Installation Method Selection for Heavy Weight Topside in the South China Sea

Jinlin Hou(1), Qian (Ken) Tang(2) and Lian Xu(2)
(1) Research Institute, China National Offshore Oil Corporation
Beijing, China
(2) Shanghai Richtech International Engineering Co., Ltd.
Shanghai, China

ABSTRACT

This paper presents the installation selection and feasibility study of methods at the initial stage for a heavyweight topside. Both lifting and float-over methods have been studied and worldwide installation information for installing topsides similar in size and sea state are gathered for this study. The conventional lifting installation method with its advantage in mature technology was considered first. Then the float-over method with the benefits of saving offshore installation and hookup time in a single piece installation was evaluated next. The paper primarily discusses the feasibility of the float-over method used for this designated field and topside. It also examines the challenges involved in the determination of the installation method between heavy weight lifting and float-over. The decision was made after balancing risks and benefits of both methods.

KEY WORDS: Jacket platform, Heavy topside, Float-over, Offshore installation, Lifting

NOMENCLATURE

CNOOC = China National Offshore Oil Corporation
LW = Li Wan
PY = Pan Yu
HTV = Heavy Transportation Vessel
NS = North Sea
FOC = Float Over Capacity
LOA = Length Over all
LMU = Leg Mating Unit
HYSY = Hai Yang Shi You

INTRODUCTION

The jacket platform discussed in this paper is a part of the deep water field development project of CNOOC (LW3-1), located in the South China Sea approximately 300 km South of Hong Kong/Victoria, and 6 km away from the existing PY 30-1 oil field. In early 2009, CNOOC planned to develop the deepwater natural gas field in the South China Sea that requires a jacket platform to be installed in 190 meter water depth. With a topside installation weighing of over 30,000 tons, no one has ever installed such a heavyweight infrastructure at this depth. There are many challenges for this decision making process where there is little information for jacket, sea state, and past experience for this area.

The jacket platform is located in the shallow water segment of the field, it provides basic processing and compression required to deliver the fluids through a long distance pipeline to the inlet of an onshore plant. The water depth at the jacket location is approximately 190 meters. The topside weight was estimated at 20,000 tons at the initial stage of the concept study, but was growing with the progress of the design process, the final weight was estimated to be over 30,000 tons at installation. In this situation, selecting a proper installation method which is technically feasible and economically favorable became a challenge at the conceptual study stage of the project.

Since no platform with such heavy topside had ever been installed in this area, the technical feasibility of either lifting or float-over installation remained unknown, although both lifting and float-over installation methods for relatively small topsides were mature. CNOOC had successfully installed several topsides (over 10,000 tons) by using float-over in recent years, but they are all located in Bohai Bay, which is a shallow water region (less than 40 meters) and the sea state is relatively calm. In the South China Sea, this would be the first time to install a topside over 20,000 tons, for float-over, this would be the first time to install a topside with such heavy weight in an open water area with a near 200 meter water depth worldwide. Therefore, the study needed to answer the questions whether the topside is feasible to be installed by either lifting or float-over.