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Intelligent use of Cloud sharpens operational insight

Cloud-based wireless sensing enables safety, reliability and profits through widespread asset monitoring

By Simon Rogers

Many assets found in oil & gas industry plants and facilities often are not connected — directly or indirectly — to a distributed control system (DCS) or other type industrial control system. While this reduces the number of assets requiring DCS inputs and outputs (I/O), it doesn't mean they don't require monitoring. Many assets need regular data monitoring as part of improved maintenance efforts, but not for real-time control. Examples include motors, pressure relief valves, safety showers and steam traps.

In most plants and facilities, these type assets are much more numerous than those connected to the DCS, and many of them are difficult to access, either due to distance from connection points or lack of access.

If traditional wired sensing methods were used to connect these assets to a DCS or other control system for monitoring, the expense would be astronomical. So, the status quo leaves many of these assets unmonitored, or minimally monitored by technicians periodically checking them during rounds. However, tightening health, safety, and environmental regulations (HSE) are forcing facilities to invest in better maintenance to improve safety, reliability and profitability.

An increasing urgency exists to implement industrial internet of things (IIoT) solutions to deal with these and other issues as inevitable demographic changes bring in younger workers, who sometimes possess less situational awareness and ability to troubleshoot these assets. The proliferation of data, and data-driven organizations, compresses timeframes for decision making and introduces digital competitors.

Safety is enhanced by reducing the number of field workers in dangerous locations. Reliability is increased by applying predictive analytics to the big data generated by continuous plant monitoring. Profitability is improved by precluding the need for consulting services for plant equipment failures and plant-wide improvements. These three anticipated benefits have been the catalyst for most IIoT implementations.

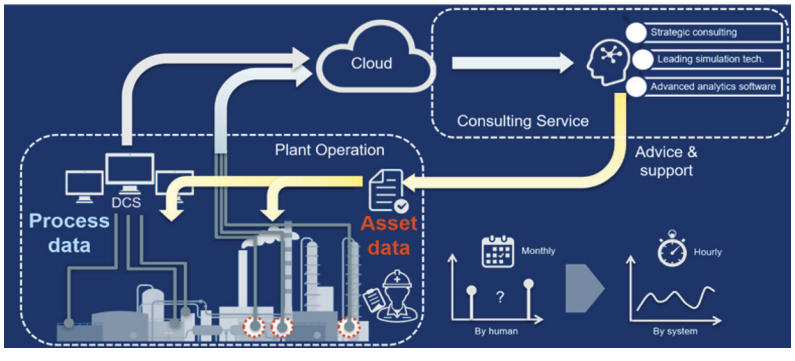

Figure 1: By integrating data into the Cloud, an environment is created for cross-sectional analysis, with third-party consultants able to perform high-precision analysis and provide suggestions for optimizing production. All figures courtesy: Yokogawa Electric Corp.

Address the issues

Condition monitoring coupled with predictive analytics can deliver a significant transformation by improving safety, reliability and profitability. Preventing a major asset failure often can more than justify the cost of implementation.

In the past, condition monitoring was accomplished by either walking around with portable devices and having the operators make ad-hoc decisions, or by installing extremely expensive condition-monitoring systems.

The first alternative produces inaccurate data that often doesn't get analyzed. The second is so expensive that only the most critical assets are monitored. What usually happens in a typical plant is a combination of the two. Rounds data is effectively useless, while condition monitoring systems that monitor only the most critical assets can miss the failure of less critical assets — those that become critical only after a failure.

When walkaround monitoring is replaced by inexpensive wireless sensors, such as a system of battery-operated sensors by Yokogawa, this is disruptive technology that alters best practices and proves extremely productive. It can improve safety by reducing the amount of time workers

are required to be in potentially dangerous areas of the plant.

Wireless monitoring also frees workers for more value-added activities, and the much larger number of sensors that can be installed permits ubiquitous and wide-scale monitoring throughout the plant or facility. The data gathered by these wireless sensors empowers online condition-monitoring diagnostics for a much greater number of assets, producing predictive analytics when this data is translated into actionable insights with guaranteed outcomes.

The best way to deal with this kind of data uses the Cloud. As is well known, cloud computing involves the practice of using a network of remote servers hosted on the Internet to store, manage and process data, rather than a local server or a personal computer. Because the plant data is in cyberspace, it can be interrogated from anywhere (See figure 1). The Cloud combines accessibility and convenience with enhanced plant security, as well as additional benefits.

The data can be seen by anyone using an approved smart device, and it can be remotely monitored and analyzed for condition monitoring and performance improvement by experts. Because the data is in the Cloud, a simple one-stop solution is provided for data management.

DaaS in the Cloud

The sensor series includes devices for monitoring vibration, temperature and pressure. These sensors and the Cloud service provided constitute a data-as-a-service (DaaS) offering.

DaaS appeals to operators of oil & gas industry plants and facilities that do not want to manage and operate numerous data collection, transformation and sharing solutions — all of which would require granting access to their internal OT and IT networks.

DaaS addresses these and other issues by providing one dedicated point of contact, along with one approved and trusted company that is granted access behind the operator's firewall. The required multiple-managed and -supported connections and visualizations are therefore handled by a third-party, separating these services from the operator's core business activities.

For DaaS with visualizations, operators receive exposed data from existing automation and asset management systems. This enables the use of tools for engineers, managers and other personnel to perform work through a browser. And of course, this work can be done from anywhere on any device capable of hosting a browser, such as a PC, smartphone or tablet.

DaaS is therefore an enabler of digitalization activities for operators. Digitalization forces good data practices, helping to simplify DaaS service implementations, along with the quality delivery of services to operators to promote their digital transformation activities.

Cloud case studies

It is no longer efficient to have workers doing rounds of equipment and assets, checking for potential failure. Those operators could be doing higher value-added work instead of filling in boxes on rounds reports attached to clipboards. It is just too easy for them to accidentally overlook a significant sign of abnormality, and failures often occur despite rounds.

For example, one plant was outsourcing vibration measurements for 200 items, with data collected monthly. This cost was approximately $48,000 per year, but frequent failures still occurred because the data was not digitalized, and the customer could not utilize the data for predictive maintenance.

The Yokogawa Group consulting company positioned dozens of sensor devices throughout the plant, with each transmitting data to the Cloud. Cloud-based data management tools provided visualization and trend monitoring to indicate abnormal signs of incipient failure.

The consultant provides the information to plant personnel so they can act. The plant gets real-time equipment status reports. Automatic warnings are provided to plant technicians when failure can be predicted. Because the data is

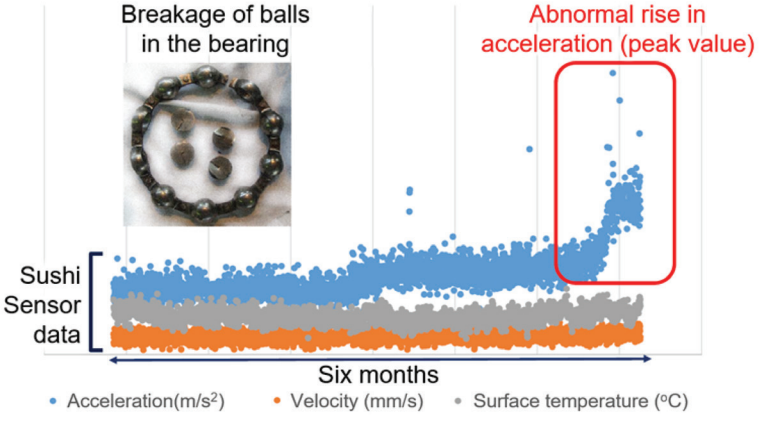

Figure 2: A sensor system monitored the acceleration of pumps and detected signs of abnormality before failure.

already digitalized, this methodology enables digital transformation of the plant.

Another plant installed wireless sensing devices on pumps, monitoring the acceleration for six months. In many cases, signs of abnormality occurred and were detected (See Figure 2).

These potential failures were most often traced to broken balls in the bearing assembly. Early detection allowed predictive maintenance to be performed on the pumps, keeping them in service and reducing the costs of unplanned downtime.

Final words

Simple wireless sensors are easy to install, relocate and connect to the Cloud. Data in the Cloud provides a force multiplier for consultants, and for maintenance managers, operators and other plant personnel. For many oil & gas plants and facilities, this is the quickest path to initial IIoT implementations.

Many sensors sending data to the Cloud provides ubiquitous and real-time field information that can be analyzed and acted upon to prevent failures and downtime. It becomes possible to optimize production by integrating utility equipment data not associated with the DCS. The data can be used as input to a digital twin in the Cloud mimicking plant operations, permitting the plant personnel and consultants to tune plant performance. The Cloud-based data can be analyzed by experts located anywhere in the world using approved smart devices.

Sensing, with data storage in the Cloud, therefore becomes "sense making" because it opens the way to digitalization of the plant. Digitalization leads to performance improvement and plant optimization. OG

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