

Demand analysis of cost control and intelligent construction in shipbuilding industry under new situation

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Abstract

In order to eliminate overcapacity in shipbuilding, the shipbuilding industry is facing industrial restructuring, transformation and upgrading. Therefore, it has become the general trend of the shipbuilding industry to strengthen cost control and develop intelligent manufacturing. In order to ensure that shipbuilding enterprises have better economic benefits in the cold winter of shipbuilding industry, according to the characteristics of shipbuilding enterprises, fully considering the characteristics of shipbuilding enterprises and combining the weaknesses and difficulties of cost control in traditional shipbuilding enterprises, a cost control method suitable for the whole development cycle of the project is proposed. In order to adapt to the transformation and upgrading of shipbuilding industry, the concept of intelligent shipyard based on 3d model virtual construction platform, intelligent management and control platform and Internet of things is proposed. It is beneficial for shipbuilding enterprises to reduce production cost, shorten construction period, increase operating profit and improve competitiveness.

Keywords

Shipbuilding industry, Intelligent construction, Cost control, Demand analysis.

1. Introduction

Global orders for new ships fell to an all-time low in the first half of 2019. Among them, bulk carrier new ship orders are down 73% compared with the same period of 2018, new oil tanker orders are down 47% compared with the same period of 2018, new container ship orders are down 49% compared with the same period of 2018, new LNG ship orders are down 39% compared with the same period of 2018, and new LPG ship orders are down 73% compared with the same period of 2018. The number of new shipbuilding ships and the total amount of orders have both dropped to the lowest in nearly a decade. The changes of new shipbuilding orders from 2011 to 2019 are shown in figure 1. The new shipbuilding market has entered a real winter. Therefore, the shipbuilding industry should accelerate its transformation and upgrading, eliminate overcapacity in shipbuilding capacity, strengthen cost control, and increase the proportion of high-tech ships and offshore oil and gas development equipment in new orders. At the same time, improve the level of enterprise intelligence, to create an intelligent shipyard.

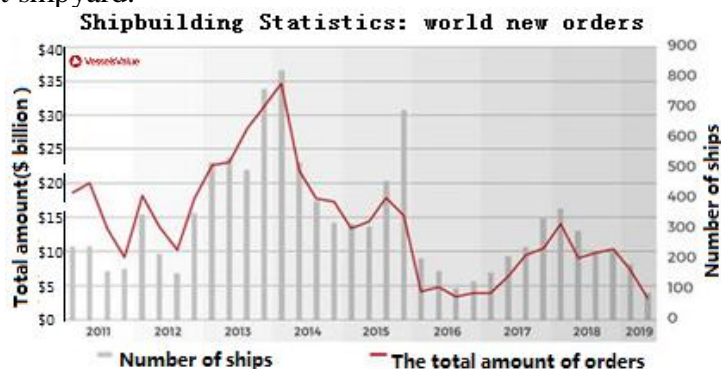


FIG. 1 The changes trend of new shipbuilding orders from 2011 to 2019

2. Methods of cost control for shipbuilding enterprises

2.1 Demand analysis of cost control

Shipbuilding enterprises are facing new challenges. In order to ensure better economic benefits for shipbuilding enterprises in the cold winter, it is required to accurately estimate the project benefits when undertaking orders, and to ensure the realization of target profits in the procurement and construction process. Due to the characteristics of shipbuilding, the generic cost control theory fails to play its proper role in shipbuilding enterprises, aiming at the characteristics of shipbuilding enterprises, give full consideration to the characteristics of shipbuilding enterprises, combined with the weakness of traditional cost control in shipbuilding enterprises and difficulties, puts forward a suitable project development life-cycle cost control methods are especially necessary.

2.2 The whole project cycle cost control method of shipbuilding

Cost control in the shipyard to cover the whole process of shipbuilding, refers to the starting point of the cost control of extends to the shipbuilding enterprise business quotation and design phase, the main stage of formation of cost, through starts at the beginning of the project, until the delivery of the entire process of the completion of the project cost control, cost can at best time points under control, and to constantly dynamic feedback, fundamentally guarantee the realization of the shipbuilding enterprise target profit. By extending the starting point of cost control to the operation quotation stage, that is, the final formation stage of design cost, the center of cost control is moved from the procurement and production stage to the cost formation stage, emphasizing the design cost, solidifying and reducing the cost from the root. From the beginning of the project (design quotation stage), through the detailed design, procurement, production and construction, delivery and use of the process, until the end of warranty, the whole process of application of cost control theory and method, to achieve the dynamic cost control of the whole process of the project.

3. Shipbuilding intelligence

With the sluggish growth of the world's shipping volume and insufficient internal demand driving force, the shipping industry has entered a new critical stage, facing brutal industrial restructuring, transformation and upgrading, and the development of intelligent manufacturing has become the general trend of the shipping industry.

3.1 Intelligent shipyard

Ship intelligent manufacturing is based on a new generation of information and communication technology of the new manufacturing mode, intelligent manufacturing is based on a new generation of information and communication technology and advanced manufacturing technology depth fusion, throughout the design, production, management, service and other manufacturing activities of each link, have self awareness, self-study, the decision-making, execution, and adaptive functions of the new mode of production, better play the core role of people and potential, will robots and organic integration in together, cooperate with each other, its essence is the man-machine integration.

Intelligent shipbuilding factory is based on digital technology and intelligent technology, to integrate the process flow, logistics, information flow, and improve the ship system and standard system, and intelligent manufacturing technology in the industry data, the Internet of things and on the basis of industrial robots, breakthrough key technology of intelligent manufacturing, digital equipment, digital workshop, the respect such as intelligent monitoring equipment integration, to the transformation and upgrading of man-machine integration of intelligent manufacturing.

Intelligent manufacturing of ships has the following basic characteristics: a) realize intelligent decision-making, intelligent planning, intelligent scheduling and intelligent control of equipment; b) adopt digital assembly line and intelligent robot production line to realize intelligent pulsating production mode; c) digital workshop, digital production line, digital production unit and digital control; d) complete integration of digital equipment, complete integration of information, real-time

and effective transmission of information; e) full digital equipment and autonomous execution of intelligent robots; f) man-machine effective interaction and ultimately man-machine integration.

Figure 2 shows the production and operation process of intelligent shipyard. Relying on the virtual construction platform based on 3d model, the production control platform based on intelligent control and the digital logistics platform based on the Internet of things, intelligent shipyard realizes the intelligent manufacturing of ships by reasonably arranging digital production lines and professional industrial robot production lines.

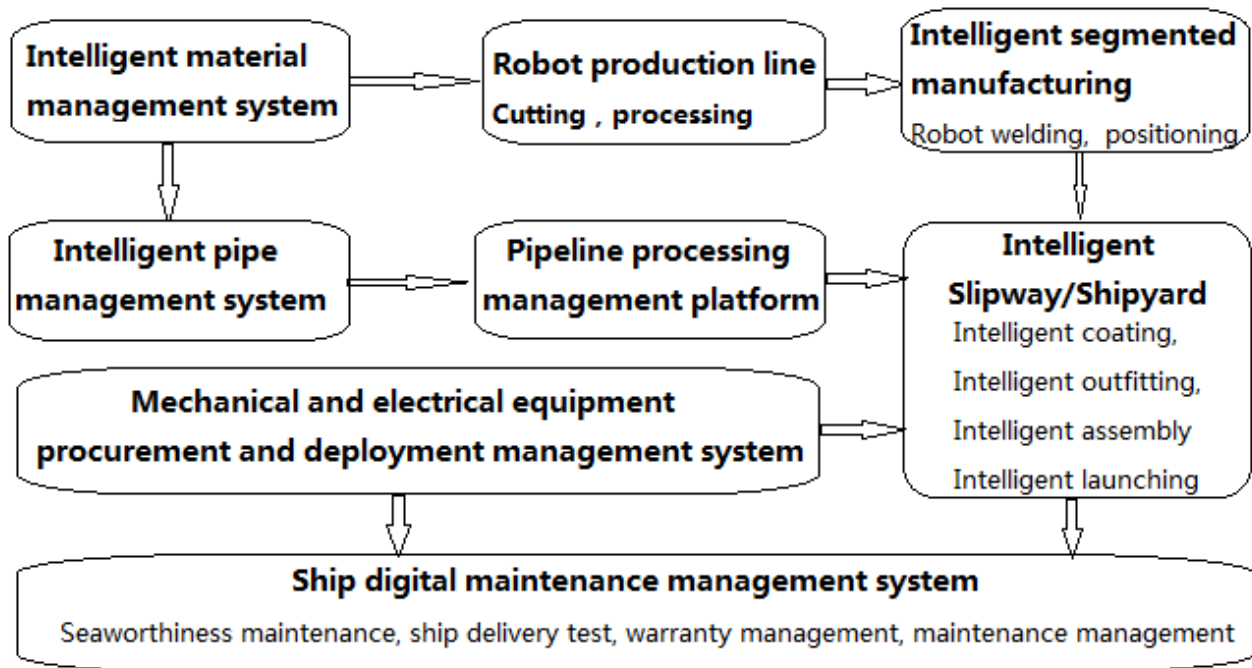


FIG. 2 The basic composition of intelligent shipyard

3.2 Intelligent ship

Intelligent ships use sensors, communications, Internet of things, Internet and other technical means to obtain information and data of ships themselves, Marine environment, logistics, ports and other aspects through automatic perception. Based on the big data processing and analysis technology, smart ships can operate intelligently in navigation, management, maintenance and cargo transportation, so as to make ships safer, more environmentally friendly, more economical and more reliable.

The main functions of intelligent ship include intelligent navigation, intelligent hull, intelligent engine room, intelligent energy efficiency management, intelligent cargo management and intelligent integrated platform, which basically includes all the functions that intelligent ship should have. Intelligent ships involve seven key technologies: information perception technology related to ships, communication and navigation technology, energy efficiency control technology, route planning technology, state monitoring and fault diagnosis technology, early warning and rescue technology in distress, integration of aircraft and autonomous navigation technology.

Intelligent ship is based on the "big data", using real-time data transmission and collection, large computing capacity, digital modeling capabilities, remote control, sensors, such as technology, realization of ship intelligent perception, judgment, analysis, and decision making and control, to better ensure ship navigation safety and efficiency, greatly reduce or even eliminate accident caused by human factors. Intelligent ship management system includes ship intelligence, latest communication management system, ship intelligent terminal and intelligent ship command and control system. Figure 3 shows the schematic diagram of intelligent ship operation.

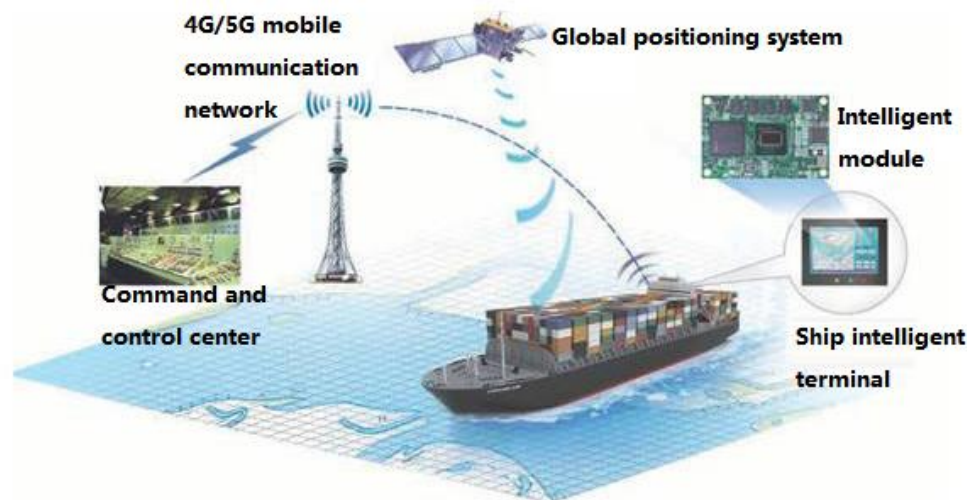


FIG. 3 The core components of intelligent ships

4. Summary

As the whole international economic situation has been affected by the financial crisis, the continuous downturn of the international economy has caused very unfavorable external conditions for the development of shipbuilding enterprises, which not only causes the shipbuilding enterprises to face the rising manufacturing costs, but also has to face the capital requirements for their production and development. Good control of cost is essentially control of capital, so shipbuilders should focus on the control and management of cost. Because of the complexity and the particularity of shipping enterprise determines for cost control in the process of production and manufacturing difficulty, as a result, realize the whole process cost control can make the ship manufacturing enterprises to actively control the cost, to reduce the production cost, shorten the construction period, increase business profits and improve the competitiveness of the enterprises.

References

- [1]. Lou, Lixing, and Y. Yin. "Study on cost control of railway construction project based on Hall Three-Dimensional Structure." International Conference on Logistics Systems & Intelligent Management 2010.
- [2]. Liang, Xiaojun, and W. U. Gang. "Inovative System of Construction Method on Positive Impact of an Intelligent Shipyard." Marine Technology (2017).
- [3]. Kim, M. Y, et al. "Visual sensing and recognition of welding environment for intelligent shipyard welding robots." IEEE/RSJ International Conference on Intelligent Robots & Systems 2000.
- [4]. Ozkok, Murat, and S. Cebi. "A fuzzy based assessment method for comparison of ship launching methods." Journal of Intelligent & Fuzzy Systems 26.2(2014):781-791.
- [5]. Saracoglu, Burak Omer. "Selecting industrial investment locations in master plans of countries." European Journal of Industrial Engineering 7.4(2013):416-441.
- [6]. Eide, Magnus S., et al. "Intelligent ship traffic monitoring for oil spill prevention: Risk based decision support building on AIS." Marine Pollution Bulletin 54.2(2007):145-148.
- [7]. Yang, G. X., C. Guo, and X. L. Jia. "Simulation study of ship control based on hybrid intelligent technology." Acta Simulata Systematica Sinica 14.5(2002):637-640.
- [8]. Chen, Ming Lang. "Cost control for a ship-remaking project in the shipyard." China Shiprepair (2015).
- [9]. Sisson, Jonathan A. "THE IMPROVED NAVAL SHIPYARD MANA GEMENT INFORMATION SYSTEMâ€™ A POTENTIAL FOR INCREASED PRODUCTIVITY." Naval Engineers Journal 91.2(2010):192-203.