Modeling The Behavior Of A Composite Production Riser

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Abstract

The trends in technological advancements in the oil and gas industry and the need for more oil have seen explorations move from shallow waters to deep water. Currently, approximately 3,400 deepwater wells in the Gulf of Mexico (GoM) having depths greater than 150 meters, and a worldwide undiscovered deepwater reserves estimated to exceed 200 billion barrels and 25% of the total US reserves (BOEM, 2016), while others are in regions such as Angola, Brazil, Canada, Egypt, India, Morocco and the UK. The application of composite risers in offshore engineering for ultra-deep applications has been facing a lot of challenges, such as in West Africa and Gulf of Mexico. Presently, the steel catenary risers are used for deepwater applications requiring large diameter pipes, while the flexible while top-tensioned risers are used for shallow water applications, but composite riser technology used mostly for deepwaters, as this is an exciting frontier in the offshore industry as it provides a potential solution for future riser design challenges. This research involves modelling composite riser to investigate the Riser Installation behaviour. The behaviour of composite risers is compared against the behaviour of top-tensioned steel risers with the main research focus on the motion characterization and the behaviour as regards the fatigue of composite materials, considering that composite materials are light-weight, combustible but not corrosive. The COMSOL Multiphysics® software is used to model the composite materials considering the behaviour characterization. AS4/PEEK was first used considering the mechanical properties make it a good composite material for composite material. Some comparison is made with some research done on composite materials, and further studies is done on the fatigue analysis of the composite risers which is ongoing and specific attention is given on the applicability, and to present the design the local and global analysis, in other to reduce installation and maintenance costs. Recommendations from this will enable other industry specifications like ABS, DNV, API, EN and ISO on composite risers as currently they are limited codes and specifications on composite risers.

Figures used in the abstract

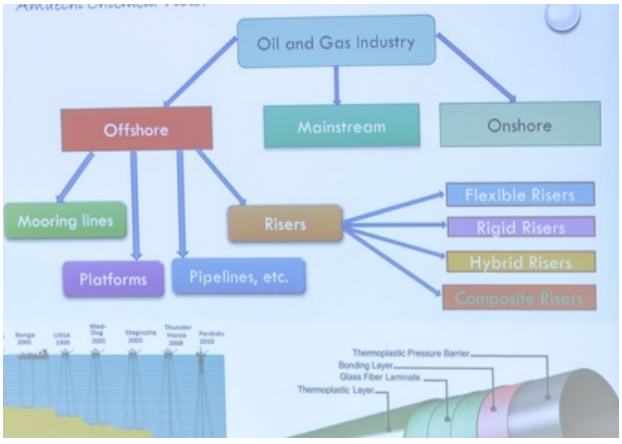

Figure 1 : Composite Production riser