Investigation on the Positioning Capability of Anchor Handling Vessels

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ABSTRACT
The aim of this paper is to study anchor handling vessel (AHV) thrust capacity during anchor deployment. The thrust utilisation plot, a concept widely used in the Dynamic Positioning (DP) system, is used to illustrate the positioning capability of an AHV. Bollard pull reduction due to heavy side thruster loading is considered. Thrust loss of the stern tunnel thruster due to main propeller action is also considered. The Bourbon Dolphin accident was investigated as a case study using the proposed model and methodology. The result showed that thrust loss restricted the vessel positioning capability significantly during the accident event.

KEY WORDS: Anchor handling; positioning capability; thrust utilisation plot; tunnel thruster; propellers interaction

INTRODUCTION
Anchor handling operation (AHO) is considered to be one of the potentially most hazardous and demanding marine operations in the offshore industry. A typical scenario of AHO is illustrated in Fig. 1. In this scenario, the anchor handling vessel (AHV) is subjected to environmental forces coming from wind, swell, wave and current. In addition, the vessel carries mooring load coming from the mooring line. The magnitude and orientation of the mooring load vary during the whole operation, based on the total pay-out length of the line, the shape of the line, the speed of the vessel and the environmental conditions. The more mooring line has been paid out, the higher the force that will be exerted on the vessel. When an AHV goes to deep-water region, the risk level is even higher. Deep-water means harsher environmental conditions, longer anchor line to be deployed, larger stow space required, heavier equipment to carry and higher external forces. Skilled crew and well-designed vessels are needed to fulfil the tasks. The planning and execution of the operations are also of significance. Any miscalculation or misjudgement prior or during the operation might lead to project delay and economical lost. In the extreme cases, miscalculation or misjudgement can lead to casualties.

The most recent accident of AHV is the notable Bourbon Dolphin accident in 2007 that claimed eight lives. The vessel drifted considerably (see Fig. 2) during the deployment of the last anchor line (No. 2) for the drilling rig Transocean Rather. When the vessel was close to collide with another deployed anchor line (No. 3), an attempt to manoeuvre the vessel toward the other side was performed. During this process, the chain’s point of attack over the stern roller shifted from the inner starboard towing-pin, to the outer port towing-pin. Due to the huge over turning moment from the mooring line, the vessel was capsized. More detail can be found in Lyng (2008).

The risk influencing factors associated with the Bourbon Dolphin accident have been addressed by Gunnu et al. (2010). The considerable

Fig. 1 Typical anchor handling operation

Fig. 2 Track plot of the Bourbon Dolphin (red line) (Lyng, 2008)