

Nikola VLADIMIR **South Korean Shipyard *Hyundai Heavy Industries***



Sight from Busan

A short overview of the South Korean shipyard *Hyundai Heavy Industries (HHI)* is presented, with particular emphasis on R&D activities of the company. The paper is based on available technical data [1, 2] and author's personal impressions obtained during the technical visit to the shipyard. In September 2011 the author attended the 2<sup>nd</sup> Annual MarineTech Summit in Busan, South Korea, where he presented the paper "Investigation of Linear Springing of Large Container Ships" (authors: I. Senjanović, Š. Malenica, N. Vladimir). In addition to the attendance of the conference, within the scientific cooperation between the *HHI* and *Faculty of Mechanical Engineering and Naval Architecture (FAMENA)*, Zagreb [2], the author's technical visit to the *HHI* was arranged.

**Authors address:**

*University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture*,  
I. Lučića 5, 10000 Zagreb, Croatia,  
e-mail: nikola.vladimir@fsb.hr

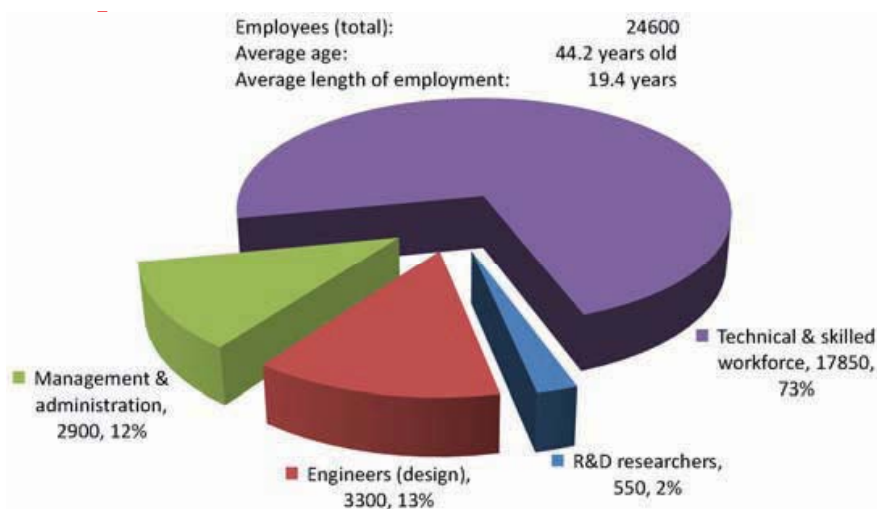
The world's largest shipyard *Hyundai Heavy Industries* is located in Ulsan, in the

*Hyundai Heavy Industries* shipyard [3]



south-east of South Korea. Together with the world's largest assembly plant operated by *Hyundai Motor* and the world's largest oil refinery owned by *SK Energy* it forms the heart of the *Ulsan Industrial District*. The *Hyundai's* shipyard stretches over four kilometres along the coast of Mipo Bay in Ulsan.

*HHI* was established in 1947 by *Chung Ju-yung*, as a construction company. Despite the fact that *Hyundai's* shipyard was still in the planning stages and the company had no experience, capital and shipbuilding technology, in the early 1970s it received orders for two 260000 DWT crude oil tankers from Greek shipowner George Livanos. In March 1972, ground was broken on an empty stretch of beach in Ulsan to construct what would become the world's largest shipyard. The ships and the shipyard were built simultaneously and this was a historical first step for *Hyundai Heavy Industries*. The *HHI*



**HHI employee structure**

separated from the *Hyundai Group* in the early 2002, and in its current independent establishment *Hyundai Samho Heavy Industries* and *Hyundai Mipo Dockyards* are included. Since the above mentioned beginning, the *HHI* has diversified its business activities from shipbuilding into other heavy industrial fields and it has developed into an integrated company with seven divisions: Shipbuilding, Offshore & Engineering, Industrial Plant & Engineering, Engine & Machinery, Electro Electric Systems, Green Energy and Construction Equipment, and has about 25000 employees in total.

The Shipbuilding Division currently leads the shipbuilding industry with a 15% share of the global market, and it is capable to build all types of ships. It has nine large-scale dry docks with seven huge "Goliath Cranes". Since the 1970s this division has garnered many awards and set many records within the shipbuilding industry. The Shipbuilding Division reached the milestone of 20 million DWT in 1988, 30 million DWT in 1991, 40 million DWT in 1994, 50 million DWT in 1997, and 100 million DWT in 2005. *Hyundai Heavy* has delivered about 1600 ships to more than 250 ship-owners in about 50 countries. Main products of this division are the following: VLCCs, tankers, product carriers, chemical tankers, (ultra large) container ships, bulk carriers, OBO carriers, Ro-Pax ships, Ro-Ro ships, high-speed ferries, car carriers, LNG carriers, LPG carriers, submarines, destroyers, frigates etc.

The founding of the Offshore & Engineering Division began in 1991. It was strongly motivated by the Saudi Arabian order for 89 jackets and deck structures for the Jubail Industrial Harbour Projects. Since then this division has completed about 150 projects, 3 million tons of offshore facilities and 5100 kilometres of subsea pipelines. The main products of the Offshore & Engineering Division are floating units, fixed platforms, pipelines & subsea facilities and offshore installations.

The Engine & Machinery Division is the diesel engine builder with approximately 35% global market share and it plays an important role in the shipbuilding industry. This division reached the production milestone of 100 million bhp in low-speed engines in 2010. It received more than 5800 unit orders for Korea's first independently designed in-house diesel and gas engine, the *Hyundai HiMSEN*, which represents a remarkable growth in the medium-speed engine market. Industrial pumps and robot

systems are strategic items in the division's plan for long-term growth. Other division's key products are 2-stroke marine engines, 4-stroke marine engines, crankshafts, propellers, marine propulsion shafts, power plants, packaged power stations, cargo oil pumps and side thrusters.

The role of the R&D Division of the company is related to creating new products by focusing on the development of market-driven technologies. The division consists of six institutes as presented in the table, and includes two overseas research centres in China and Hungary. *HMRI* currently possesses capital facilities and support equipment for hydrodynamic research on ships and offshore structures. *HMRI* joined the International Towing Tank Conference (ITTC) in 1986. The other aspects of research covered by the Institute include offshore engineering, structural research, noise & vibration reduction, model manufacturing as well as measuring. *HPDRI* is a newly organized institute with a special mission to improve product development technologies. The main tasks are to enhance the performance and reliability of existing products and to develop next generation models and new products. Products include engines, construction equipment, fluid machinery, and wind turbines. *HIRI* played a vital role in developing production technologies such as welding, casting, forging, protective coatings, and automatic manufacturing facilities. *HIRI* has also developed engineering technologies for energy and environmental control systems used in oil & gas processing plants, power generation plants, IGCC plants, desalination plants, engine emission protection systems, ballast water treatment systems etc. With a strong emphasis on mechanical and electrical engineering, *HEMRI* is engaged in a variety of R&D activities addressing fundamental, applied & theoretical, and practical technology. Activities of the *TDI* are

**HHI research institutes**

Name	Abbr.	Founded
<i>Hyundai Maritime Research Institute</i>	<i>HMRI</i>	1984
<i>Hyundai Product Development Research Institute</i>	<i>PDRI</i>	2011
<i>Hyundai Industrial Research Institute</i>	<i>HIRI</i>	1983
<i>Hyundai Electro-Mechanical Research Institute</i>	<i>HEMRI</i>	1991
<i>Techno Design Institute</i>	<i>TDI</i>	2000
<i>Technology Management Institute</i>	<i>TMI</i>	2011



Jagalchi fish market in Busan



A snapshot from a street of Busan

related to creation of corporate cultural environment, through visual communication design, industrial design, and brand identity design. Recently established *TMI* is in charge of planning mid to long-term R&D strategy, creating and exploring new businesses, securing and dealing with intellectual property, building global R&D network, knowledge management, etc.

Although it is impossible to predict the future of the shipyard in the doubtful conditions which will probably continue to be present in the field of global sea transportation and exploitation, one can say that the position not only of the *HHI* but of the whole Korean shipbuilding industry will be surely kept in the near future. Due to different economic, technical and technological as well as social reasons it is not possible to compare Croatian and Korean

shipbuilding industry directly, but in the author's opinion, the close link between research and industry, as in case of the *HHI*, should be one of the baselines in the future of Croatian shipyards. Further on, the just-in-time production strategy which is present in the *HHI* reminds that the whole production system besides research institutions and ultimately shipyards also includes engine factories, equipment manufacturers, other joint industries etc.

Finally, it should be mentioned that the author's visit to the *HHI* was supported by the EU FP7 Project TULCS (Tools for Ultra Large Container Ships) [3]. The author expresses his gratitude to Byung-Ki Choi, PhD, Principal Research Engineer, *Maritime Research Institute/R&D Division*, as well as to Professor Emeritus Ivo Senjanović, *University of Zagreb, FA-*

*MENA* for making possible his technical visit to the shipyard. Also, the author is grateful to Croatian naval architects Mr. Jurica Bašić, Mr. Ivan Guina and Mr. Ivica Pamuković, who work as inspectors in Korean shipyards, for the time spent together while exploring the beauties of Busan.

## References

- [1] <http://www.hhi.co.kr/>
- [2] Shipbuilding – digital brochure, *HHI*, 2011.
- [3] MALENICA, Š., SENJANOVIĆ, I., DERBANNE, Q., VLADIMIR, N.: "On the EU FP7 Project 'Tools for Ultra Large Container Ships' – TULCS, *Brodogradnja*, Vol. 62, No. 2, 2011., p. 177-187.