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Tahiti Online Monitoring System for Steel Catenary Risers and Flowlines

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Abstract

The Riser and Flowline Monitoring (RFM) project deployed one of the most comprehensive subsea structural monitoring systems to date on a Tahiti infield (production) Steel Catenary Riser (SCR) and associated flowline. State-of-the-art motion and strain measurement devices are optimally placed along the SCR to continuously measure and store real-time full scale riser response. In addition, RFM project is the first to implement monitoring devices on a flowline to measure the flowline buckling, a phenomenon that is predicted during repeated start up/shut down. The project goals are two-fold:

1. Understand fundamental hydrodynamic behavior of SCRs and flowlines, specifically, floater motion induced response of catenary risers, Vortex Induced Vibration of catenary risers, riser behavior at the pull tube exit region, riser-soil interaction at the touchdown region, flowline buckling, flowline axial walking, and flow assurance characteristics of infield flowlines. The information generated will be used in future riser designs.

2. The information will be used to validate Tahiti riser and flowline system robustness and conduct “health checks” on the fatigue critical risers and flowlines, particularly after significant environmental or operational events.

This paper describes the monitoring system configuration, the technology deployed, and the installation methods.

INTRODUCTION

The Tahiti field development is located in the Gulf of Mexico at 4,000 feet of water. More detailed information about the field and the riser systems can be found in References [1], and [2], respectively. Steel Catenary Risers (SCRs) have a proven track record and have been successfully installed in water depth of up to 8,000 feet. However, there is industry wide acceptance that a reasonable level of uncertainty exists with respect to the ability to predict riser performance. Calibration of analytical SCR response prediction models with full scale field measurements will improve design methods, design allowables, and operation integrity. RFM project’s main drivers for development of a full scale monitoring system are to understand fundamentals of riser hydrodynamics with full-scale field measurements, calibrate design tools, and validate Tahiti riser system robustness. The monitoring devices and locations are specifically selected to characterize SCR behavior with respect to:

1. Vessel Induced Motion (VIM)
2. Vortex Induced Vibration (VIV)
3. Effectiveness of VIV suppression devices (strakes)
4. Riser behavior at the pull tube exit regions
5. Riser-soil interaction at the touchdown region
6. Flowline buckling, axial walking
7. Flow assurance characteristics of infield flowlines