Modular concept in the design of environmentally friendly passenger vessels: Techno-economic aspects

Nikola Vladimir(nikola.vladimir@fsb.hr)[1], Ivica Ancic[1], Marina Tosic[1]
Dae Seung Cho[2]
[1]University of Zagreb, Croatia, [2]Pusan National University, Korea

Abstract

This work discusses techno-economic aspects of implementation of modular concept [1] in the design of small passenger ships intended to satisfy rigorous environmental criteria together with ordinary design requirements. As indicated, the procedure is based on the modular concept enabling the change of ship production paradigm from the classical all-in-one approach to a parallel manufacture of different components done by highly specialized producers and a final assembly done by the local shipyard [2,3]. This approach has the ambition of achieving a design of a modular passenger vessel concept which goes beyond the simple payload criteria. It is structured in a way that enables the development of a set of solutions which cover a quite wide range of applications in short-sea shipping. The target vessel is considered as made of independent modules which can be combined together to achieve different characteristics in terms of ship dimensions, carrying capacity, operability, comfort, fuel consumption and energy efficiency. There are several advantages in such a wide set of combinations. The first immediate consequence is that, due to the flexible and easy adaptation of the concept to different requirements of passenger ships, each component can be produced in larger lots, justifying an improved design and making it cost effective. Also, the modularity allows a parallel production of the modules. This can change the approach to the production from local, small size, shipyards, which build the vessel in a sequential way, to highly specialized and large business size industries that manufacture the modules in large numbers and deliver them to for the final assembly. This investigation is a part of long-term project, where at first an analysis of the market needs and of the corresponding ship requirements is being performed for different navigation areas, which is actually a main subject of this presentation. Then, the preliminary concepts based on those outcomes are being proposed, while the final concepts will be developed taking into account all important aspects of ship design: resistance and propulsion, seakeeping, structural aspects, ship habitability, simplified manufacturing processes as well as environmentally friendly energy solutions. Through this project several optimized modular passenger vessels should be proposed depending on the selected design criteria sets. It is expected that the investigation will result in a number of concepts fitting to the market needs with reduced production costs, higher level of comfort for crew and passengers, reduced fuel consumption as well as lower environmental impact.

Keywords: *modular concept, ship production, economic aspects, hydrodynamic performance, ship habitability, energy efficiency, environmental protection*

References

[1] Jollif, J. V. (1974), Modular Ship Design Concepts, Naval Engineers Journal.
[2] Baldwin, C., Clark, K. (2000), Modularity in design of complex engineering systems, Harvard, Boston, USA.
[3] Erikstad, S. O. (2009), Modularisation in shipbuilding and modular production, Innovation in Global Maritime Production, Norwegian University of Science and Technology (NTNU), Trondheim, Norway.

Biography

Nikola Vladimir holds the position of Assistant Professor and head of the Chair of Marine Engineering at the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb (UNIZAG), Croatia. He obtained MSc degree in Naval Architecture in 2007 at UNIZAG, and PhD in 2011 at the same University. His research interests include vibration of ship structures, ship hydroelasticity and environmental problems related to shipping.