Fabrication Considerations of the Liwan 3-1 Mega Jacket

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ABSTRACT

LW3-1 CEP jacket ranks fifth heaviest jacket in the world and the heaviest in the Asia. Many changes were encountered by fabricator due to its heavy weight and relative short length of the jacket. This paper is to summarize new fabrication methods and techniques developed and successfully applied to jacket fabrication, and construction sequence; and authors also discuss special issues associated with fabrication including the schedule and work flow for fabrication, the material requirements, the fabrication techniques for LW3-1 CEP jacket, the method for dimensional survey & control, installation of stiffening rings, prefabrication and installation of skirt sleeves.

KEY WORDS: Jacket platform; Fabrication technology; Dimensional control; Multi-crane lifting.

NOMENCLATURE

CEP = Central Processing Platform
CNOOC = China National Offshore Oil Corporation
COOEC = China Offshore Oil Engineering Co. Ltd.
EPCI = Engineering, Procurement, Construction, Installation
CCS = China Classification Society
SAC = Standardization Administration of the People's Republic of China
JISC = Japanese Industrial Standards Committee

INTRODUCTION

The central platform of Liwan (LW) 3-1 Gas Field Development Project is an 8-leg jacket platform operating in 189.5 m water depth with production treatment facilities and living quarter, LW3-1 platform is mainly designed to treat production well fluids that are transported from Liwan3-1 subsea wellhead, and to receive mixed fluids consisting of dry gas & dewatering condensate which are transported from PY34-1 CEP through a 14", 30km shallow water subsea pipeline. China National Offshore Oil Corporation (CNOOC) is the owner of this platform, and China Offshore Oil Engineering Co. Ltd. (COOEC) is the general EPCI contractor of the LW3-1 CEP jacket.

Fig. 1 presents LW3-1 jacket side view after fabrication completion. The loadout weight of the LW3-1 CEP jacket is 31,375 tons, which ranks the fifth heaviest jacket in the world (following Bullwinkle, Pompano, Harmony and Heritage Jackets) and the heaviest in the Asia. The jacket bottom frame plan has dimension of 87m×100m and transits into 34m×72m at the top frame plan. The jacket has 46m wide opening designed for topside float-over operation. The total length of the CEP jacket during fabrication is 201 meters where the 173.7m of jacket launch trusses rest on the yard skid beams. Due to the heavy weight and relative short length of the jacket, the construction teams at the COOEC Qingdao Fabrication Yard face many challenges, such as yard skid beam foundation reinforcement, small angle brace connections, welding quality control of tubular members with 4m diameter and 100mm thickness, dimension control, use of multiple super-large crawler cranes to perform erection and installation of internal and external stiffening rings. The whole fabrication operation is simulated at all the erection stages using 3D CAD software, and the potential risks were identified and resolved prior to the erection operations.

It took 19 months to complete the jacket construction at the Qingdao Yard. This paper presents the new fabrication methods and techniques developed and successfully applied to the jacket fabrication, construction sequence, general aspects of jacket fabrication, and also discuss special problems associated with the fabrication including the schedule and work flow for the fabrication, the material requirements, comparison between the fabrication techniques for the LW3-1 CEP jacket and the traditional jackets, the method for dimensional survey and control, wind load calculation, installation of the stiffening rings, the prefabrication and installation of skirt sleeves.

FABRICATION SCHEDULE

Fig. A-1 shows the jacket construction schedule. The construction of LW3-1 CEP jacket started on December 20, 2010. Due to installation