ABSTRACT

Petrobras are developing the Roncador field located offshore Brazil and plan to develop part of this field using the P-55 semi-submersible, located in approximately 1800 meters water depth. This paper presents the key engineering challenges, solutions, and lessons learned from the FEED analysis of selected steel catenary risers attached to the P-55 floating production unit (FPU).

KEY WORDS: SCR; VIV; P-55; P55; Campos

INTRODUCTION

The Roncador oil field, which contains an estimated 2.7 billion barrels of oil, is located in the Campos Basin offshore Brazil in a water depth of approximately 1800 meters. The Brazilian state oil company Petrobras plans to develop module III of the field using the semi-submersible P-55 vessel.

The tools and methods used by 2H in this analysis are described in this paper, as well as the obstacles and technical challenges overcome during the design of this system. It is considered that these lessons will have significant relevance to future SCR projects offshore Brazil and in other regions of the world.

Seven risers were selected for the FEED analysis. The criteria used for this selection were: magnitude of the induced vertical motions at top connection points; the need for high insulation properties and critical azimuths for VIV response. The previous experience of Petrobras in similar projects, as referenced, was particularly useful in the selection of critical risers.

Petrobras issued a technical specification covering all of the areas of analysis that should be performed for the SCRs design. For each selected riser a range of design activities is specified including wall thickness sizing, extreme storm analysis, engineering critical assessment (ECA), installation, wave fatigue, VIV fatigue and interference analysis on selected riser pairs.

According to the Petrobras technical specification, the SCR design was to be conducted over two separate analysis cycles. The main reason for this was to allow vessel mooring limits and design parameters, which were being updated during the course of the FEED, to be incorporated in the second analysis cycle. However, a secondary benefit was that lessons learnt and recommendations for improvement from the first cycle of the analysis could be employed in the second phase.

The objective of the work was to demonstrate feasibility of SCR configurations for the field development.

OUTLINE OF THE DEVELOPMENT

The Roncador oil field is located offshore Brazil in the Campos Basin in a water depth of approximately 1800 meters. The Brazilian state oil company Petrobras is planning to build the P-55 semi-submersible vessel in order to develop module III of the field.

Following a preliminary study conducted by Petrobras, steel catenary risers (SCRs) have been selected as the preferred riser configuration for the development.

The 20 SCRs connected to P-55 are divided into two separate groups:

Infield SCRs
- Thirteen 8-inch SCRs, and Steel Flowlines, with rigid diverless jumpers connecting the flowlines to the wet production christmas trees.
- Three 10-inch SCRs for three pairs of water injection wells.
- One 12-inch oil import pipeline from Module IV of the Roncador development to P-55

Export SCRs
- The export system comprises of two 12-inch oil pipelines, where the first is 50km long, from P-55 to the PRA-1 fixed platform installed in 100m water depth, and the second is approximately 8 km long, from P55 up to the vicinities of the P-54 floating production unit, which is also located in the Roncador Field.
- The produced gas will be exported via a single 12-inch pipeline.

The risers selected for FEED analysis are three production risers, one