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## NDP Review of State-of-the-Art in Riser Monitoring: Lessons Learned and Experiences Gained

M. Chezhan and K. Mørk, Det Norske Veritas; T.S. Meling, Statoil; C. Makrygiannis, BP; and P. Lespinasse, Total

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### Abstract

As part of the Norwegian Deepwater Programme (NDP) a state of the art review was carried out by DNV to gather information on the various riser monitoring methodologies and solutions currently available to the industry. A significant number of riser monitoring campaigns have been carried out in the last decade and there is a plethora of experience that can be used for the benefit of future campaigns and assessments.

The important questions that arise when implementing a Riser Monitoring System (RMS) are:

- Why, where, when and how to measure and monitor, and the direct consequences for the platform / riser.
- How to use measurements for present and future operations and provide feedback.

This paper summarizes experience gained from previous and ongoing riser monitoring campaigns across global deepwater frontiers. The synthesised information is based on extensive document review, discussion and feedback from eight oil & gas majors, and discussion and interview with 10 international riser monitoring service providers.

Practical experience, recent failures and lessons learnt from real-time riser monitoring have also been summarised in a distilled format. Both conventional (strain / accelerometer) RMSs and fibre optics based solutions have also been reviewed in detail. Challenges and shortcomings with respect to data specification, data acquisition, analysis and calibration and application and usage are covered. All kinds of riser, such as top-tensioned (TTRs), steel catenary (SCRs) and hybrids, and their specific challenges with respect to RMSs, are also addressed.

Important problem areas, technology gaps, potential areas for improvement and future R&D requirements with respect to riser monitoring are also covered.

A “best practice approach” for RMSs is also briefly discussed, based on the ongoing JIP on Riser Integrity Management,

which is to be published in the upcoming DNV Recommended Practice.

### Introduction

As part of the Norwegian Deepwater Programme (NDP), a state of the art review was carried out by DNV to gather information on the various riser monitoring systems (RMSs) currently available to the industry. The paper summarizes experience gained from previous and ongoing riser monitoring campaigns across global deepwater frontiers.

The objectives of the work were to:

- Gather information on the practical state of the art riser monitoring methodologies and solutions currently available to the industry.
- Summarize the experiences gained and lessons learnt from previous or ongoing riser monitoring campaigns.
- Identify problem areas, potential areas of improvements and future R&D requirements.
- Produce a summary document on the state-of-the-art in riser monitoring, based on the above mentioned scope of work.
- The summary document was also intended to serve as a basis for the ongoing DNV JIP in ‘Riser Integrity Management’, which is to be published as a new Recommended Practice, DNV-RP-F206.

The ‘riser monitoring’ term could be applied to a wide range of parameters. The focus of this paper is on riser dynamics monitoring.

Internal flow, temperature (gradient), pressure, corrosion and annulus monitoring are not addressed.

### Motivation

A significant number of riser monitoring campaigns have been carried out in the last decade and there is a plethora of experience that can be used for the benefit of future campaigns and assessments.

The important questions that arise when implementing a riser monitoring system are:

- Why, where, when and how to measure and monitor, and the direct consequences for the platform / riser.
- How to use measurements for present and future operations and provide feedback.

The review of needs highlighted the following: