PIioneerinG steel lazy wave riser monitoring system to combat slugging fatigue in ultra-deep water

PROJECT OVERVIEW
An operator required a slugging response monitoring system for their steel lazy wave riser (SLWR) on an FPSO in ultra-deep water in South America. The project started in October 2019 and is scheduled until December 2022.

This is a new field development in unfamiliar territory to the industry. A novel riser concept coupled with a motion-sensitive FPSO platform in ultra-deep water depth and challenging Metocean conditions creates uncertainty around the riser design and whether it is fit for purpose. As a result, the customer needed to partner with an asset integrity monitoring service provider to capture data on this complex set-up which required a full touchdown zone (TDZ) strain monitoring, tailored solution, aligned to the customer's objectives and goals.

THE CHALLENGE
SLWRs are a popular cost-effective choice when compared to flexible risers for deep-water developments. They effectively isolate the touchdown zone from vessel motions and therefore have superior fatigue performance over traditional catenary riser systems. However, the response of SLWR to multiphase slugging is not well understood.

Severe slugging is a transient cyclic phenomenon that may occur in multiphase pipeline–riser systems. At relatively low flow rates, liquid accumulates at the riser base, creating a blockage for the gas, until sufficient upstream pressure has been built up to flush the liquid slug out of the riser.

Slugging fatigue can be a very significant contributor to the overall fatigue budget. During their project execution, the customer became aware of the challenges and reached out to Pulse, the lead brand for Acteon's asset integrity and monitoring segment, to design an innovative monitoring system to meet their challenging demands.

CUSTOMER GOAL
The customer needed to understand the mechanics of the riser response to slugging to enable them to benchmark multi-phase flow predictions and riser fatigue predictions. The data provided would help them ensure the riser system is fit for purpose for the life of field and validate the SLWR as a feasible solution for future projects.

OUR SOLUTION AND ITS COMMERCIAL BENEFITS TO THE PROJECT
“We developed, designed, built, installed and commissioned a ground-breaking riser fatigue and slugging response monitoring system. The tailored solution will deliver comprehensive data to provide the operator with the insight they need to benchmark fatigue predictions, validate the system and help them to make strategic decisions for future operations.”

Mark Towell - Managing Director, Asset Integrity and Monitoring, Acteon

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Market-leading services and integrated solutions
- We designed, developed, tested, and qualified the industry’s first monitoring technology to monitor the average mixture density remotely, and continuously at three discrete locations along the riser system.
- We utilised our market-leading sensing portfolio consisting of INTEGRIpod Motion Sensing Hub and dynamic curvature sensor INTEGRIstick to measure bending fatigue at the touchdown location and other key critical areas.

Work at scale with a proven track record for delivery
- We applied the skills, know-how and unique IP to deliver a tailored monitoring solution to ensure the customer asset will stay safely within design boundaries.
- This was achieved through seamless customer collaboration, industry-leading sensing technology, unwavering focus on quality, safety and protecting the environment.

Optimise the project to increase the commercial value
- The data from the monitoring campaigns is being used to validate the riser system performance, fatigue damage and accumulation and ultimately ensure that it is fit for purpose for the duration of the project.
- The monitoring campaign potentially mitigates the need for riser replacements.
- The data will validate whether the cost-effective SLWR is fit for use on future similar projects.

Minimise the environmental impact
- The system allowed the number of inspection intervals to be reduced, therefore reducing the overall project footprint.
- The system mitigated the need for replacing components and has the potential to play a part into a long-term asset life extension strategy.

Combine digital technology and data to enhance our expertise
- We leveraged our unique product and service portfolio to deliver a tailored and cost-effective monitoring solution combined with Pulse’s data processing engines to form a powerful solution architecture.