



## **FORCE Steel Catenary Riser Monitoring, F-SCR**

Condition control through response monitoring from seabed to topside





**Offshore oil and gas industry is moving to deeper waters. Steel catenary riser (SCR) can be the cost efficient and preferred riser solution. This has been the case for several field developments in the GOM and West of Arica. The risers are literally the umbilical of the production facility, and hence SCR integrity management is of key importance.**

## **Steel catenary riser monitoring**

**For deep water development, high speed data sampling for vortex induced vibration tracking, deflection angle and bending moment.**

Instant data on structural integrity of in situ risers is of high importance from an integrity point of view. FORCE Technology is an experienced partner when it concerns professional services to the oil and gas industry among our services are: riser monitoring, risk based inspection management, automated inspection subsea or topside, corrosion management, protection and production optimisation and many more.

When it comes to monitoring Steel Catenary Risers, a key aspect is delivering a high accuracy system with the robustness required to survive both the coating process and the offshore installation without compromising service life of risers nor reliability of the monitoring system.

Another important aspect is to communicate and manage the enormous flow of data involved in monitoring a riser for frequencies at 25 Hz.

To give you a broad overview we have divided 'monitoring of 'steel catenary risers into five areas of importance.

These are:

- Onshore sensor installation
- Offshore system installation
- Top zone strain stations
- Touch down area strain stations
- Topside control cabinet.

FORCE Technology is a global technology and service provider within offshore and land based industry. Our mission is to develop and market value-creating technologies, solutions and services to boost the competitiveness of our customers, thus assisting them to achieve their business goals and results.

Challenges in the development of deep sea project provide areas where FORCE Technology contributes. One of these areas is our experience and knowledge in providing subsea monitoring systems.

## Onshore and offshore system installation

Extensive qualification trials over a period of three years in cooperation with the Thermotite Custom Coating – BrederoShaw, has enabled FORCE Technology Norway to qualify sensor installation procedures on SCRs beneath the coating. Conventional strain gauge design ensures the highest possible accuracy in one of the most hostile environment in the oilfield industry.

Installation of the strain stations and sensors are done onshore. This is also the case with respect to the topside part of the system. This reduces the required work to be performed offshore to hook up work for the monitoring points. This saves offshore time and secure that the sensors are well protected and fitted to the SCR positions.



*Top zone and touch down instrumentation.*

*Installation of the instrumented infield risers on BP's Thunder Horse 2006 to a water depth of 2000m.*

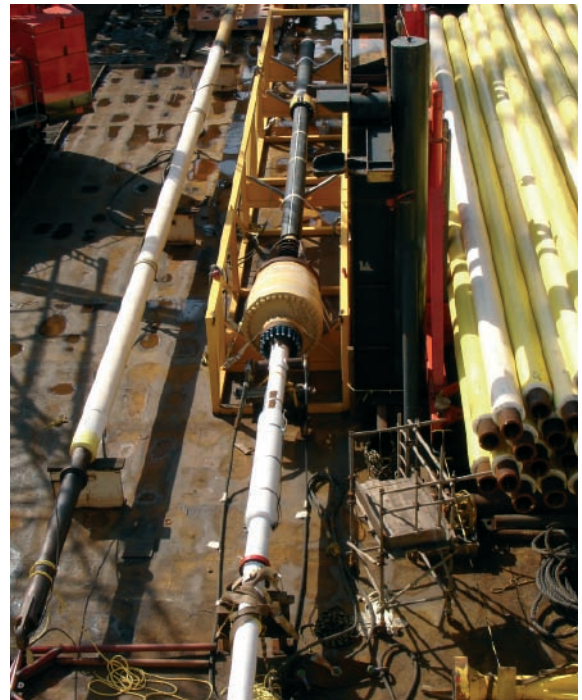


**FORCE Technologys instrumented steel catenary riser joints during installation in the Gulf of Mexico 2006**

## Top zone strain stations

The SCR's are hung of to the floating production vessel with a flexible junction. It is crucial for a SCR monitoring system to give the differential deflection angle between the platform and the riser.

Another important task for such a system is to monitor the top strain and the bending moment in this position of the riser.



*FORCE Technologys instrumented flexjoint during installation 2006.*

## Touch down area strain stations

An important part of determining the integrity of a Steel Catenary Riser is given in the Touch Down area where the SCR lifts off from the seabed. Monitoring the bending moment in the area is a crucial parameter for the integrity evaluation.

The touch down area is also where data models have much uncertainty and real data is given to the engineers by the riser monitoring system. Designing redundancy into the monitoring system is important in the range of more than 2000 m water depth, and using a distributed amplifier system ensures the best possible redundancy for the system.

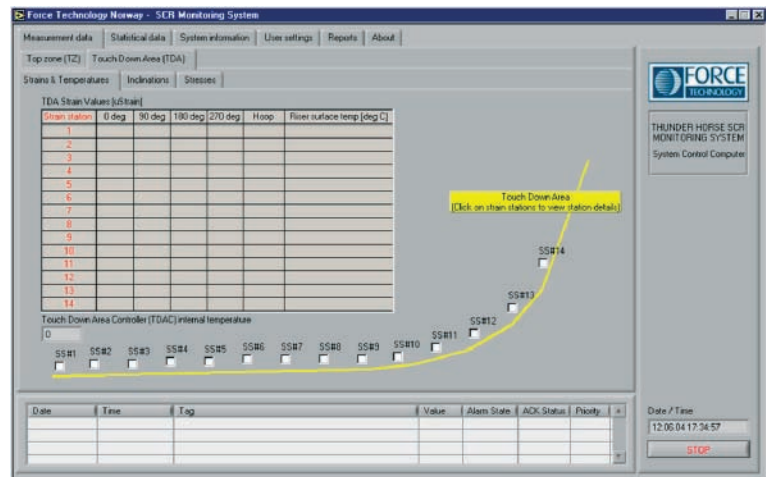


*Touch down area controller with Sicon delivered modem units.*

## Top side control cabinet

The system has its own database where both raw and processed data is stored continuously.

The control cabinet has a system control computer where statistical data is processed and displayed, and alarms are triggered to the vessels control system. This information is available over the web and the system can be accessed for data downloading from shore.



System Control Computer graphical interface.

### Technical data on Thunder Horse

- Data logging capability 25 Hz
- Distributed amplifier system in 14 touch down strain stations and 5 top zone strain stations
- System design life 25 years
- 174 channels of data
- Dynamic angle accuracy 0,3 degrees
- Strain accuracy: +/-10 microstrain
- Stress accuracy: +/- 2 MPa
- Conventional strain gauge design
- Design temperature 135 degrees celsius.







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