



MARITIME

LIFE CYCLE MANAGEMENT OF HULL STRUCTURES

Next generation life cycle management (LCM) procedure for hull structures

Background

Driven by increased safety and reliability requirements as well as the need to reduce downtime against an economically competitive background, the application of life cycle management is gaining more and more importance.

In order to establish a common view on the next generation of procedures for the life cycle management (LCM) of hull structures, a joint industry project (JIP) was started. It brings together the five major class societies and twelve oil majors and operators, reflecting a broad range of the Floating Production, Storage and Offloading industry.

DNV GL contribution

For DNV GL, the project offered the unique possibility to demonstrate its capabilities and knowledge with respect to LCM while receiving direct feedback regarding the industry's needs and expectations. Furthermore, the JIP delivered a comprehensive basis for further LCM developments, which were agreed and accepted by nearly all major players.



Project results

Covered by a procedural framework, the JIP addressed the following technical tasks: coating, corrosion assessment, crack management as well as sensing and cold repair technologies – all of which are key items for LCM. Although focusing on hull structures of FPSOs, the results can be applied or transferred to any ship-like offshore structure without any adjustment as well as to other structures such as spars or semi-submersibles with minor adjustments. Within the JIP, the following tasks were driven and developed by DNV GL:

Coating breakdown prediction

The task on coating breakdown modelling describes a simplified model for coating degradation, including the coating formulation, the application conditions such as surface preparation and humidity, and in-service parameters like temperature and content of tank. The presented model is a simplified empirical tool that allows a non-specialist to estimate coating performance from a handful of critical factors, which are explained in simple terms. This model can have many benefits, including quickly estimating the performance of different coatings systems or coating strategies.

Corrosion assessment – first principle strength approach

Within this task, a first principle approach for the strength assessment of corroded plates has been developed. By individual consideration of various influence parameters such as type of corrosion, degradation, stress state and plate dimensions on the remaining strength of corroded plates, the developed procedure offers a much more detailed and yet practical assessment possibility compared to the procedures currently in place. The potential advantages of this newly developed approach have been demonstrated by practical application examples. This in particular refers to the optimization of the scope of repair.

Sensing technology

DNV GL delivered a look at the future of sensing technology and started the discussion of the state-of-the-art solution. The discussion centres on the challenges of FPSO application and the principles of class acceptance. It creates a reference for non-specialists in the industry while taking a holistic view of solutions today and tomorrow – from fixed static inspections to performance management.

Cold repair

This task reviewed the state-of-the-art methods of cold repair with particular emphasis on composite patch repair. Cold repair methods have the advantage that they avoid hot work and the need for a permit to perform it, thus minimizing interruption of operations. A report was delivered that presents information about the different repair methods with the aim of providing a better decision-making basis for selecting the right repair method for a given problem. Three repair methods are presented: (i) composite patch repair, (ii) sandwich plate system (SPS) and (iii) improvement of fatigue life by fabrication.

CONTACT

Dr Olaf Doerk
Head of Structural Engineering
olaf.doerk@dnvgl.com

Graeme Ripley
Principal Engineer
graeme.ripley@dnvgl.com