



## RAMS™

**Tritech's Real-Time 360° Riser and Anchor-Chain Integrity Monitoring for FPSOs.**

**Monitors the integrity of risers and mooring lines on the Teekay Petrojarl Foinaven FPSO on BP Oil Field.**

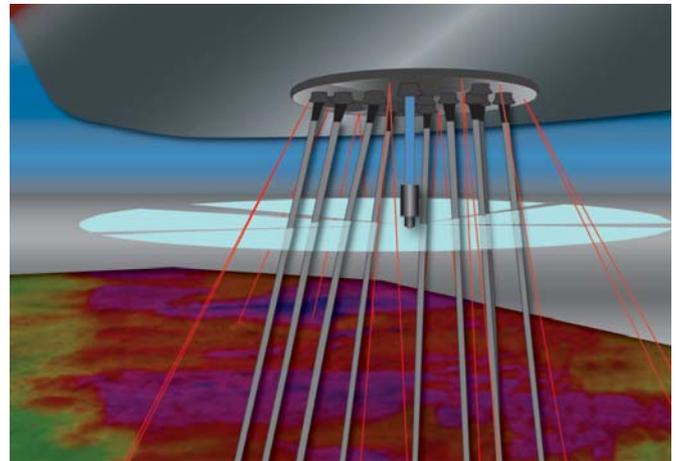
Tritech's RAMS™ technology is a real-time 360° anchor-chain and riser integrity monitoring system for Floating Production Storage and Offloading Units (FPSOs). Deployed beneath the vessel, RAMS™ monitors the presence, integrity and position of mooring lines and risers 24/7 from a single sonar head, in real-time.

### Customer Background

**BP** is one of the world's leading international oil and gas companies.

**Teekay Corporation** is an essential marine link in the global energy supply chain, serving the world's leading oil and gas companies.

**Teekay's Petrojarl Foinaven FPSO** is a deepwater oil development platform, operated on a BP deepwater oil field, within the UKCS (UK Continental Shelf). It is located approximately 19km, (10mi) off the West Coast of Shetland in a water depth of 330-520m.



*Graphic showing a representation of RAMS™ head deployment; real-time 360° riser and anchor chain monitoring for FPSOs .*

### The Need for Mooring Line & Riser Monitoring

As an owner/ operator partnership, Teekay and BP have paid significant attention to monitoring and maintaining riser integrity on the Petrojarl Foinaven FPSO.

RAMS™ has been developed in conjunction with BP, following their requirement for an automated system, able to monitor the series of bend stiffeners, umbilicals and risers on an FPSO. BP required a system that would record the relative movement of an FPSO's anchorage, providing a warning system should the movement fall outside the design specification. Recognising the short falls of other monitoring technologies, Tritech modified its proprietary multibeam sonar technology to a system that could provide a 360° field of view with the ability to detect multiple targets within close proximity of each other.

In 2009, RAMS™ was installed on the Petrojarl Foinaven FPSO, where it continues to be in operation today.

## The Challenge of the FPSO

The Foinaven FPSO has an internal turret, 12m in diameter with 14 riser slots of which 10 are currently in use, comprising 5 x 8" risers, 5 x 10" risers and 2 x umbilicals. There are 10 mooring lines which secure the FPSO to the seabed. The RAMS™ sonar head is deployed through an I-tube on a custom-designed deployment mechanism, at a predetermined depth, to ensure a clear line of sight to the 22 targets (10 risers, 10 mooring lines and 2 umbilicals). Electronic beam steering in the vertical plane is used at the time of installation to ensure an optimal return or acoustic reflection from the risers, mooring lines and umbilicals.

## How it Works

The RAMS™ sonar head is controlled by the RAMS™ software which runs on a dedicated Surface Control Unit (SCU). The RAMS™ software displays the known turret configuration as a background to the real-time sonar imagery. Acceptable levels of movement for the displayed targets are user definable, with any abnormal behaviour being easily identifiable. Internal and external alarms are generated when the target behaviour falls outside the defined scope of movement. In addition to providing extremely accurate and robust real-time measurement and detection of riser or mooring line targets, all data is recorded and exported to allow for integrity trend analysis.

## Measuring Success

Since installation, RAMS™ has proven to be 100% effective in its operation. The quantity, accuracy and detail of the recorded data provides BP with the potential to conduct trend analysis.

## A BP Representative, comments on RAMS™ effectiveness:

*"RAMS™ has been installed on the Foinaven FPSO since 2009 and shown to be 100% effective. We are confident of the system and its ability to monitor the integrity of risers and umbilicals and its capability for data export in order to analyse riser/ bend stiffener movement which is very important, not only to maintain the asset but to identify the need for corrective action."*

## Installation, Commissioning & In-Field Support

Support is provided in partnership with NCS Survey, an Acteon company and leading independent survey contractor, to deliver the installation, commissioning and after-sales support of RAMS™. The combined solutions offered by Trittech and NCS Survey are unmatched by other solution providers, as we are able to offer a complete solution to the FPSO industry.



Graphic showing a screen shot from the RAMS™ software showing the real-time imagery of the risers and alarm triggers.

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