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Flexible Approaches to Risk-Based Inspection of FPSOs

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Abstract

As the FPSO fleet matures, the challenge of how to more rationally and efficiently manage the life-cycle integrity of an FPSO attracts more attention. Risk and reliability based approaches are regarded as very powerful tools to help optimize an integrity program and offer flexibility in helping better manage the integrity management regime.

ABS has developed a multi-level risk-based inspection methodology ranging from simplified deterministic approaches using standard design analysis up to sophisticated probabilistic approaches. Each approach has various levels of usefulness ranging from the definition of critical areas for a single inspection campaign up to the generation of an optimized inspection schedule and work scope covering the entire lifecycle of a particular unit. These RBI methodologies have been successfully applied in inspection planning for several FPSO installations. A wide range of engineering analyses were involved, depending on the needs of individual projects and client requests, inspection objectives, condition of the asset, availability of design analysis information, etc.

In line with the various levels of assessment defined above, ABS has also started developing an automated RBI assessment tool which is discussed at the end of this paper.

Introduction

As experience with the current FPSO fleet grows, it has become common knowledge that there are fundamental differences in the way FPSOs are operated compared with trading tankers. Therefore, it is not surprising that the survey practice normally applied to tankers does not always suit FPSO operations. For example, dry docking of a vessel, a procedure routinely conducted in trading tankers, would only be considered in extreme circumstances for FPSOs. For this and other reasons, it is desirable to have more flexible inspection approaches.

While there remains a strong need for traditional rule-based and prescriptive approaches [1], offshore units are becoming more complex and have a higher degree of novelty. Many aspects of their designs are falling outside of traditional Class rules. The ever-expanding offshore oil and gas frontier demands the adoption of new and advanced technology. Risk and reliability technology [3] is finding increased application given the current demands from clients for more flexibility in the way classification services are provided as well as the greater use of performance-based criteria. Offshore exploration and production in deeper water require novel installation configurations and lighter structure and moorings (newer materials). In addition, commercial pressures are driving changes in FPSO operating practices:

- Vessels (e.g. tankers converted to FPSO service) are being kept in service beyond their service lives
- The standard survey cycle does not always align well with operating practice
- The industry needs more efficient and rational ways for maintaining machinery and structures

Traditional practice as exemplified by prescriptive Rules and standard methods [13] lacks the flexibility to respond to these demands. Risk and reliability based methodologies [7] allow systematic and rational ways for dealing with variations from the “standard” approach. These more advanced methods of maintenance and inspection strategy development follow along an evolutionary continuum that other industries [3-6] are also traveling upon (Figure 1).

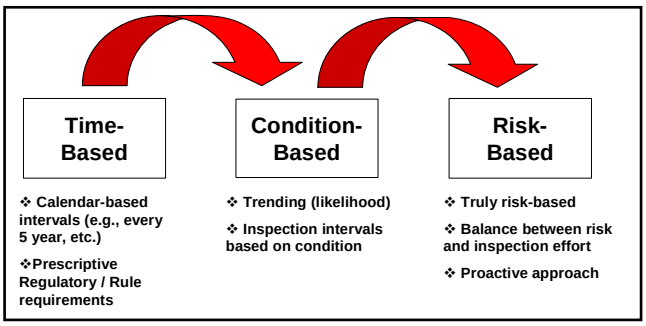

Figure 1 Evolution of Inspection and Maintenance Plan Strategies