

# FRIEND

## Remote surveillance and diagnostic system

### APPLICATIONS

- Equipment surveillance
- Condition-based maintenance (CBM)
- System-wide integrated production management

### BENEFITS

- Reduced downtime and associated costs
- Access to 24/7 remote assistance, and priority support from domain experts
- Extended system service life
- Decreased NPT with access to equipment data, status, and analysis from anywhere, anytime and fast response on troubleshooting and diagnostics
- Optimized system operation with assurance of best-practice utilization
- Enhanced maintenance planning and reduced offshore service work

### FEATURES

- 24/7 monitoring of networked sensors installed on OneSubsea equipment
- Historical and addressable databasing of sensor data, real-time knowledge management of equipment operational events, alarm statistics, and potential failure statistics
- CBM and equipment integrity monitoring with flow assurance risk evaluation and mitigation
- Around-the-clock help desk and access to our technical experts on duty
- Field data interpretation and evaluation plus optimized equipment utilization
- Interactive analysis tools and operational performance indicators for equipment operational assistance
- Online web portal with access to real-time data from field startup
- Real-time interfacing with Schlumberger OLGA\* dynamic multiphase flow simulator and Avocet\* production operations software platform

FRIEND\* remote surveillance and monitoring system is a tiered service designed to help maximize production and minimize total cost of field operation. The fully automated FRIEND system maximizes equipment availability by using real-time calculation engines that determine when the production system is performing suboptimally and issues advisory alerts. OneSubsea experts at support centers around the world are available 24/7 to monitor the integrity of the subsea installed equipment base and offer advice regarding production, equipment life and status, and maintenance operations.



*The FRIEND system allows for regular feedback and ongoing improvements to the operation of subsea equipment, which leads to improved KPIs, reduced downtime, and suggestions for operational adjustments that improve well production.*

### Three tiers of service

**1) Surveillance**— FRIEND system surveillance helps ensure safer and environmentally acceptable equipment integrity, asset production, and operational processes. Key parameters are monitored to enable operators to evaluate the condition of the equipment and uncover potential fault states across system boundaries. Deviations between actual and expected performance initiate alarms, making it possible to provide operational advice that safeguards the system operation. Continuous recording and classification of events, according to a traffic-light system, provides the basis for the feedback cycle for operational improvement.

**2) Condition-based maintenance**— Monitoring system or equipment parameters provides early detection of significant changes (e.g., degradation) indicative of a developing failure. The ability to predict future failures enables improving maintenance schedules, limiting unplanned down time of equipment, and optimizing spare parts in storage. The FRIEND system can be used to analyze dominant failure modes of the equipment based on the effect the degradation has on the system and then evaluate future health by investigating long-term trends and reliability data of similar components. Performance can be monitored for HSE parameters, production optimization, or both.

**3) Integrated production management**— Together with Schlumberger, OneSubsea has developed an integrated approach to production management in which data is captured, organized, analyzed, and presented in a hierarchal interconnected structure to take full advantage of equipment knowledge to understand and analyze the production system. The FRIEND system seamlessly integrates with industry-standard OLGA simulator and Avocet platform to enable calibration of production models with monitoring data. With full control of all data workflows, key value information can be selected and deployed either in a collaborative web interface or seamlessly integrated into the operator's workflow platform.

## Expert advice, always available

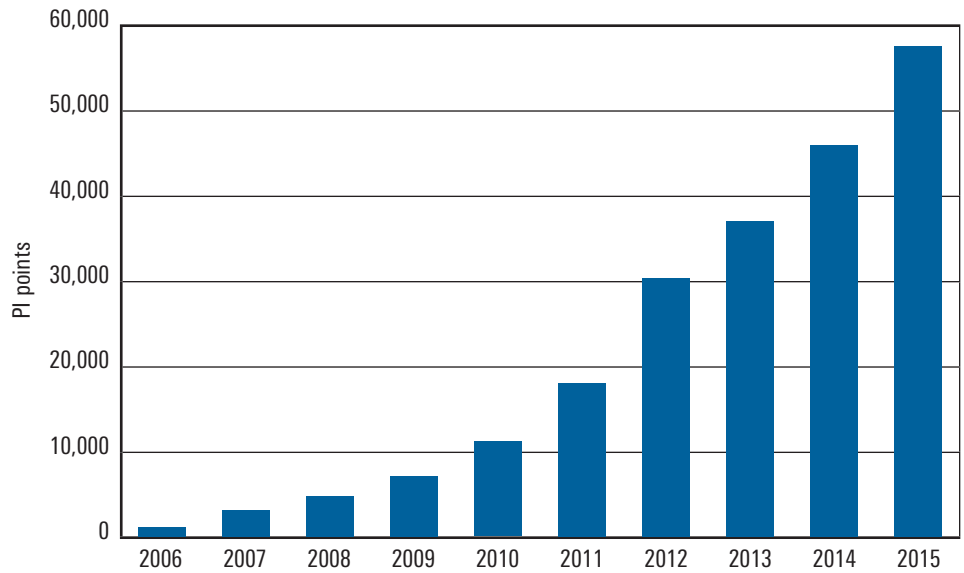
The FRIEND system features a real-time historian database that makes event-driven data collection and trending of historical data possible. In addition, the system's automated alert feature continuously monitors equipment performance for suboptimal process and system conditions.

OneSubsea has support engineers on staff 24/7 who are immediately notified of any alarm conditions or causes, and can quickly act to mitigate or even prevent an upset condition and keep the equipment running at the desired level of output, integrity, and reliability. This information enables OneSubsea to provide a proactive service through an integrated working methodology — securing best practices in operation and maintenance of the subsea products we supply.

## A cycle of continuous improvement

In addition to notifying the operator of suboptimal operating conditions, the FRIEND system also generates frequent reports (monthly reports are typical) that detail the ongoing operation of subsea equipment. These reports evaluate the equipment's operability as related to meeting predetermined KPIs, identify any unexpected events, highlight areas of concern, and suggest operational improvements. Preventative maintenance actions also are proposed.

This reporting provides a continual performance improvement cycle, whereby the results of real-time condition monitoring spur proactive support activities that help improve equipment availability and run time. Improvements to the operation and reliability of subsea equipment ultimately lead to improved well efficiency and reduced NPT and safety risks.



Since 2006, the FRIEND system has grown considerably in application, monitoring more than 45,000 quality data points from more than 100 subsea systems worldwide and achieving an availability uptime of 99.82%.

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