



OTC 19198

Polyester Moorings — Is Insert Recovery & Testing The Best Way To Determine Rope Integrity?

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This paper was prepared for presentation at the 2008 Offshore Technology Conference held in Houston, Texas, U.S.A., 5–8 May 2008.

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Abstract

This technical paper addresses the value of regulatory requirements to recover and test 15-meter inserts from polyester mooring systems for production systems in the Gulf of Mexico. The authors have been working on a MMS-sponsored project to determining the Accuracy of Polyester Subrope Damage Detection by ROV Inspection, and Assessment of Remaining Rope Strength and Life.

Typical samples of subropes used to comprise 15-meter mooring rope inserts for polyester-based mooring systems have been exposed to the equivalent cyclic motions of 20 Hurricane Katrinas, and then the ropes were tested to failure. Results were compared to tests results from the same subropes not exposed to 20 Katrinas. There appears to be little if any rope decline in rope integrity, even if one Katrina-type hurricane scores a direct hit each and every year for the 20-year life of the mooring system.

Introduction

Background

In March 2007, the MMS contracted Stress Engineering Services, Inc. assisted by TTI, Ltd., to evaluate the accuracy and effectiveness of polyester subrope damage detection processes following hurricanes and other events (i.e., loop current) that exceed the 100-year design criteria for offshore structures. ROV inspections are used by the offshore industry to detect damage to polyester mooring systems and estimate remaining fatigue life if damage is found. This work addresses permanently moored floating production systems.

Approach

The fundamental question is: "What are the best ways to ensure the structural integrity of a polyester rope mooring system over the life of the project?" The specific objective for the MMS was to **evaluate the accuracy of non-invasive damage-detection methods**. Toward meeting this objective, the following issues were considered for polyester rope mooring systems:

1. Structural mechanics
2. Factors that reduce structural integrity
3. Qualification for service
4. Characteristics of structural damage
5. Assessment of current and new methods for determining fitness for service

The final report to the MMS (Reference 1) documents the complete set of findings from the work

Scope of this Paper

This paper contains our specific findings regarding the value of insert recovery and testing vs. that of ROV-based rope inspection. Significant tasks completed during the project included:

1. Developing & performing a "20-hurricane" cyclic wear testing procedure for subropes.
2. Assessing the effect of creep and cyclic wear on rope integrity and remaining life
3. Conducting a polyester mooring risk workshop involving participants from the oil industry and regulators.