S-Lay Installation of Deepwater SCRs and Pipelines for Lingshui 17-2 Project

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ABSTRACT

The J-lay and S-lay are two common methods for SCR (steel catenary riser) and pipeline installation. When using the S-lay installation method, onboard welded pipe joints leave the vessel horizontally and are guided to the seabed over a stinger. The pipe is lowered using tensioners. With the advantage of high production rate, S-lay can be a cost-effective solution for deepwater riser and pipeline installation. This paper investigates feasibility of using CNOOC’s HYSY 201 S-lay installation vessel to install Lingshui 17-2’s SCRs and pipelines.

This paper first introduces the S-lay installation vessel HYSY 201 and S-lay configuration. The hydrodynamic motion analysis for a Response Amplitude Operator (RAO) was computed for HYSY 201 in different environmental headings. It then presents the layout and description of SCRs and pipeline for LS17-2 project. With the site-specific metocean design basis, this paper presents an installation procedure, analysis methodology, and acceptance criteria.

The study covers different sizes of SCRs and pipelines to investigate the feasibility of S-lay installation. The study starts from the static installation analysis of SCRs and pipelines and includes different installation steps. The acceptance criteria are examined for the pipes at over bend and sag bend regions. The support reactions load on the stinger structure are reported at each step. The dynamic analysis is selectively performed to evaluate Dynamic Amplification Factors (DAFs) of support reaction loads especially for roller box supports on the stinger structure. The sensitivity of DAFs to wave parameters such as wave height and peak period is analyzed as well.

The maximum top tension and the stinger’s roller reactions are also computed and post processed for installation team to check against HYSY 201’s tensioners and stinger’s load capacity. This paper finds the feasibility of S-lay installation of deepwater SCRs and pipelines for Lingshui 17-2 project using the installation vessel of HYSY 201.

KEY WORDS: SCR; S-lay; RAO; Strain limit; API RP 1111 code check; Hold back tension; Stinger Strength & Fatigue Integrity.

INTRODUCTION

Lingshui 17-2 (termed LS17-2) is a gas field that is being developed in South China Sea. The development calls for a deep draft semi-submersible for processing gas that will be produced and exported through steel catenary risers. The water depth of the LS 17-2 field is around 1,423 meters (4,670 ft) that makes LS17-2 the first deepwater project in China.

Figure 1 shows the field layout of LS 17-2 with the semi shown at the center, 10” and 12” production SCRs connecting to adjacent wells, and 18” SCR for exporting produced gas through the existing pipeline to Hong Kong. There are also 6” Methanol and Glycol (MEG) injection SCRs and umbilical for subsea production and control.

Figure 1 – Lingshui 17-2 Field Layout