

Leveraging the IIoT for Remote Monitoring and Diagnostics

■ New technologies enable rapid deployment of remote monitoring capabilities.

CONTRIBUTED BY VERICOR POWER SYSTEMS

Vericor's gas turbine engines are now being used in trailer-mounted mobile configurations such as hydraulic fracturing. This utilization requires a low-speed, high-torque cyclical operating cycle that differs from the power generation cycle for which gas turbines are known to excel. It is therefore imperative for the original equipment manufacturer to fully understand how its engines perform when operated through this type of cycle.

Vericor's legacy remote monitoring systems are typical of those used at power plants where the network infrastructure is housed within the facility where the engine

is installed. The same type of system cannot be used in mobile applications due to the need for small form factor devices suitable for rugged environments.

Initially, the approach was to develop a solution based on well-known SCADA technology. As different SCADA solutions were investigated, it became readily apparent that SCADA has now evolved into the Industrial Internet of Things (IIoT).

The emergence of the IIoT has made technologies available to quickly develop and deploy a viable remote monitoring package. One of the primary characteristics of the IIoT is the use of cloud computing for data storage, analytics and visualization. Vericor has partnered

with Microsoft to implement a cloud-based platform for remote monitoring services. Within the Microsoft Azure Cloud, data from the field are stored and served to a web browser interface or mobile app. Users interact with engine data through dashboards, trends and other visualizations. The cloud also hosts a digital twin of each engine that determines real-time performance. Predictive analytics is used with the performance trend to aid in the determination of maintenance intervals. An alert system pushes notifications out through SMS, email or a mobile app whenever certain critical faults are detected or if the digital twin identifies an abnormal trend in engine performance.

To collect data from the field, a network edge device is needed to extract data from the engine controller and relay it to the cloud. Vericor has partnered with LEC Inc. to provide the edge device and manage data transmission through its existing relationships with global cellular providers. Data are sent at 1-sec intervals during an engine start sequence and at 6-sec intervals while the engine is running at power. The edge device also retains up to seven years of historical data on an encrypted SD card.

Successful deployment in China

The IIoT-based remote monitoring system has been successfully deployed in a hydraulic fracturing trailer in China. The installation of the edge device took only a few hours with data arriving at the cloud within a few seconds of actual engine operation. The system continues to deliver operational data whenever the trailer is running. The immediacy and regularity of the data provide insight for Vericor to understand how its engine is being utilized in this application. Through the use of the digital twin, Vericor is able to proactively respond to performance trends and communicate that information to the customer.

Cybersecurity

Although the internet age has brought connectivity to an unparalleled scale, it has also brought serious cyber risks along with it. Cybersecurity needs to be considered throughout the development of any IIoT program. Exploits could result in asset downtime or damage to equipment. Therefore, the selection of IIoT technologies and partnerships must be well thought out. A thorough risk assessment of every possible exploit must be analyzed to develop a defense in-depth strategy for cybersecurity. In Vericor's remote monitoring system, the edge device and the cloud both incorporate multiple levels of cybersecurity protection. Even after development is completed, it remains necessary to stay abreast of industry standards and continually adapt best practices to mitigate these risks. ■

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