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Flexible Riser Outer Sheath Full Scale Wearing Simulation and Evaluation

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Abstract

The interface between the flexible risers and I tubes is being considered by the market as a critical region due to its geometric characteristics and high contact loads between the flexible risers and I tube interface equipment. During the past few years several instances of outer sheath damage were reported by the offshore industry. Such damage was a result of wear against steel parts and occurred in the regular design adopted by the industry, causing riser annulus flooding which significantly reduces service life.

Some of the most severe riser failures reported indicate the rupture of the outermost tensile armour layer. Wellstream has designed and patented a new concept for riser interface equipment by adopting a split and replaceable polymeric insert designed to be in direct contact with the riser's outer sheath.

Wellstream is currently performing a 12 month alternative dynamic test using a 9.13 inch gas export riser as part of the qualification programme; the interface between the outer sheath and the polymeric insert is under peer evaluation. As part of the test, the evaluation of the wear considers actual flexible riser service fatigue loads and actual relative displacement between the riser and polymeric insert in order to reproduce field service conditions. This paper presents the wear evaluation performed during the dynamic test, which also includes UT and laser scanning measurements to monitor and assess the wear on both the riser's outer sheath and the polymeric insert. The test results indicate that the proposed design, which adopts the polymeric insert, is capable of preserving the outer sheath throughout the riser's service life thus demonstrating that it resolves the problems reported by the industry.

Introduction

Floating production units used for offshore oil and gas exploration employ flexible pipe systems and may present two different kinds of configuration at the platform. In the first type, referred to as 'direct', the bend stiffeners and interface equipment are assembled directly onto the pipe's end fitting on the platform's riser balcony. This does not lend itself to wear-related problems since the distance between the end fitting and the interface equipment is so short that pipe axial deformation, due to service loads, may be considered negligible thus drastically reducing, or even eliminating, the possibility of damage to the pipe's outer sheath due to wearing.