ABSTRACT

Main target for expanding the possibilities of SCR application is the development of optimized setup and welding parameters which lead to a significant fatigue life enhancement. PURE is a ready for service solution for on- and offshore applications developed by V&M Tubes and qualified in cooperation with TWI. It provides among others an assured pipe end match, minimum stress concentration factors as well as an unaffected media flow. This paper will highlight the key activities of design development and qualification.

The design benefit and the welding technology on property profile were determined by comparing the results of PURE design with plain ends. FEM calculations were used to investigate the influence of design parameters on SCF. A specific GMAW technology was applied as joining technology. Complex heat treatment and an optimized chemical composition resulted in an assured X-65 over the entire upset end line pipe. The testing program comprised besides mechanical testing and all weld test on girth weld and HAZ, resonance full scale fatigue tests of single weld pipes to determine fatigue life and location of failure (post mortem investigation).

KEY WORDS: steel catenary riser, upset pipe end, weldability, fatigue behaviour, sour service, all weld test

INTRODUCTION

Discoveries in the offshore areas for oil & gas are more and more going into deeper waters and therefore require products which can withstand the increased workloads. Main criteria for the selection of products for SCR application is high resistance against fatigue in combination with optimized tolerances at pipe ends.

The aim of the study is to evaluate the mechanical properties and fatigue performance of girth welds made using upset and machined pipe ends, and to compare these with standard pipe end (plain design) welds.

RISER REQUIREMENTS-OFFSHORE

Welding conditions and in operation

The application of SCR design for production and export operations from floating production and storage units has significantly increased during past years. The interaction of various conditions, such as water depth, vessel type and motion, fluid type, riser dimension, in some cases leads to estimates of significantly high fatigue damage at touch down zone (TDZ) of SCR design. One important factor to enhance the SCR fatigue life is to minimize the mismatch at pipe ends. Poorly fitted pipe ends can give variable fatigue performance in the girth welds. Selecting the right pipe ends to minimize the mismatch on assembly is often very expensive and time consuming and may lead to multiple populations of pipes resulting in the need for a end-dimensioning plan.

DESIGN DEVELOPMENT

PURE is a ready for service solution for on- and offshore applications developed by Vallourec Mannesmann Tubes specifically to eliminate the need for pre-matching pipe ends and to give more consistent fatigue performance.

From Plain End to PURE (Premium Upset Riser End)

Usually the variations in pipe wall thickness and the ovality of the pipe ends result in unacceptable levels of mismatch on assembly with plain