

**KEY PERFORMANCE INDICATORS AND ANALYSIS METHOD  
FOR SHIP BLOCK LOGISTICS FLOW IN SHIPYARDS**

Huiqiang Shen  
Yong-Kuk Jeong  
Jong Gye Shin

Philippe Lee

Department of Naval Architecture  
and Ocean Engineering  
Seoul National University  
1 Gwanak-ro, Gwanak-gu  
Seoul 08826, REPUBLIC OF KOREA

PLM Research Labs.  
Xinnos Co., Ltd.  
641 Seolleung-ro, Gangnam-gu  
Seoul 06100, REPUBLIC OF KOREA

Jong Hun Woo  
Yong Gil Lee  
Sang Hun Kim  
Ju Hyeon Jeong

Department of Naval Architecture and Ocean Engineering  
Korea Maritime and Ocean University  
727 Taejong-ro, Yeongdo-gu  
Busan 49112, REPUBLIC OF KOREA

**ABSTRACT**

Most of large shipyards in Korea, Japan and China, ships are constructed by dividing them into blocks. Fabricated blocks are stocked throughout shipyard in accordance with the process statuses. Due to the physical constraints of the blocks, special transportation equipment such as transporter is utilized to move the blocks, during which, efficient transportation plan and verification process is necessary because of the limited number of transporters. However, most shipyards are struggling to efficient transportation planning as well as performance analysis due to various reasons. In order to efficiently establish and analyze transportation logistics plan, a method to define and analyze the key performance indicators is proposed in this research.

**1 INTRODUCTION**

In most shipyards which applying ship block construction method, elements required for constructing a ship such as steel plates, components, outfitting parts and ship blocks are stocked at specified areas. Particularly, due to the physical characteristics of the blocks, special transportation equipment called transporter is required to move them to designated locations in shipyard. However, a shipyard has a limited number of transporters due to huge size and cost of the equipment, some even lease transporters according to production volume. In order to operate a limited number of transporters efficiently, proper transporter should be allocated to proper block in an appropriate situation. Some large shipyards have developed the system to establish and analyze the transportation plan by their own methods. But, the developed system in each shipyard is not widely used in production site because there is no well-defined index or systematic analysis method to analyze the transportation performance, which can be considered deeply in conjunction

with PDCA(plan-do-see-act) cycle. In this research we defined the KPI(key performance indicator) to analyze the block transportation performance, and proposed a method to systematically analyze the block transportation performance by utilizing defined KPIs, aiming to enhance the see phase in PDCA cycle Ultimately.

## **2 CURRENT STATUS OF SHIP BLOCK LOGISTICS FLOW AND ANALYSIS**

In most shipyards, ship block logistics flow is as follows. First, the departments which deal with blocks will apply for the transportation of the blocks to be moved. Second, the planners of block transport department will establish the daily plan using their know-how according to the number of applications. Third, the determined plan will be delivered to transport teams and the leaders of each transport team will determine the daily work order based on given plan. Finally, the transporter will transport the blocks according to the work order. In large shipyards, the whole process is done in a developed block transport system. Even if the system is applied to improve or facilitate the ship block logistics, there always exists a situation where an unplanned block needs to be transported urgently. As for a large shipyard in Korea, there are about 600 blocks need to be transported daily on average and 12 transport teams which possess about 30 transporters in total. And the urgent transportation accounts for about 30~40% of the total logistics. Therefore, various developed systems in shipyards is more focused on handling urgent transportation rather than improving plan quality or analyzing the performance. As above-mentioned the work order required to make the performance is determined and conducted based on a predetermined plan. However, no matter how well planned, the performance could not be the same as plan due to various factors such as situation at the time or environment variables. Therefore, it is more important to analyze whether the performance results are showed up as expected from the plan rather than to check whether the performance results are exactly same as plan. To this end, it is better to analyze the performance statistics systematically instead of one-to-one comparison between performance and plan, furthermore to improve the accuracy or quality of ship block logistics.

## **3 KPI AND ANALYSIS METHOD FOR SHIP BLOCK LOGISTICS FLOW**

Since the analysis method and focus of ship block logistics differ by shipyard and there is no systematic analysis method for logistics in shipyard, we defined the KPIs for analyzing the logistics performance based on the 6-factor model(product, process, facility, space, workforce and schedule) analysis methodology which is specialized for shipyard production management(Woo et al., 2017), and proposed a method to systematically analyze the ship block logistics performance by utilizing defined KPIs. As for analyzing the logistics in shipyards, the load balancing of the transporters as well as blocks is most important in management level. Transporters will have relatively balanced performance and the same is true for the blocks, if the plan is established to make the most use of the limited resources. To this end, transportation distance and count by ship block is analyzed as an initial study under different simulation scenarios, which can also be additionally used to measure the transportation cost.

## **ACKNOWLEDGEMENT**

This work was supported by National IT Industry Promotion Agency(NIPA) grant funded by the Korea government(MSIP) (S1101-16-1020, The Development of Manufacturing Strategy and Execution Simulation for Shipyard Manufacturing Cost)

## **REFERENCES**

Woo, J. H., Y. Kim, Y.K. Jeong, and J.G. Shin. 2017. "A Research on Simulation Framework For The Advancement Of Supplying Management Competency". *Journal of Ship Production and Design*, 33(1): 60-79.