Topside Float over Installation on Floating Substructure at Near Shore

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ABSTRACT

This paper presents the topsides mating analysis results, including maximum motions and accelerations at mating points such as each leg ends and maximum loads on DSUs, LSF, LMUs, Sway fenders, mooring lines, tether lines, etc., for installation of the topsides structure by means of float-over on floating substructure at offshore.

A modified T-shape launching barge has been determined as the installation vessel to have adequate capability to install heavy weight topside by float over operation at Site. The barge is equipped with guiding structures at stern for avoiding unexpected clashes between structures and winches for controlling tether lines during mating operation.

The Substructure is floating structure which consists of 4 columns and 2 pontoons with tubular bracings. For the purpose of adding additional buoyancy during mating stages, 4 buoyancy tanks are installed at around water surface level on each column.

The maximum motions and the loads have been computed in ANSYS AQWA compared against the limiting criteria. Consequently, it is possible to assess if float over installation of topside on floating substructure could be performed with the certain environmental status at the Site.

KEY WORDS

Offshore installation; Float over; Mating Analysis; Hydrodynamics

INTRODUCTION

As per the latest tendency of market to make bigger and heavier topside with quite huge semi hull, it is not valid to build these units with traditional construction method with small block erections. It could be started with large lifting cranes after hull unit launched and moored at quayside, so it makes total fabrication schedule much longer.

Therefore, DSME has investigated possibility of integration of heavy topside by float over at near shore of fabrication yard for achieving single integration instead of small block erection method. The topside fabricated at heavy zone has relatively lower height with many aids material on land. So it could make more efficient, higher quality with optimized schedule for suitable projects.

Overall sequence from load out to offshore installation could be described as the topside is being transported to near offshore site of Geoje (hereafter Site) by heavy transportation barge (hereafter Barge), and it will be installed by means of float over operation at Site on the floating substructure (hereafter Substructure) which consists of pontoons and columns. After installation, integrated unit should be return to fabrication yard for finalizing work and sail away as a completed unit to operating site.

It is required to verify all conditions that topside, hull and integrated unit could experience during this float over operation. And connectors such as LMUs, fenders, mooring and tether lines are also designed and verified. This paper describes how to select basic concept for float over operation and the result of conceptual study for hydrodynamics and components design load during mating operation are also given.

BASIC DATA

Coordinate System

Three coordinate systems are defined for topsides mating analysis; the coordinate systems include the global coordinate system, the Barge coordinate system and the Substructure coordinate system. The global coordinate system will not move at any stage of the topsides mating analysis.

The global coordinate system has been defined as follows,