

Global Strength and Buckling Assessment for IMO Type B Independent LNG Cargo Tank of LNG FPSO using FE Analysis

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ABSTRACT

Green ship using LNG for fuel has emerged as new trend recently due to increasing environmental regulations in the world. This is the reason for continuous active research of LNG Tank. IMO type 'B' independent LNG cargo tank has received attention in order to get over limitation of membrane type LNG cargo tank. In this paper, global FE analysis was carried out in order to find out structural considerations of IMO type 'B' LNG cargo tank.

KEY WORDS: FE analysis; strength assessment; buckling assessment; independent tank

INTRODUCTION

The demands for natural gas as clean energy are rapidly increasing worldwide. Such demand is due to the increase in the construction of large LNG Carrier and LNG Floater. The demands of natural gas in energy market have been growing for last several years, and the growth continues for next few decades. For the reason, the construction orders for large LNG Carrier and Floater are continued. Since the medium to long-term forecasts predict a shortage of LNG in onshore production base, offshore LNG production has been emerging as alternative for the future. Market of membrane type cargo containments system (CCS) is strong for LNG Carriers. However, constraints of NO96 Type CCS have been reported like filling limit caused by sloshing impact and vulnerability to external impact. For the reason, many concerns are focused on IMO type 'B' independent cargo tank for LNG FPSO, arctic LNG Carrier and fuel tank of LNG fueled vessels. As IMO type 'B' tank can be filled partially and strong on sloshing impact and external impact, the tank is especially taken into account appropriate for LNG FPSO and arctic LNG Carrier.

In this study, strength and buckling assessment for STX's own IMO type 'B' Tank (ITS: Independent Tank of STX) was carried out by global FE analysis using Floating Offshore Liquefied Gas Terminals Program (FLGT) of ABS. The analysis was performed based on ABS rule, and eight (8) standard load cases, three (3) special load cases and two (2) sloshing load cases were considered. ITS needs support structure as it is separated from hull structure. Therefore special load cases such as flooding, collision and heeling condition should be

especially considered as well as standard load cases for structural analysis.

INDEPENDENT TANK OF STX FOR LNG FPSO (ITS-F)

ITS-F is IMO type 'B' independent LNG cargo tank which was developed by STX Offshore & Shipbuilding. Feature of ITS-F and typical section of target vessel that applied ITS-F are as follows.

Target Vessel (270K LNG FPSO)

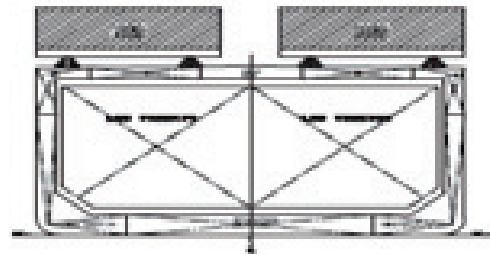


Fig.1 Typical section of 270K LNG FPSO

Table 1. Principal dimension of 270K LNG FPSO

Principal Dimension	
Length (O.A)	380.5 m
Length (B.P)	368.0 m
Breadth (Mld.)	69.0 m
T _{sc}	19.0 m

ITS-F was developed for 270K LNG FPSO. Typical section of the floater is shown as Fig. 1. Table 1 is principal dimension of 270K LNG FPSO.

The cargo hold region of LNG FPSO consists of hull, ITS-F and support that are supported on inner hull and external insulation system and support structure.