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New shipyard layout design for the preliminary phase & case study for the green field project

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ABSTRACT: *For several decades, Asian nations such as Korea, Japan and China have been leading the shipbuilding industry since the decline in Europe and America. However, several developing countries such as India, Brazil, etc. are going to make an entrance into the shipbuilding industry. These developing countries are finding technical partners or information providers because they are in situation of little experiences and technologies. Now, the shipbuilding engineering companies of shipbuilding advanced countries are getting a chance of engineering business against those developing countries. The starting point of this business model is green field project for the construction of new shipyard. This business model is started with a design of the shipyard layout. For the conducting of the shipyard layout design, four kinds of engineering parts are required. Those are civil engineering, building engineering, utility engineering and production layout engineering. Among these parts, production layout engineering is most important because its result is the foundation of the other engineering parts and it determines the shipyard capacity during the shipyard operation lifecycle. Previous researches about the shipyard layout design are out of the range from the business requirements because most research cases are in the tower of ivory, which means that there are little consideration of real ship and shipbuilding operation. In this paper, a shipyard layout design for preliminary phase is conducted for the target of newly planned shipyard at Venezuela of South America with an integrated method that is capable of dealing with actual master data from the shipyard. The layout design method of this paper is differentiated from the previous researches in that the actual product data from the target ship and the actual shipbuilding operation data are used for the required area estimation.*

KEY WORDS: Shipyard; Layout; Preliminary design.

INTRODUCTION

Background

Shipbuilding business starts with a shipyard construction with a large scale investment initially. The starting point of shipyard construction is to design a shipyard layout. For this purpose, four kinds of engineering parts required. Those are civil, building, utility and production layout engineering. The business organization of shipyard green-field project (Greenfield project is one which is not constrained by prior work. It is constructing on unused) is shown in Fig. 1. Among these, production layout engineering is most important because its result is going to be foundation of the other engineering parts and determine the shipyard capacity in the shipyard lifecycle.

Production capacity of shipyard is, in most case, defined by the resource secured, the yard area, and especially the proximity

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degree of each factories and work stages. The problem is that most resources and factories are hard to be changed from the initially installed and built status even though the need for the increase of the production capacity is taken place. Therefore, initial layout design of the shipyard has to be conducted with a reasonable input data and a logical methodology.

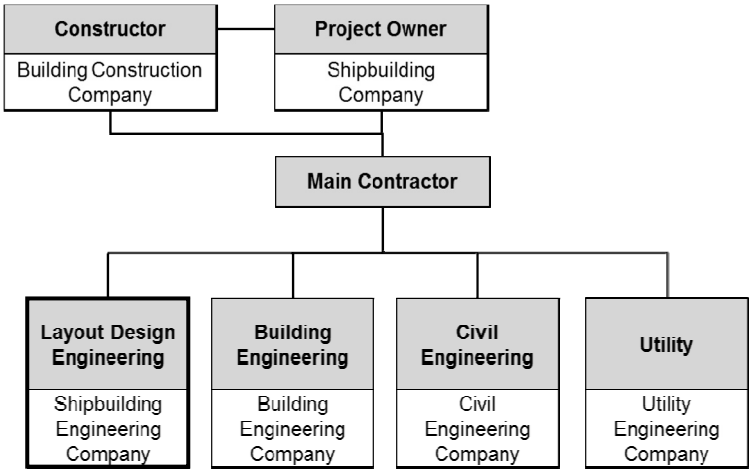

Fig. 1 Typical organization of shipyard green-field project.

The design phases of the shipyard layout design are shown in Table 1. As shown here, shipyard layout design phases are divided as a preliminary design, basic design and detail design. This division is similar with that of the ship design process. The target phase of this paper is the preliminary design, which determine a rough layout of the main shops & work stages (Indoor shops, Painting shop, Outfitting shop, Pre-Erection (PE) workstage, etc.) considering the capacity of the dry-dock and the ship construction cycle. The scope of this phase is indicated with the shipbuilding process in Fig. 2.

In this paper, an integrated shipyard layout design methodology is developed based on the actual product data of planned ship and the actual shipbuilding operation data for the preliminary shipyard layout design phase. Also, case study is conducted for the newly planned project in Venezuela of South America. The research of this paper is differentiated from the previous researches in that the actual product data from the target ship and the actual shipbuilding operation data are used for the required area estimation. Also, the result through the proposing method has a commercial value that can be directly used as a sales material.

Table 1 Phases of shipyard layout design.

Phase		Object
Phase1	Preliminary design	- Design a rough layout (concept layout) of the main shop & workstage (Indoor shops, Painting shop, Outfitting shop, PE workstage, etc.) considering the capacity of the dry-dock (input) and the ship construction cycle (e.g. 1 ship / 2 week)
Phase2	Basic design	- Simulate the concept layout considering a ship block data and transportation, in order to define the capacity of each shop and inter-operability - Make a modified layout from the concept layout, which can satisfy the requirements (production volume, lead time per ship, etc) of the shipyard owner
Phase3	Detail design	- Design each shop and workstage in detail level - Flow production line - Design a number of the block assembly line and the configuration of each line - Workstage - Define the location and the arrangement of each workstage - Design the number & size of each workstage