T-Shaped Launch Barge Modification Design for Very Challenging Floatover Installation of Liwan 3-1 Mega Topsides in South China Sea

Huailiang Li(1) Yun Yang,(2) Ruhua Yuan,(1) Weiwei Xie,(1) Alan Wang, (1) and Xiaojian Jin (1)

(1)Installation Division, Offshore Oil Engineering Co., Ltd.
Tanggu, Tianjin, China
(2)Company Management, Offshore Oil Engineering Co., Ltd
Tanggu, Tianjin, China
(3)Engineering Division, China National Offshore Oil Corporation
Beijing, China

ABSTRACT

This paper describes the design functionality and structural integrity of the T-Shaped barge hull modification of launch barge HYSY229 in depth. The T-Shaped hull has to be reinforced to comply with both regulation and project strength requirements by adding internal longitudinal bulkheads and increasing thickness of deck and bottom plating. The challenge of the hull modification is to ensure a floatover installation capacity of 30,000Te integrated topsides while maintaining its original launch capacity of 30,000Te jackets.

KEY WORDS: T-Shaped launch barge; modification design; floatover installation; jacket launch.

NOMENCLATURE

CPP = Central Processing Platform
COOEC = Offshore Oil Engineering Co., Ltd.
DSF = Deck Support Frame
HMC = Heerema Marine Contractors
HII = Hyundai Heavy Industry
HYSY = Hai Yang Shi You
JRM = J. Ray McDermott
LW3-1 = Liwan 3-1
Te = Tonne, or Metric Ton

INTRODUCTION

Many different floatover technologies have been successfully developed and gaining more and more popularity since its inception in 1983. As one of newly emerging floatover technologies, T-shaped barges offer a common place solution to floatover installation of mega integrated topsides, especially for floatover weight exceeding 25,000Te. This is mainly due to limited availability of large expensive crane vessels and, more importantly, the great advantages of onshore hookup and commissioning of large integrated topsides. The world's second largest launch barge Hai Yang Shi You 229, or HYSY229 hereafter, has been selected and purpose-reshaped into a T-shaped configuration for the very challenging floatover installation of more than 26,000Te integrated topsides at a water depth of 190 meters in South China Sea. This gigantic launch barge has successfully changed her regular launch barge shape into a T-shaped barge in the Beihai Shipyard in the end of 2011 for the Liwan 3-1 Gas Field Development. This modified T-Shaped launch barge has a floatover capacity of 30,000Te integrated topsides plus 5,000Te DSF while maintaining its original launch capacity of 30,000Te jackets. Refer to Fig. 1 for illustration of the T-Shaped Barge HYSY229.

Floatover barges have to provide adequate transportation stability and strength to accommodate the high deck support frame (DSF) for floatover installations. T-shaped barges would also enable it to become more competitive in the market for floatover installations of large integrated topsides. So far all the three world's largest conventional launch barges, including HMC's H-851, JRM's Intermac 650, as well as COOEC's HYSY229, have been successfully modified into T-shaped launch barges. The T-shaped barge design is an effort to reduce the slot requirement, thus having less impact on structural design of the substructure and the integrated topsides. In addition, South China Sea is not only prone to typhoons but also liable to significant internal wave current induced by soliton waves. The launch barge HYSY229 is devised and modified to be suitable for the loadout, transportation, and installation of the largest integrated topsides ever installed by a