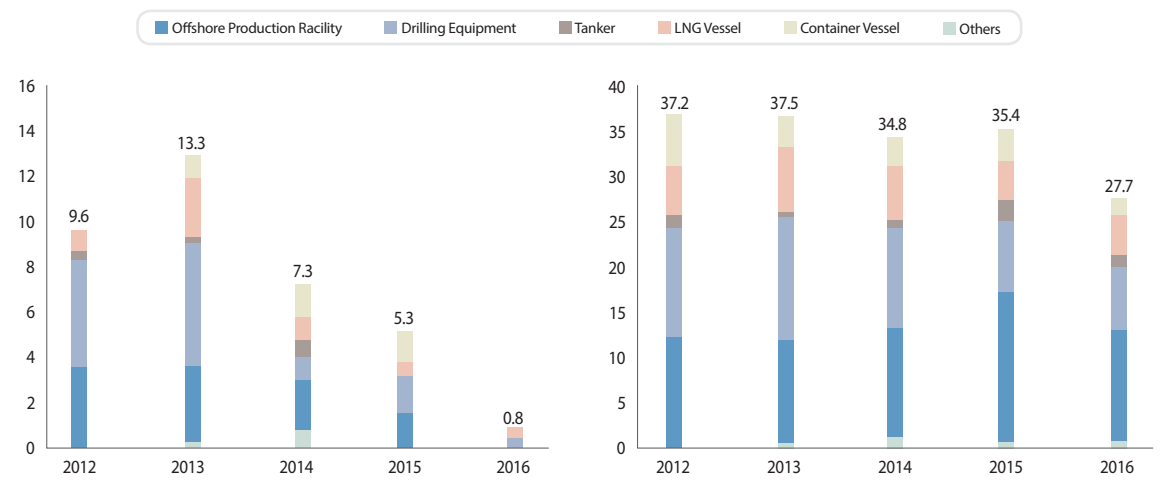
Source: Hyundai Heavy Industries IR (Dec. 2016)  
Note: 2005 to 2009 sales are based on Korea-Generally Accepted Accounting Principals (K-GAAP) data

Samsung Heavy Industries

Samsung Heavy Industries, the world’s second-largest shipbuilder, has an order backlog of 73 vessels, or 8.77 million DWT (deadweight tonnage), as of November 2016. Drillships account for the largest share of the total ships constructed by the company, but there have been delays in delivery due to the recent market slowdown. Currently, the company is also building the world’s largest LNG-FPSO for Shell.

Samsung Heavy Industries’ Orders Received (Left) and Order Backlogs (Right)

(USD billion)



Source: Samsung Heavy Industries IR (Dec. 2016)

- Samsung Heavy Industries has an order backlog worth USD 27.7 billion, as of November 2016, which breaks down to offshore plant facilities such as drilling rigs and production facilities (69%), and commercial vessels such as LNG and container carriers (31%).
- The sales portion of the offshore plant segment has been growing, but its operating margin declined from 10.8% in 2010 to -15.5% in 2015, due to an increase in man-hour, extra costs, and falling ship prices.

Daewoo Shipbuilding & Marine Engineering

Daewoo Shipbuilding & Marine Engineering, the world’s third largest shipbuilder, has an order backlog of 95 vessels, or 12.23 million DWT, as of November 2016, and is currently building an LNG-FPSO for Malaysia Petronas.

- The company has been undertaking drillship, FPSO and FSRU projects, but became a target for major restructuring after incurring massive losses from its offshore plant projects. At present, the company plans to focus on building commercial ships of high added value rather than offshore plants.
- The company’s cost composition reveals the massive losses were caused by exposure to contractual risk, rapid cost increases due to design changes, man-hour increases, and low vessel prices. Currently, the rate of debt has slightly lowered, by converting Korea Export Import Bank and Korea Development Bank loans (worth KRW 2.8 trillion) into equity, and through capital reductions.

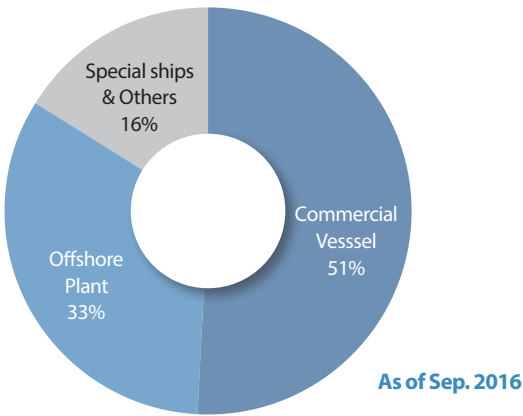
Daewoo Shipbuilding & Marine Engineering's Orders Received

(no. of ships, USD billion in parenthesis)

Type	2013 Order	2014 Order	2015 Order	2016 Order (As of Nov.)	2016 Backlog Order (As of Nov.)
Bulk	-	-	-	-	-
Tanker	15	10	8	6	15
Container	19	6	11	-	12
LNGC	6 (Including 1 FSRU)	37	9	2	50
LPGC	3	12	2	-	4
Others	-	-	-	-	-
Commercial Vessel	43 (4.50)	65 (12.05)	30 (4.44)	8 (0.88)	81 (15.38)
Offshore Plant	11 (8.10)	1 (2.69)	-	-	13 (13.95)
Special Ship	3 (1.02)	3 (0.18)	1 (0.03)	2 (0.41)	20 (5.23)
Total	57 (13.61)	69 (14.92)	31 (4.47)	10 (1.29)	114 (34.56)

Source: Daewoo Shipbuilding & Marine Engineering IR (Dec. 2016)

Sales by Product



Source: Daewoo Shipbuilding & Marine Engineering IR (Dec. 2016)

- The sales breakdown shows that the offshore plant business incurred losses despite continuous sales expansion since 2009. As the market slowed down due to an extended period of low oil prices since mid-2014, commercial vessels, offshore plants, and special ships, recorded 44.5%, 40.4% and 15.1%, respectively, of the company's total sales volume as of the end of November 2016.

## Related associations

### Korea Offshore & Shipbuilding Association

Korea Offshore & Shipbuilding Association (KOSHIBA) was established in July 1977 to enhance the market information system and mutual benefits through collaboration between shipbuilding and offshore plant companies, and industry-wide cooperation. It also seeks to boost the growth of Korea's shipbuilding and offshore industry and shipbuilding exports by further developing the shipbuilding and offshore sector.

Key roles: The association helps to create a level playing field for member companies, operate the productivity consultation committee, and enhance the exchange of information and international cooperation

- The association's Policy Consultation Committee aims to establish a fair and orderly market for member companies. It is responsible for making key policy decisions, promoting cooperation with shipowners associations in Korea and abroad, operating various consultation committees, and coordinating joint efforts to promote international cooperation.
- In addition, the association holds shipyard leadership meetings to share information on ways to improve shipyard operations, provide support and tasks for consultation bodies created under the association, and identify policy suggestions and develop joint countermeasures
- The association's Productivity Consultation Committee, which consists of sub-operating committees related to hull, ship engine, ship equipment, painting, commissioning, quality and loading, works to enhance productivity and promote technology development. The committee strives to enhance member companies' activities for productivity growth, holds consultations on ways to improve production technologies, publishes activity reports on department committees, organizes seminars for division committees, and publishes the shipbuilding directory.
- The association's Production Management Committee works to exchange information on production and general market trends, identify challenges in the production field, and propose improvements.

The association's Technical Consultation Committee participates in international conferences such as International Maritime Organization (IMO) meetings, shares information on design technologies and pursues joint R&D, publishes design and equipment standards by segment, and organizes seminars at the department committee level.

- The association supports the Shipbuilding Research Association in an effort to manage government-invested projects, to establish a system linking academia and industry, to identify mid and long-term tasks for technology development, and to undertake B2B network-building projects for the shipbuilding and offshore industry.
- The association also pursues various efforts to enhance international cooperation and address trade conflicts: operating the International Information Committee; attending the plenary sessions of the OECD WP6 and Supply-Demand Subcommittee; participating in JECKU (Japan-Europe-China-Korea-USA) meetings for shipbuilding companies; participating in the new OECD shipbuilding agreement, other international conventions and exhibitions, etc.; seeking domestic procurement and the standardization of offshore and shipbuilding equipment; enhancing labor/safety and healthcare/environment management; conducting market survey and analysis; and undertaking information system projects.



Companies in Other Related Industries

The offshore plant industry works closely with other industries, including those related to the manufacturing of materials (e.g., steel) and equipment (e.g., pipes, steel pipes, and flanges).

Company	Main Items	Website	Location
Hyundai Steel	Various steel, hot coil, and special steel products	www.hyundai-steel.com	12, Hunreung-ro, Seocho-gu, Seoul
POSCO	Various steel, hot coil, and special steel products	www.posco.co.kr	Donghaean-ro, Nam-gu, Pohang, Gyeongsangbuk-do
Doosan Heavy Industries	Engines, turbines, marine engines, forging and casting services	www.doosanheavy.com	555, Guikok-dong, Seongsan-gu, Changwon, Gyeongsangnam-do
Ganglim CSP	Pipes, seamless pipes, seamless pipes for plumbing, stainless steel pipes, tubes, and boiler tubes	www.klcsp.com	(618-280) Hwajun-dong, Gangseo-gu, Busan
Samkang M&T	Special steel products and stainless steel pipes for offshore plants	www.sam-kang.com	(638-842) 159-13, Naesan-ri, Donghae-myun, Gosung-gun, Gyeongsangnam-do
Sungkwang Bend	Plumbing and pipe fittings for offshore plants	www.skbend.com	(618-820) 26, 262-ro, Noksan Industrial Complex, Gangseo-gu, Busan
Shinan	Plumbing materials, flanges, and fittings for offshore plants	www.shinansteel.co.kr	(618-220) 190, Mieum Industrial Complex, Gangseo-gu, Busan
Taekwang	Plumbing materials, metal pipe fittings (elbows, teas, reducers and flanges) for offshore plants	www.tkbend.co.kr	(618-817) 117-12, Noksan Industrial Road, Gangseo-gu, Busan
Donghwa Entec	Heat exchangers for offshore plants and ships	www.dh.co.kr	(618-818) 7, 261 ro, Noksan Industrial Complex, Gangseo-gu, Busan
Sunbo Industries	Plumbing materials and engine parts for offshore plants and ships	www.sunboind.co.kr	(604-866) 61, 405 gil, Gamchunhang-ro, Saha-gu, Busan

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A world map in light gray with four concentric dashed circles centered on the Korean peninsula. Blue dots representing Invest Korea offices are scattered across the map, with a higher density in Europe, North America, and East Asia. The text "Global Link to Success, Invest Korea" is centered over the map.

## Global Link to Success, Invest Korea

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