Technical Challenges in Piggy-back Bundle Pipeline EPCI Project in Chinese Costal Area

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ABSTRACT

There was one piggy-back pipeline EPCI project in a Chinese costal area, accomplished in 2014. Piggy-back pipeline has been well known with its economy efficiency advantage due to its cost reduction on installation. However, this type of pipeline brings significant technical challenges to engineers, such as torsion during installation, buckling, crossing design, etc.

Responsible engineering and installation teams have developed solutions to overcome the challenge stated above. One anti-rotation device has been proposed and employed to ease the pipeline torsion trend during installation. There were several temporary abandonment and recovery activities being carried out to reduce the accumulated torsion work within pipeline during laying process. There was one invented tool named “horse rubber” suggested between two pipelines during crossing area to overcome potential structural damages. Advanced numerical models have been established by using ABAQUS to perform the piggy-back pipeline buckling analysis.

China Offshore Oil Engineering Company (COOEC)'s newly launched flagship deepwater DP3 pipelay crane vessel - Hai Yang Shi You 201 (HYSY 201) has successfully accomplished this project in 2014. Novel anti-rotation device being proposed and adopted.

KEY WORDS: Pipelay; HYSY 201; piggy-back; corrosion resistance alloy (CRA); dynamic positioning (DP)

INTRODUCTION

With offshore field development cost being increasing, approaches which can provide cost-effective engineering solutions have been paid significantly more attentions. Piggy-back pipeline has its economy efficiency advantage since one bundle needs only one time of pipelay. This brought considerable reduction in total project cost. However, the adoption of such type of pipeline induced technical challenges to engineers, such as torsion during installation, buckling, crossing design, welding fire line, reduction on pipelay effectiveness etc. This paper presents solutions and corresponding supporting analysis conducted during the engineering phase.

PROJECT BACKGROUND

One 20 km, 8” nominal diameter (ND) multiphase flowline with a piggybacked 2” ND Mono Ethylene Glycol (MEG) line has been placed in a field where water depth was about 100m. This type of pipeline has been selected due to its advantage on economy efficiency. A general view of the pipeline has been given in Fig. 1 General view of piggy-back pipeline

Challenges

However, the selection of this type of pipeline brought technical challenges from perspectives of crossing, buckling and installation design. The details of each challenge are further discussed in the following subsections.

Crossing Due to the features of piggy-back pipeline, in crossing area, concrete mattress proposed to be placed on the top of the pipeline bundle has possibility of damaging the 2 inch MEG pipe on the top of the bundle. In addition, if the torsion of the pipeline exceeds 90 degree so that the 2 inch MEG pipe may be beneath of the 8 inch pipe. The 2 inch pipe may be vulnerable to the concrete mattress on the bottom of the pipeline bundle, which has been placed before the piggy-back