STRESS ENGINEERING SERVICES INC.®

UPSTREAM: OIL & GAS

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Life Cycle Condition Based Monitoring (CBM) for Drilling Risers

Problem

As the critical conduit between the drilling rig and the well system, the drilling riser on a mobile operating drilling unit (MODU) is inspected for flaws every five years. The logistically complex process of physically transporting components for inspection by water and land is both costly and time-consuming.

Challenge

Stress Engineering Services (SES) partnered with LaserStream, a specialist in laser-based measurement for the inspection of oilfield equipment and pipe/tubing, to implement a new standard process for collecting critical riser data. Their aim was to mitigate the costs and time associated with essential MODU drilling riser inspections, by empowering operators to reliably determine the condition of drilling riser joints, consistently predict when vital components will require service, and accurately assess remaining component life.

Solution

Our laser-based pipe inspection approach utilizes a life cycle condition based monitoring (CBM), maintenance and inspection system that can be deployed on the MODU, enabling resources to be deployed only when necessary, instead of on a calendar interval.

How it Works

The Laser Profilometry Bore Erosion Measurement and Inspection System (BEMIS™) has been used extensively by the Dept. of Defense and NASA. The scanner head rotates at 250 rpm, collecting more than 3000 points of measurement in each rotation, producing a high-resolution internal map of the component surface. Laser ID measurements are collected on the inner diameter of the main bore and auxiliary lines, between wells to characterize the state of drilling riser joints.

The system generates millions of high-resolution data points, which are harnessed and analyzed using LaserViewer™ software to accurately map and determine material loss, characterize features to determine method of causation and perform detailed dimensional analysis of the entire tube. A report summarizing the anomalies that meet the criteria are identified and measured, along with the location of the feature on the tube.

System Highlights

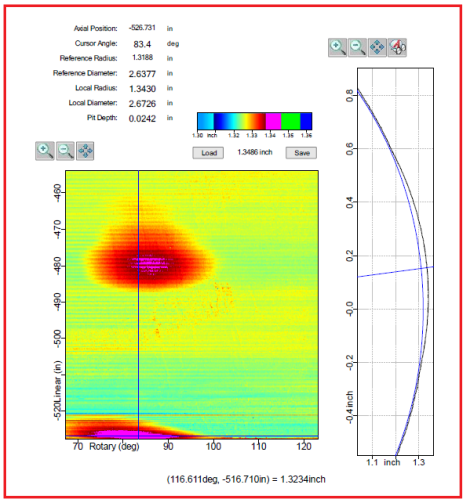
The system determines stress and fatigue at any location in a riser system/wellhead/conductor casing with vibration sensors and data acquisition electronics housed in a Subsea Vibration Data Logger (SVDL). The data is processed using state-of-the-art SES patented technology, designed to provide the drilling crew with critical, actionable information.

The SVDL can be installed individually by an ROV on riser joints, wellheads and BOPs in 'offline' mode, where the recorded vibration data is retrieved after the measurement campaign, (which can last several weeks), and processed offline to estimate stress and fatigue. The operator is provided with a useful tool to assess system integrity at any time during a drilling campaign and the semi-analytical method to compute fatigue from measured vibrations provides rapid turnaround of raw data to fatigue consumption, enabling informed decisions to be made in adverse conditions.

After the drilling riser joints have been recovered to the surface, the BEMIS™ is used to inspect them. The BEMIS™ is deployed through the ID of the riser via a tethered crawler. This data is collected while the riser is on the deck and eight joints can be inspected in one day, with the field results being available at the site, and a final report following in a week.

A Valuable Report

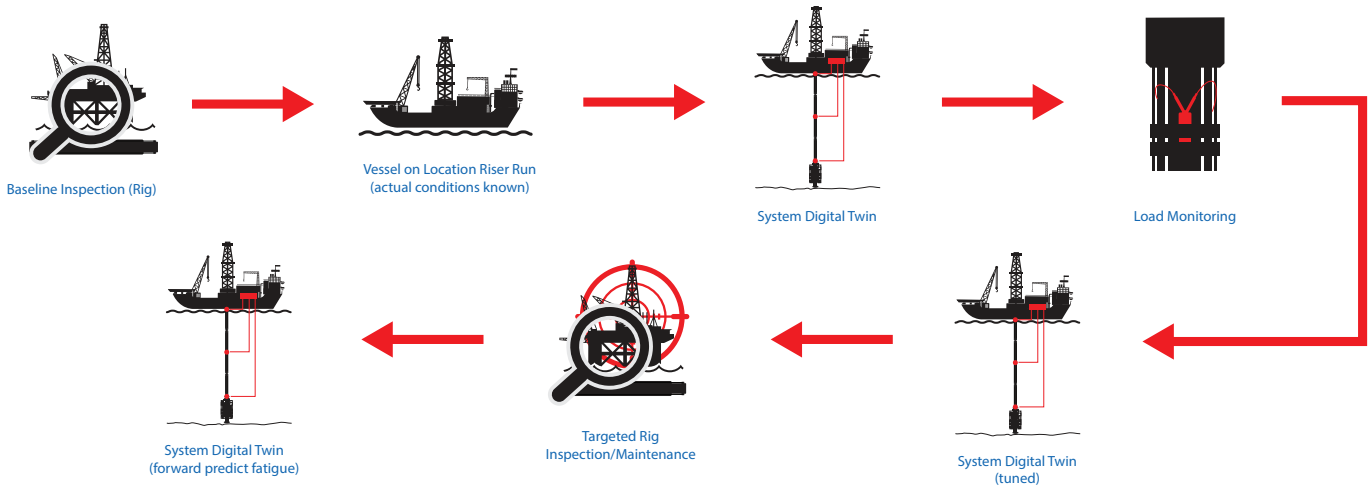
The system delivers extensive and precisely compiled data, enabling the user to build a powerful picture to better understand their riser damage and wear rates.



The report provides the operator with vital knowledge:

- Current condition of the riser – if it is fit to return to service
- Extent and causes of any damage
- Effective determination of remaining life of riser

The report also includes a damage signature, noting the cause of the suspected damage (erosion, corrosion, mechanical damage or an irregularity from manufacturing).



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