

Public Executive Summary

Title: Fatigue Performance of High Strength Riser Materials in Sour Environments

Name of Offeror: Southwest Research Institute

Project Manager: James Pappas

Principal Investigator: Steven Hudak

Additional participants: BP, Inc. (cost share contributor)

Solicitation Number: RFP2007DW1403 (07121-1403)

Project Start Date: December 15, 2008

Project End Date: January 31, 2012

Total Estimated Cost: \$ 1,000,000.00

RPSEA Maximum Share: \$ 800,000.00

BP Cost Share: \$ 200,000.00

Goal

The goal of this project is to assess the fatigue performance of new high strength materials required for ultra-deepwater high pressure, high temperature (HPHT) risers, under representative conditions. These materials include high strength steel and titanium linepipe, high strength forgings, and nickel-base alloys.

Background

The quest for offshore oil and gas is leading the industry into deeper waters and more hostile environments compared to those encountered in previous exploration and development projects. Increasing water depth results in production from reservoirs with increased pressures and in some cases reservoirs can exhibit high temperature and/or "sour" (hydrogen sulfide or H₂S) environments. These conditions limit the use of conventional materials, particularly for production risers, which must be capable of withstanding extremes of pressure and temperature. Safe access to these reservoirs requires the development of enabling riser technologies in the form of new materials with higher strength (lower weight), as well as increased resistance to sour production brine and seawater environments. These demands represent a significant technical challenge since while higher strength materials are available; they often exhibit increased sensitivity to aggressive environments. Several suppliers of tubular materials have developed higher strength products that would enable the design of light-weight risers needed for deepwater application. However, information is lacking on the fatigue performance of these new materials under environments representative of those anticipated in ultra-deepwater development areas. The objective of this project is to generate corrosion fatigue data on these new materials to fill this information and data gap.

The work carried out under this project will quantify the fatigue properties of high strength line pipe material (steel and titanium). An assessment of the fatigue properties of high strength forgings and nickel base alloys could occur in a subsequent project phase. Fatigue life (S-N) and fatigue crack growth rate (FCGR) behavior will be evaluated under various environmental conditions. The aim is to explore several different materials and systems and determine those which exhibit the best properties.

Potential Impacts

Assessing the fatigue performance of new high strength materials representative of those encountered in deep, sour service will assist operators in the design of new light-weight HPHT risers. Such designs will increase the technical feasibility of deepwater development projects, while at the same time decreasing development time and reducing technical risks. This will accelerate the speed with which ultra-deepwater development can safely proceed, and in some cases, will enable production in areas where it would not otherwise have been possible.

Contact Information: James Pappas (jpappas@rpsea.org)