FREEWAVE

REMOTE MONITORING OF FIELD ASSETS

Custom Industrial App Development on FreeWave's IQ Application Environment

Overview

An independent petroleum and natural gas exploration and production company based in Southern California sought cost-saving solutions that would replace manual well pad inspections and proactively identify potential operational problems. It needed to digitize data collection and reduce maintenance overhead while increasing efficiencies, safety and reporting accuracy for one of its crucial well sites.

Working with its long-time operations partner and equipment provider, Accuflow, the company specifically needed to gather and email data from remote water injection meters for better and quicker decision making. Based in Bakersfield, CA, Accuflow is a recognized global supplier of well measurement and metering systems in the petroleum industry and has for years used FreeWave solutions to enable the wireless transport of remote well site data.

Although the company currently deploys the Theta XSPOC Well Management System, implementing it at this particular site would be costly and time consuming. FreeWave recommended the IQ Application Environment, its Linux-based application development and deployment platform, to meet these data needs. Deployed on FreeWave's 900 MHz series of ZumLink™ IQ Intelligent Edge Radios, the IQ Application Environment provided the edge-intelligent features the company required to implement its version of the digital oilfield and minimize expensive truck rolls and manual meter inspections.

Needs and Pain Points

The company needed a reliable alternative to remotely monitor Accuflow water injection controllers at various well sites located in the Southern California desert. There are currently around 60-70 active water injectors with more planned in the future. It currently deploys field personnel to manually record flow totals from these water injectors daily. Manual reporting costs like these are significant for companies that have operations in remote areas. Truck rolls and clipboards to inspect and maintain assets is expensive and potentially dangerous to field personnel. In fact, manual inspection costs can be up to $15,000 annually, taking into account inspection, mileage, and spill costs.

Moreover, this region of Southern California is hot and dry with temperatures in the summer reaching well over 100 degrees (F), and the sites require C1D2 equipment. The solution needed to be tough as well reliable and intelligent.

Accuflow implemented FreeWave's **IQ** Application Environment running Node-RED to replace manual reporting and enable daily email reports. Specifically, the company needed to:

- Access water injection data from any device
- Access to real time reporting 24/7/365
- Implement Proactive Maintenance and see problems before they occur
- View historical data and trends

The initial implementation gathers data from 60-70 active injectors at various locations. The solution needed to be vendor-neutral because the company could not remove its existing sensors and meters without incurring significant retrofit costs.

The total number of intelligent FreeWave ZumLink Z9-PEs deployed is 79, with 1 **IQ**-enabled base station device and 78 endpoints. The range of the various RF links is approximately 1 mile with a moderate amount of potential RF interference from well site motors and VFD power systems throughout the ecosystem.

Node-RED is an easy to use visual programming language for IoT application development. Originally developed by IBM in 2013, Node-RED is used to quickly assemble flows of services in the IIoT. Node-RED is available as an open source platform, and the flows created in Node-RED are stored in JSON and easily imported and exported to share with others.

Solution

RF Testing (Wireless Data Links)

With experienced and knowledgeable software and SCADA systems engineers onboard, Accuflow performed a radio survey which took less than one day. The Z9-PEs performed perfectly using 5 dBi omni antennas mounted and ping was 10-20 ms with no dropped packets.

Equipment

Seventy-eight (78) 900 MHz ZumLink Z9-PE C1D2 radios pull in sensor data from the existing Accuflow meters via Modbus interface at each wellsite. An edge intelligent Z9-PE at the base station is pre-loaded with the **IQ** Application Environment for full app programmability and to publish real-time site data to the company's email servers via Internet connectivity. Integrating seamlessly with Analog and Digital interfaces, each Z9-PE has 512 MB of RAM and 1 GB of flash that can store up to 30 days of site data.

Custom Application Development and Deployment

Utilizing the **IQ** Application Environment and Node-RED, Accuflow software engineers developed a custom application to be hosted on the base station Z9-PE radio.

The app extracts the flow totals remotely over the Z9-PE radio links (by Modbus TCP) and sends out a daily report email. With edge intelligent ZumLink IQ radios, the data is acted upon at the sensor utilizing an all-in-one system that combines sensors, wireless connectivity and process control via open-source programmability.

RESULTS AND ROI

The company expects the **IQ** Application Environment and ZumLink IQ radios to provide added value by freeing up some of its resources and time currently directed towards data collection and provide a system that will allow it to prioritize operations efforts.

> Implementing the intelligent edge solution will result in immediate and significant reductions in insurance, fuel and employee costs, enabling this site to be profitable even when oil prices plummet.

> The **IQ** Application Environment running Node-RED allows the company to set targeted work days that reduce field personnel deployments. The company predicts workers comp claims will drop because truck rolls and site inspections will be minimized.

> Despite that Theta's XSPOC Well Management System is present in the field, ZumLink IQ radios represent a more cost effective soft-PLC alternative to gathering wellsite data. The time it takes to set up all the injectors on the Theta system takes much longer to implement than to write a Node-RED program on the **IQ** Application Environment.

According to Accuflow Project Manager, Jacob Abel, "Gathering data from multiple points at a higher frequency for more proactive monitoring of performance vectors is now possible through FreeWave's **IQ** Application Environment and ZumLink IQ radios. There really is no ruggedized C1D2 app-programmable solution like it in the market today."

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