Stability and Strength Analysis on Structure Ring Floating of FPSO

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ABSTRACT

The two scenarios of the structure ring erection are compared and selected, which are supplied by the production management department and can be done in practice. In the paper, the hydrostatic models of the two scenarios are modeled by NAPA software. The ballast scheme, floating position and stability are calculated and analyzed respectively on the two scenarios, and then the preferred preliminary scenario is selected. Based on the selected scenario, the dock support reaction force and the local strength of the structure ring are further analyzed by finite element analysis method. The calculation result shows that the ballast scheme of the scenario 1 cannot be achieved, the draft is greater than the depth of the pier and the dry dock. The scenario1 is infeasibility. The ballast scheme of the scenario 2 can be achieved easily, and the draft and stability can meet the requirement of the depth of the pier and the dry dock. The dock support reaction force and the local strength of the structure ring can meet the requirement. So, the scenario 2 is feasibility. Through the comparative study on the structure ring erection, it provides the technical support for the production management department to make the final production plan, and it also has a practical guiding significance for the ship production.

KEY WORDS: Structure Ring; Floating Position; Stability; Support Reaction Force

INTRODUCTION

Dry dock is the most valuable resource for modern shipbuilding enterprises. In order to take fully advantage of the dry dock resources and improve production efficiency, it is necessary to make a plan for the block erection in the dry dock in advance at the production planning stage. At present, main large-scale shipbuilding enterprises usually adopt the construction mode of one and a half ship or two and a half ship erected at the same time in the dry dock to improve the dock utilization rate, as per the size and product capacity of the dry dock (Wang, 2018). The production management department usually needs engineers to pre-calculate the floating position and strength of the structure ring to ensure that the erection plan is reasonable. However, the structure ring usually has unfavorable factors such as a poor structural integrity, small waterplane surface, large openings, easy overturning, few available ballast tanks, and extremely sensitive to the accuracy of the weight and center of gravity estimation etc. Therefore, the stability and strength of the structure ring shall be pre-checked. In order to obtain a precise calculation result of the floating position of the structure ring, it is usually necessary to use hydrostatic software to simulate calculation. This paper uses FPSO as an example to introduce the calculation floating process of structure ring on out–in drydock condition. The flow chart of the study is presented in Fig. 1.