

APPLICATION SYSTEM BASED ON SIMULATION FOR OUTFITTING FABRICATION OF OFFSHORE STRUCTURE

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ABSTRACT

Timely installation of fittings is a vital element of successful construction of offshore structures. In particular, pipe spools take up a large part of installation work of the entire fittings. Most of the pipe spools are fabricated and supplied by partner companies. Whereas the procurement and supply of raw materials are carried out by Samsung Heavy Industries (SHI). Therefore, it is necessary to not only manage the timely receipt of raw materials, but also check a bill of materials (BOM). Inventory and delivery schedule are considered to forecast a possibility of outfitting fabrication. This paper discusses an example of the application of an algorithm that supports schedule confirmation and decision making when forecasting a schedule.

1 INTRODUCTION

SHI has been an offshore Engineering, Procurement and Construction (EPC) contractor in the shipbuilding industry. SHI has built differentiated technology and turnkey production capabilities in the shipbuilding and offshore industry, and is capable of designing and constructing topsides, one of the key components of any offshore development facilities (SHI Sustainability Report 2017). An offshore EPC project is divided into a hull structure and a topside. A hull structure is a part which makes a ship float while a topside is engaged in oil and gas exploration, refining, and processing. The top side consists of a number of processing modules which a huge network of pipelines connect internally and externally. The prefabricated components of a piping system called pipe spools, including pipes, flanges, and fittings, are supplied from partner companies to SHI. In an offshore EPC project, the pipe line installation process accounts for more than 60% of the total construction workload. In this sense, it is crucial to ensure the timely delivery of pipe spools fabricated in suppliers to the SHI yard. The point is that raw materials of pipe spools are supplied by SHI. In order to facilitate the supply of raw materials. SHI has developed a system that analyzes the fabrication and delivery status of pipe spools by utilizing a simulation method. Figure 1 displays the pipeline work process of an offshore structure.

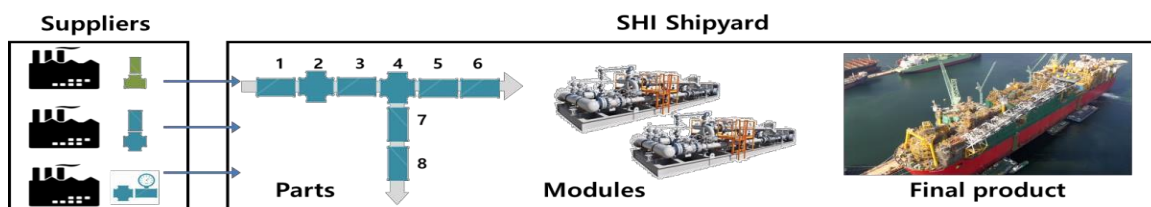


Figure 1: Top Side Module Work Process.

2 DISPATCHING ALGORITHM OF RAW MATERIALS

The following factors must be considered to ensure the timely construction of an offshore structure: the final delivery date of pipe spools, construction period of pipe spools, inventory status of pipe spools, expected arrival date of non-imported raw materials, BOM and the production capacity of suppliers.

The fabrication sequence is determined based on the final delivery date. Once determined, the inventory status and expected delivery date are compared with the BOM to identify a priority. It is established on the basis of the BOM and the process schedule. An algorithm for mapping raw materials in order of the priority has been developed. Figure 2 demonstrates the algorithm for checking pipe production possibility and work order. With regard to raw materials not yet purchased, it is possible to forecast the date and time of the completion of fabrication through simulation. When the raw materials and BOM are matched, a list of deficient materials in each spool unit is extracted. The logic of distinguishing the types of the causes is reflected. Moreover, this algorithm makes it possible to simulate the dispatch of each raw material to the corresponding spool. It would be able to predict possibilities of fabrication. After allocating raw materials, the capability of the suppliers in terms of fabrication period should be analyzed to establish a schedule that meets the delivery deadline of a project.

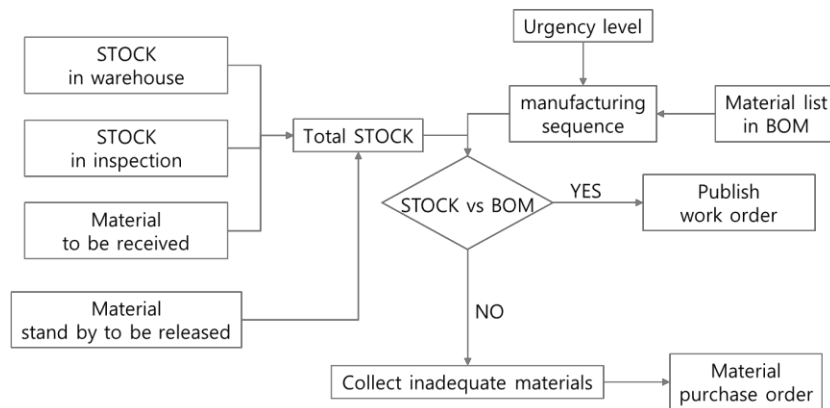


Figure 2: System Algorithm Configuration.

3 CONCLUSION

With the aim to ensure the timely fabrication of pipe spools for offshore structures, a simulation-based system is developed by the algorithm. The system operates with data of present inventory status and fabrication status of raw materials from Enterprise Resource Planning (ERP) system. The system automatically generates the results through batches on a daily basis for pipe spools production and visualizes them as a web-based system. At present, the system is used in SHI as a decision-making tool that helps develop work sequence for pipe spools fabrication. Also it supports changes of work schedules based on the expected date of delivery and prompt deliveries of raw materials.

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