

James Fisher and Sons plc
Marine Services Worldwide

James Fisher
Testing Services



SAMSTM Smart Asset Management System

Turning data into insight



Introduction to SAMS™



Enabling you to monitor, evaluate and manage your assets more effectively.

Fully integrated into the life management of any structural asset, SAMS™ provides the ultimate solution for convenient and reliable structural health monitoring (SHM). The advanced analytical processing capabilities of the SAMS™ platform has revolutionised the way SHM is used as a preventative maintenance tool, optimising asset management.

The system's software capabilities include real-time data handling with online analytical processing tools from which users can run queries, perform analysis and produce reports, including health indices for risk based maintenance planning.

SAMS™ is a versatile system and can be applied to a wide range of structures. Common applications include:

- Bridges
- Buildings
- Railways
- Tunnels
- Wind turbines
- Highways
- Oil and gas assets
- Geotechnical instrumentation



Structural health monitoring

Hardware

The data acquisition system for SAMS™ is a modular network of data acquisition units (DAU), sub-units and third-party systems. Each DAU has multiple inputs from a variety of sensors including strain gauges, accelerometers, temperature and displacement transducers, distributed across the key points on the structure. The SAMS™ platform applies a data fusion process to assimilate information from multiple sensor inputs to produce data that is more consistent and accurate than from a single source alone. The system can also interface with existing customer systems such as SCADA systems.

The data processing and control system consists of a number of hardware servers which collect, control and store the data received from the DAUs across the structure. The web application server displays the structural performance of the asset to allow real-time monitoring of key or pre-defined parameters, whilst the post-processing application server will perform analysis of the collected data. Data can be correlated from different sources with millisecond accuracy to provide unparalleled insight into the behaviour of the asset.

Software

The customisable user interface operates and manages all the data generated, using a modular and scalable open framework architecture.

The software capabilities of the SAMS™ platform include real-time information processing, systematic storage and retrieval of data and manipulation of multi-platform analysis. It also includes the provision of multi-dimensional views of data through the utilisation of a relational database management system, equipped with online analytical processing tools from which users can run queries, perform analyses and produce reports.

The complete flexible 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, facilitating dynamic, user-defined two-way communication.



System benefits



Maximise productivity and significantly reduce costs through the whole life management of your asset.

SAMS™ provides the ultimate solution for the move between raw data and insight driven actions – allowing you to acquire, analyse and act on intelligence, quickly and with confidence.

Designed with a focus on speed to action management, JFTS' SAMS™ software continuously calculates and streams dynamic information about your asset, in real-time.

Benefits of SAMS™:

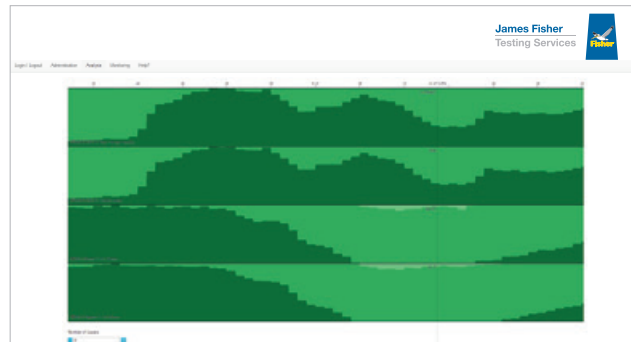
- Quality data provides the opportunity to predict failure and plan maintenance, reducing costs and minimising downtime while increasing structural safety
- Allows faster reactions to operational conditions
- Optimisation of operation and maintenance strategies
- Translates masses of data into clear, actionable insight in a variety of formats including moving graphics, 3D models, integrated maps, graphs, reports and alerts
- Integration of all data streams into a single information platform

The system can be configured for any asset management related activity, at any stage in the lifetime of an asset. From initial design and site testing, through construction, operation and maintenance, to life extension and decommissioning; data is produced, stored and continuously analysed.

SAMS™ provides the ideal platform for the cost-effective management and analysis of data throughout the whole life cycle of your asset or project.



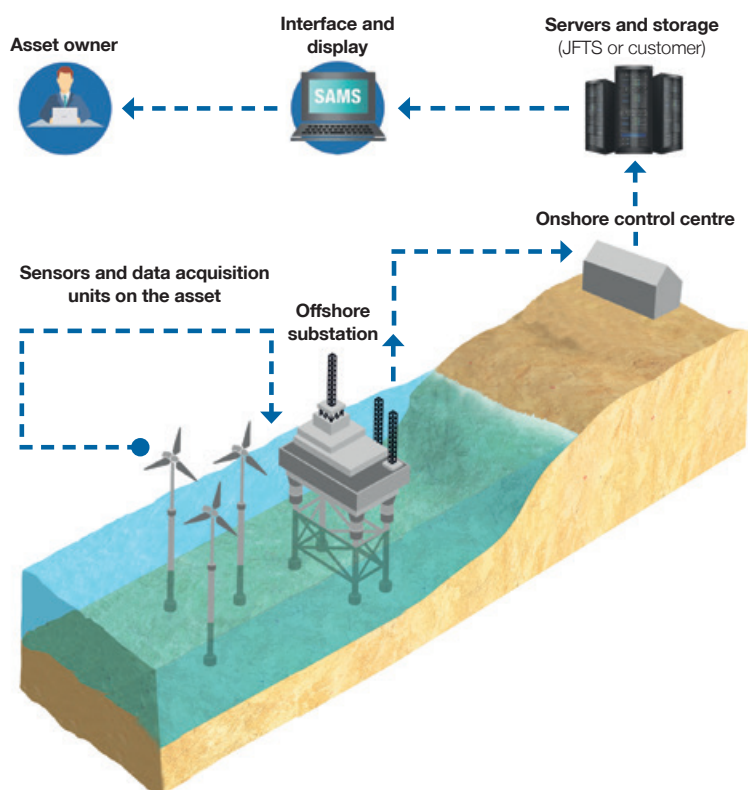
SAMS™ main displays are uniquely configured for every asset to meet your specific requirements.



The software and reports can be branded for your project needs, and is available securely over the internet via PCs and other mobile devices. SAMS™ can be run in the cloud or installed on customer servers.

The user displays can be based on maps, plans, drawings, sketches, photographs and 2D or 3D graphics, with animations representing the real-time movements.

Example illustration of the SAMS™ process



System features

Overview

- Web-based access to data - anywhere
- Automated data collection and management
- Manual data input and management
- Sophisticated data processing and reporting in real-time
- Real-time alerts and alarms

Servers, data management and storage

- Servers can be on-site or cloud based
- Automated routines for checking validity of data
- Seamless integration of operational data store with the optional systems data warehouse
- Key system performance benefits
- Ability to create long-term data reports
- Intranet solution for offline, secure networks

Analysis

- Data processing modules provide a suite of algorithms for calculation of commonly required parameters and correlation of data
- Easy to add further complex algorithms using simple scripting
- Processing scripts can be applied to data, creating real-time plots of derived parameters
- Cross correlation of any sensor against any sensor

Manual data input

- Manually read sensor data
- Manual survey data (total station, level)
- Photographs and inspection records

Sensors and data acquisition equipment

- Compatible with all JFTS monitoring systems, regardless of application, data acquisition system or sensor mix
- Compatible with third-party monitoring systems
- Seamless integration with GNSS, ATS, DWIM and corrosion monitoring

User interface and displays

- Customised web-based user interface
- Secure log in to customers' own project pages
- Fast navigation through user-friendly interface
- Displays configured to suit individual projects – maps, plans, 2D / 3D graphics, drawings etc
- Data sorted by location, sensors and events

Reporting

- Customised notification and alarm events
- Enables flagging of abnormal events and custom report generation
- Automatic custom report compilation from multiple information sources
- Dynamic interactive self-container reports
- Download full data sets

Additional functionality under development

- Can provide further asset management capability
- BIM integration
- Asset digital twins linking FE models with in-service actual data
- Mobile app for site data input
- Machine learning predictive analysis

SAMS™

Smart Asset Management System

Transform data into actionable intelligence.



Data and storage

- Big data analytics
- Data management
- Legacy data
- Open source architecture
- Network security
- Data warehouse

Asset types

- Bridge
- Building
- Transmission network
- Rail
- Wind turbine
- Oil and gas installations

Cloud and processing

- Actionable intelligence
- Real-time processing
- Automated reporting

Decision making

- Action
- Accuracy
- Complex analysis
- Real-time display
- Peer review and validation

Case study: **Queensferry Crossing**

JFTS commissions structural health monitoring solution on Scotland's landmark Queensferry Crossing.





Overview

JFTS worked for the Forth Crossing Bridge Constructors joint venture (Hochtief from Germany, American Bridge International from the USA, Dragados from Spain, and Morrison Construction from Scotland) to design, install and commission a complete SHM solution for the Queensferry Crossing.

Challenge

The Scottish bridge is one of Europe's largest and most prestigious recent infrastructure projects. At 2.7km it is the world's longest three-tower, cable-stayed bridge and also defines a new global standard in SHM.

Solution

The scope of the solution was vast - with over 2,300 sensor channels being installed to monitor strain, acceleration, displacement and environment.

A key feature has been the seamless integration of otherwise standalone systems, through JFTS' innovative SAMS™ platform. These are the global navigation satellite system (GNSS), a dynamic weigh-in-motion system (DWIMS) and a reinforced concrete corrosion monitoring system. Despite the thousands of sensors and sources of data, using the SAMS™ platform and the concept of 'data fusion', the data is amalgamated and reported in a simple actionable format allowing users to make fast, data-informed decisions on the structural health of their assets.

SAMS™ delivers both comprehensive real-time visibility of existing performance, and predictability of through-life needs that will help allow future maintenance to be more proactive, cost-efficient, and better targeted.

Case study:
Normandy bridges

JFTS delivers structural health monitoring project
on three Normandy bridges.



Overview

JFTS, in partnership with the civil engineering consultants COWI, has designed and installed integrated SHM solutions on three bridges in Normandy; The Pont de Normandie, Pont Tancarville and Viaduc du Grand Canal.

The project started in late 2018, with the installation and commissioning completed in mid-2019. The ongoing monitoring and maintenance support is set to continue through until at least 2022.

Challenge

The scope of the project was to review and update the existing systems on all three bridges due to poor performance. The customer had specific concerns regarding deck fatigue and cable stay failure.

In contrast to their previous solution the customer wanted an integrated platform that combined their data sources into clear, actionable insight in order to streamline processes and improve efficiency.

Solution

A key element to the updated solution was JFTS' SAMS™ platform, which produces intelligent insight through 'data fusion' in contrast with unintegrated data from multiple sources. The automated reporting feature of SAMS™ delivers the client monthly updates with a concise summary, empowering users to make quick, data-based decisions on the structural health of their assets. Key parameter displays have been developed alongside real-time email alerts for pre-configured events.

In total there were about 400 sensors installed that monitor a range of parameters: strain, acceleration, displacement, environment and acoustic emissions. The system also integrated with third-party inputs and systems, amalgamating them into the SAMS™ platform, creating a single centralised point to compile and review multiple sources of data.

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