Proceedings of the 37th International Conference on Ocean, Offshore and Arctic Engineering
OMAE2018
June 17-22, 2018, Madrid, Spain

OMAE2018-78523

ENHANCE RELIABILITY OF STRUCTURAL BONDING: AN ADVANCE SOLUTION OF REPAIR FOR CORROSION ONBOARD OFFSHORE UNITS

Luc Mouton
Composite Material department, DE
Bureau Veritas Marine & Offshore
Nantes, France
Luc.mouton@bureauveritas.com

Xabier Errotabehere
Chief Technical Officer
COLD PAD
Paris, France
xe@cold-pad.com

Stéphane Paboeuf
Composite Material department, DE
Bureau Veritas Marine & Offshore
Nantes, France
Stephane.paboeuf@bureauveritas.com

Firas Sayed Ahmad
Lead experimental and numerical simulation
COLD PAD
Paris, France
fsa@cold-pad.com

ABSTRACT

An increasing number of Floating offshore units reach maturity (>10 years). This induces costly maintenance operations related to hull structure corrosion damage. While crop and renew operations are generally performed in dry docks for supertankers, the FPSO are maintained afloat offshore on the oil field. For obvious security reasons hot work such as welding and gauging are prohibited without a heavy set of recommendations. Naturally, FPSO's operators have sought "cold" solutions for decades.

This paper describes the specificities of a particular structural bonded reinforcement (ColdShield developed by COLDPAD). A general description of its particularity in the fields of installation and durability is given, but this article is mainly focused on reinforcement strength criterion. Bonded reinforcement strength is known as difficult to predict, making design methodologies not compatible with industrial applications. The innovation in the design of the presented solution leads to a special behavior in terms of strength. It is revealed by the comparison of results of the qualification test campaign with results of tests realized on a standard bonded patch application. Finite element modelling computed parallelly to the tests are used to analyze the test results. The robustness of the reached strength criteria is discussed.

NOMENCLATURE

FPSO	Floating Production Storage and Offloading platform
IDL	Intermediate Deformation Layer
LRFD	Load and Resistance Factor Design
RH	Relative Humidity

INTRODUCTION

Technical and industrial context

Adhesive bonding has experienced in recent decades a significant expansion in various industrial fields (aeronautics, automotive, civil engineering, naval…). Indeed, this assembly process presents undeniable advantages that sets it apart from other assembly technologies such as welding, bolting, riveting…:

- Homogeneous stress distribution;
- No structural weakening of the parts (no hole and no metallurgical modification);
- Multi-material assembly;
- Tightness function;
- Damping function;
- Weight gain;
- High fatigue life…

Even if these advantages are valued while assembly issues are at stake, some technical challenges remain that can form show-