



Ivara EXP Remote Drives Maintenance Excellence at Transmission Substations

Power utilities face a unique challenge. Like many industries, they have an aging workforce maintaining an aging asset base worth hundreds of millions or billions of dollars. In addition, transmission and distribution (T&D) utilities need to deal with assets distributed over a wide geographic area, and customers who are immediately impacted when outages occur on critical assets. Ivara EXP Remote was developed to help companies drive maintenance excellence beyond the plant environment and into the field. This case study provides insight into how one of the largest utilities in the South Western U.S. is using EXP Remote to proactively monitor the health of their substation assets, direct maintenance work at the substation in support of their existing CMMS, and ensure that downstream customers can count on uninterrupted power supply for their electricity needs.

The Situation

One of the largest electric utilities in the United States has billions of dollars invested in their physical assets required to transmit and distribute electric power over 100,000+ square-miles. Over 100 trucks are dispatched every day to visit one or more substations in the network, perform some routine maintenance, and check the condition of the transformers, breakers, and other assets in the substation. This was being managed with a paper based process that defined standard maintenance procedures, collected some condition information, and provided a mechanism to request follow-on work.



The Challenge

The paper based process was slow, labor intensive, and prone to error. Condition checks were inconsistent, and depended on the expertise of the technician in checking for the right things and requesting the appropriate follow-up work based on the condition found. Since all the data was on paper, it was impossible to mine it for trends, and very difficult to use it to demonstrate regulatory compliance during NERC and WECC equipment audits.

What was required was an automated system that would generate the right condition monitoring and planned maintenance work, walk the technician through the detailed steps in performing the work, and automatically trigger any follow-up work to be done. The system needed to capture everything electronically so that regulatory compliance could be enforced, problematic trends identified, and the entire program could be continuously improved based on accurate historical data.



The Solution

The utility is now using EXP to drive the maintenance programs at Transmission substations. Reliability engineers have established best practices for condition monitoring and planned maintenance across all the substations, and codified these in EXP enterprise. Each night, EXP and SAP identifies the maintenance work for the following day based on optimal frequencies, current asset condition, and maintenance work in SAP PM. This work is downloaded overnight to EXP Remote on tablet PC's that are docked in the substation headquarters.

When the technicians arrive in the morning, they take their tablet, get in their truck, and drive to the substation. Some substations are in very remote locations; since the tablet is working in disconnected mode, the response time for the technician is immediate.



Panasonic Toughbook

The tablet is equipped with all the pertinent information required by the technician to perform their work. This includes inspection routes with specific indicators and predefined alarm states; any work requests or work orders generated from SAP; and detailed procedure definitions with schematics and pictures so that all maintenance work is executed in a consistent and safe manner.

The technician uses a barcode scanner to identify the asset they are working on, records inspection results from a dropdown list of options, and records any closing comments on the SAP work orders he completes. EXP remote supports calculated indicators and immediate alarms displayed on the tablet, so the technician can be notified in real time if there are follow-on tasks that should be executed while he is at the substation.

For example, one of the conditions to check is the temperature at different locations on the transformers. If there is a significant differential between the temperatures in two separate oil reservoirs, the technician will be prompted to take an immediate oil sample. The sample vials are included in his kit, and there is a printer in the truck which will produce the labels for the vials that can then be immediately dropped off at the oil analysis lab. Within 48 hours lab results are imported into EXP. If further corrective work should be done, an alarm is triggered, the work order is sent to SAP, and a copy of the corrective SAP work order is downloaded to the tablet. In addition to SAP PM, EXP will be



integrated with online monitoring tools and the geographic information system (GIS) to leverage complementary technology investments.

Each night the technician returns his truck to the substation headquarters, and returns his tablet to the docking station. All the information from the day is uploaded to EXP, and then the next day's work is downloaded. EXP Remote supports both wired and wireless connectivity, so wireless synchronization is also an option if a wireless network with the appropriate level of security is available.

Once the system is fully rolled out, there will be over 150 remote tablets in use. If a technician partially completed a route during the day, the results are replicated to all other tablets for that substation headquarters so that a different technician can finish the route the following day. All of the inspection data being collected on the remotes is combined with condition data from other sources (online monitoring, oil analysis, calculated indicators, etc) and summarized on an indicator alarm dashboard that highlights exception conditions.

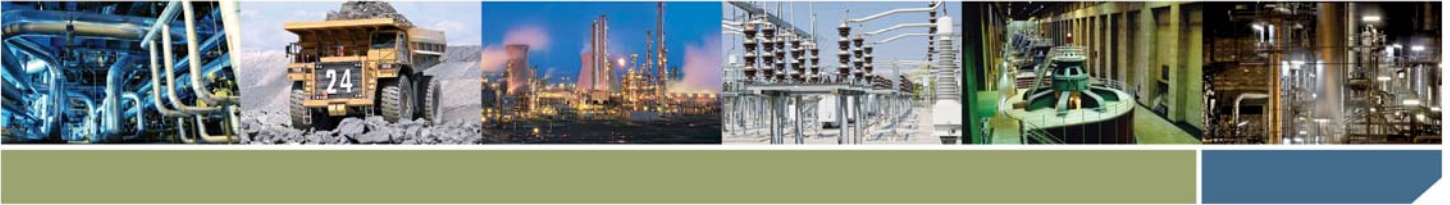
Reliability Engineers will monitor the dashboard which provides a summary view across all substations, with drill down capability to specific condition alarms on specific pieces of equipment. Using EXP they can acknowledge alarms and automatically trigger either an early call of an existing SAP maintenance plan, or an SAP notification. This allows the utility to continue to use SAP's forecasting tools to predict future labor and material requirements based on the updated maintenance plan schedule in SAP.



Now that the inspection and work results are in EXP in a structured manner, the data can be used to generate reports to demonstrate regulatory compliance. It can be leveraged to generate health indices which provide a summary view of asset health, and which help drive capital replacement decisions. But perhaps most importantly, the data is available in a format that can be analyzed for trends so that the reliability engineer can learn from history and continuously improve the overall proactive maintenance program.

The Result

By leveraging the power of EXP Remote, this utility is now able to efficiently execute the right maintenance work at the right time. Technicians have visibility to relevant asset data, SAP work orders, and current and historical condition information in a disconnected mode right in the substations. They are empowered to make fast and accurate maintenance decisions based on accepted best practices and real-time asset health.



With a centralized view of every asset's health, the utility also has the system in place to demonstrate compliance with stringent industry regulations, avoiding steep fines for non-compliance. EXP provides a consistent process for defining asset strategy, collecting condition data, and consolidating data from multiple sources. Historical data can now be used to analyze for trends, generate health indices, drive capital investment decisions, and optimize the maintenance program.

Conclusion

The days of using paper to manage time based maintenance programs while waiting for your customers to call and let you know the power is off are coming to a close. Forward thinking T&D utilities are leveraging Ivara EXP to define and automate a proactive remote maintenance program, and they are using EXP's analytic capabilities to mine this data for continuous improvement.

For more information, call 1-877-746-3787 or visit us at www.ivara.com.