UPSTREAM
TECHNOLOGY

A Focus on the Full Spectrum of IT Solutions for Oil & Gas

Predictive Maintenance Keeps Offshore Production Online

Volume 2 Number 12
Excerpt from December 2007

Predictive Maintenance Keeps Offshore Production Online

According to an ARC Advisory Group study, 60% of preventive maintenance is not necessary. The study also revealed that predictive maintenance is five times less costly than preventive maintenance practices.

"Migrating to a centralized, 24x7 data analysis system from remote locations for maintenance management is a complex process involving sensor technology, predictive analytics software and the data collection/communications infrastructure to support it," said Karl Faller, president of TIdata, a systems integrator for the upstream oil industry. "Cost justification is developed through measurable cost reductions and revenue improvement producing an excellent ROI."

While many production operations monitor temperatures, pressures and volume, among other parameters, such practices can be improved by using advanced predictive analytics programs as an early warning of developing equipment and process issues, using new sensor data and equipment data that is already being captured.

The purpose of a condition-based predictive maintenance system is to predict weeks or more in advance when and where a problem will occur. This gives the operator adequate time to schedule a remedy without causing unexpected downtime requiring shutting in revenue-producing wells. It also mitigates the risk of a larger more costly event.

South Carolina-based TIdata provides Predictive Maintenance (PdM) Systems to international offshore sites. Their comprehensive managed service, "Precise PdM", involves combining sensor engineering, data handling and software applications and managing the process from their Tulsa, OK, data center. The core business of TIdata is centered on collecting raw data from any output on the international offshore rig (sensors, devices, systems), transporting the raw data to a data center, characterizing and formatting the data, then analyzing the data for PdM or performance optimization and integrating the data into customer applications such as ERP/SAP, CMMS, EAM or other programs (see Figure 1).

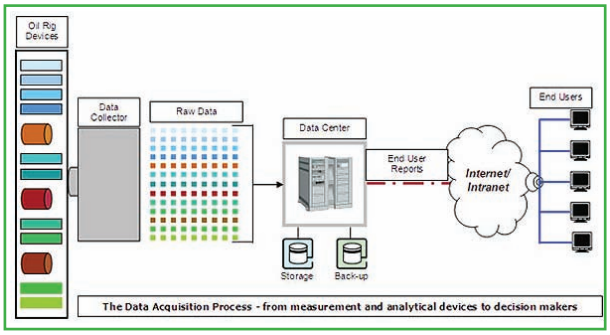

Figure 1. Data acquisition process.

"At foreign offshore oilfields in most areas of the world, we have the local presence, qualified technicians, certifications, licensing, etc., to install and support real-time data collection and communications systems connected to a centralized data center," Faller said.

Sensor Engineering

Aside from the typical sensors used for routine maintenance, online machine monitoring with the PdM system employs the following sensor groups:

- Vibration analysis;
- Lubricationcontent and condition;
- Thermography and infrared;
- Bearing wear sensors; and
- Other sensors, depending on equipment, balance, torque, speed, frequency, etc.

"Surprisingly, there appears to be a void in the market for this service," Faller said. "Many equipment OEM's refuse to touch anything beyond the iron, including sensors, software, etc. Individual sensor manufacturers are focused on their specific area of specialization, which covers only one or a partial requirement for sensor data. Sensor product houses are essentially catalogue shops providing an inventory of a wide variety of sensors for many purposes, but no engineering, installation and typically less than the latest or best of breed technology in each sensor category. The result is that there is a 'sensor gap' between the minimal sensors that the OEMs or users install and the available sensor technology with its corresponding benefits. TIdata has developed the expertise to provide

the sensor engineering to fill this gap and support the applications."

Data Handling

In addition to proper sensor engineering, there is a need for a complete infrastructure to connect data collectors/processors to the individual sensors, for the purpose of collecting, storing, logging, tagging, and time-date stamping the raw data values from each sensor. Connectivity must be established between these data collectors and the data communications system to transmit the data from the offshore rig to the data center, as well as characterize and format all the raw data into useable formats for integration with the software applications (see Figure 2).

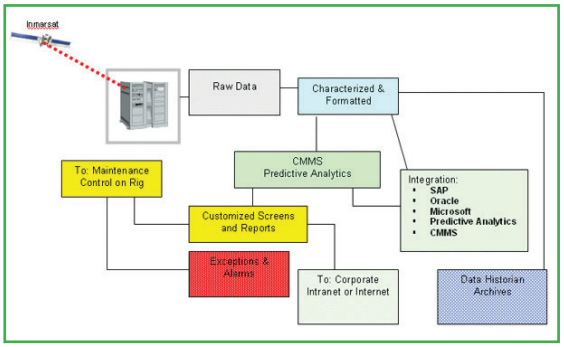

Figure 2. Integration with applications.

Data can be collected through polling, on-demand, periodic output or event/alarms. The data communications network can be a single-purpose network supplied by TIdata, or it can ride on the existing communications infrastructure on the rig, such as RigNet's infrastructure.

The data handling portion of the system begins where sensor output ends, and ends with the integration of formatted data into the designed software applications. In between, data are stored, and customized screens and reports can be provided back to the rig or to any user in the enterprise via a private internet/intranet connection.

Predictive Analytics Software

"Every machine is unique, even if it is of the same model, manufacturer and made on the same date. Some machines run a little hot, some a little cold, some vibrate differently; they all run with slight differences," observed Faller. "Understanding precisely what is the 'normal' condition of each individual machine and being able to observe slight deviations or trends from its norm is at the heart of understanding Precise PdM. The key to the PdM System is building an individual profile for each piece of equipment and measuring relevant deviations with no false alarms."

Precise PdM predicts a potential failure long before conventional monitoring systems by understanding the root cause of problems. The diagnosis and remedy actions are performed far in advance of any alarms, when it is often too late to prevent the downtime. Real-time condition-based predictive analytics enables maintenance as required, particularly for planned outages.

"One of the shortcomings of sensor analysis is that it does not provide root cause; it only indicates impending failure," Faller said. "To solve this, our data analysis is greatly improved by utilizing 'paired indicators,' or correlative sensors. Data from one sensor is coupled with data from another to form a complex indicator of condition."

For example, if bearing wear sensors indicate a problem, then the bearings are replaced. If, however, the bearing wear sensors are coupled with machine balance and the balance is off causing the bearings to overheat and wear, root cause is established. By fixing the machine balance, the bearings will no longer overheat and fail prematurely.

Precise PdM uses multiple, correlated sensor data for analysis. The technology is based on a sophisticated understanding of the complex relationships among correlated sensors. The comparison of expected sensor values to actual sensor readings in real time provides earlier warning of developing problems.

Using leading-edge predictive analytics software delivers increased uptime, improved performance, reduced cost and extended asset life, which, in turn, will improve the financial bottom line.

www.ti-data.com