Offshore renewables structural health monitoring

For effective structural integrity management of offshore wind farm assets.
James Fisher Testing Services (JFTS) has unrivalled experience and expertise in the provision of structural health monitoring solutions for a wide range of offshore structures, ensuring safe asset operation, risk reduction and cost-effective maintenance programmes. JFTS brings together Testconsult’s expertise in foundation and materials testing with the structural monitoring capabilities of Strainstall, combining over 50 years of specialist experience. As part of James Fisher and Sons Plc group of companies, JFTS has access to a wide range of support services including confined space support, diving and rope access teams and vessel support.

We are experts in supporting new build projects and retrofit installations. Our focus is to meet the evolving needs of the renewables industry and deliver challenging projects using our industry capabilities and exceptional professional standards.

Projects delivered

James Fisher Testing Services (JFTS) provides a full specialist support function that goes far beyond the remit of most other monitoring company capabilities.

**Specialist offshore expertise**

1. Design validation
   Obtaining structural response data under a variety of weather and sea state conditions to verify design model assumptions.

2. Short-term monitoring / problem quantification
   Assessing the extent of structural health issues on existing structures and monitoring any remedial solutions.

3. Long-term asset management
   Continuous monitoring to help plan preventative maintenance strategies and to enable asset owners to make informed decisions.

4. Independent project certification
   Ensuring regional project certification requirements to safeguard the quality and productivity of wind farm projects.

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**Offshore structural monitoring solutions**

1. Design validation
2. Short-term monitoring / problem quantification
3. Long-term asset management
4. Independent project certification

**Projects delivered**

- **Design**
- **Assembly**
- **Installation**
- **Monitoring**
- **Data management**

114 assets instrumented to date
10 operator clients
16 offshore wind farms

W: www.jftesting-services.com  E: enquiries@james-fisher.com  T: +44 (0) 1925 286 880
Offshore monitoring solutions

Monopile foundations
- Strain gauges for monitoring global bending and stress hotspots in monopiles (MP), transition pieces (TP) and towers
- Accelerometers mounted in the TP’s, towers and on J-tubes
- Displacement sensors at the MP/TP grouted joint
- James Fisher load cells at the MP/TP bolted joint
- Air/gas sensors for monitoring hydrogen, oxygen, hydrogen sulphide, temperature and humidity
- Water column sensors for monitoring pH, water depth, dissolved oxygen, dissolved sulphide and corrosion reference cells
- Wave radar on external platform
- Inclinometers to measure structural tilt

Jacket foundations
- Strain gauges for monitoring global bending and stress hotspots in legs, braces, suction buckets, pile stoppers and towers
- Accelerometers mounted in the transition pieces (TP) and towers
- Wave radar on external platform
- Inclinometers to monitor structural tilt

Gravity base foundations
- Strain gauges for monitoring global bending in steel vertical section
- Concrete embedment sensors fitted within rebar cages (onshore) prior to concrete pouring and setting - alternative fibre optic solutions available
- Accelerometers and inclinometers mounted in foundations and towers
- James Fisher load cells installed at bolted flange during turbine installation works
- Air/gas sensors for monitoring hydrogen, oxygen, hydrogen sulphide, temperature and humidity
- Water column sensors for monitoring pH, water depth, dissolved oxygen, dissolved sulphide and corrosion reference cells

Floating foundations
- Strain gauges for monitoring global bending and stress hotspots in structures and towers
- Accelerometers mounted in structures and towers
- James Fisher load shackles attached to tendons
- Air/gas sensors for monitoring hydrogen, oxygen, hydrogen sulphide, temperature and humidity
- Water column sensors for monitoring PH, water depth, dissolved oxygen, dissolved sulphide and corrosion reference cells

Offshore renewables structural monitoring

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Smart Asset Management System (SAMS)™

Real-time monitoring and data management software for 24/7 integrity surveillance.

The Smart Asset Management System (SAMS)™ is a sophisticated web-based software package that incorporates sensors, data acquisition hardware with data processing algorithms to provide a comprehensive structural health monitoring solution. Designed to operate within the harshest of environments, our sensors and monitoring systems ensure safe operation when it matters.

Monitor | Identify | Act

Our specially developed data management systems can be integrated with third party sensors for real-time data handling with online analytical processing tools. Users can run queries, perform analysis and produce reports to support operator decision-making and enable fully informed and safe maintenance assessments.

Structural health monitoring hardware

Our systems are designed to incorporate a modular network of data acquisition units (DAUs), sub-units and third party systems. Each DAU receives multiple inputs from a variety of sophisticated sensors distributed throughout the turbine foundation structure.

The data processing and control system consists of a number of hardware servers which collect, control and store data received from the DAUs. The smart asset management system server displays the structural performance of the turbine and real-time monitoring of key predefined parameters, whilst the post-processing application server will perform post-processing and analysis of the collected data.

Structural health monitoring software

Incorporating SAMS™, the user interface operates and manages all data generated using modular and scalable open framework architecture.

The software capabilities of SAMS™ include:
- Real-time processed information
- Systematic storage and retrieval of data and manipulation of multi-platform analysis

Fully flexible, the system enables a wide mix of sensors to communicate with the server in order to integrate data from any source and respond to the server configuration, for a completely dynamic two way communication.

Data management options:

1. Fully integrated into the life management of your structure, our highly sophisticated SAMS™ software provides the ultimate solution for convenient and reliable long-term structural health monitoring
2. Short-term design validation campaigns and live data streaming for management and analysis by our in-house experts or by the client directly for their own data processing
3. Standalone units for manual data retrieval for short-term testing purposes