Final Acceptance Test on Advanced Ship Maneuvering and Mooring Support System at Ship-to-ship Transfer Operations by Fender Monitoring System of Pneumatic Fenders

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ABSTRACT

The floating type pneumatic fender roles an energy absorber for safe ship berthing and mooring in the usage of ship-to-ship oil and gas transfer operations at offshore and ship-to-jetty in harbor basin. We proposed an advanced ship maneuvering and mooring support system by combining with fender monitoring. In this paper, the final acceptance test of the support system is demonstrated to evaluate the effectiveness and accuracy.

KEY WORDS: Floating type pneumatic fender; Monitoring system; Radio wave; Air pressure; Performance; Ship-to-ship

INTRODUCTION

Recently natural resources and energy sea transportation such as oil and gas trade are increasing, and the bulk carriers operations show activity in all over the world. Under the circumstances the offshore ship-to-ship transfer operation plays a major role in the natural resources and energy sea transportation, and is frequently carried out at many sea areas in the world even if during rough weather conditions due to increase of the demands. Thus the safety and security for the ship-to-ship transfer operations at offshore is a key issue to maintain the safe and effective operations.

The floating type pneumatic fender is an energy absorber for safe ship berthing and mooring used in ship-to-ship transfer operations offshore. We proposed a quick fender selection method by using the ordinary ship berthing energy calculation method based on the OCIMF guidelines and simulation software which consists of frequency domain analysis for hydrodynamic forces and time domain analysis for motions of ships (S. Sakakibara and S. Yamada;2008, S. Sakakibara at al;2005). However, it is required for safety to monitor the performance and workability of the fenders, mooring lines and ship behaviors on site.

We have developed “Advanced Ship Maneuvering and Mooring Support System by fender monitoring system of pneumatic fender” which is composed of a remote fender monitoring system and an advanced ship maneuvering and mooring support system.

In this paper, the details of the fender monitoring system for the floating type pneumatic fender, which uses radio waves, and an advanced ship maneuvering and mooring support system by combining with the fender monitoring, are introduced, and the final acceptance test such as an evaluation test of the effectiveness and accuracy of the system and field observation test using tankers such as VLCC and Aframax tankers is reported and verified.

SHIP-TO-SHIP OPERATION

STS operation is conducted between two ships positioned alongside each other for transferring cargo such as crude oil or liquefied gas in the open sea as shown in Fig.1. There are two kinds of methods for approaching and berthing between two ships. One is that STBL (Ship To Be Lightered) sails on a steady course at maneuvering speed and then SS (Service Ship), sailing a bit faster than STBL, comes closer to STBL. And another is that SS comes closer to FPSO in the same direction by tag boat. After berthing, two ships are connected by mooring lines and the crude oil or liquefied gas is transferred using a flexible hose as shown in the OCIMF guidelines (OCIMF; 2005, 1995).