Video Automation Solutions for Substations

Automated video systems provide utilities with real-time visualization of the substation allowing them to make key decisions designed to prevent outages, save time and reduce costs. Substation video systems use sophisticated multifunctional sensors and provide real-time information and analysis for input into substation maintenance and operations programs. Using the latest technology in video automation, these systems monitor key points in the substation providing visual and thermal imaging that ties into the utility SCADA system. Operators are provided real-time visualization of the substation assets and are automatically notified when normal operating conditions are not being met.
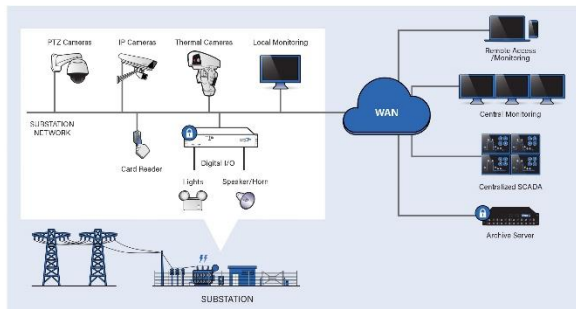

Figure 1: Video System Architecture

Video Automation

Substation monitoring systems differ from conventional video systems in function and application. A substation monitoring system is designed to give utilities a real-time view of the operational status of high value assets at remote substations from both the visual and thermal perspective. This differs from the conventional video system that is focussed on physical security. While a substation monitoring system can provide both operational and security functions, the same cannot be said of a conventional video system.

The data obtained from the video sensors is processed by an analytics engine in the digital video server at the substation that monitors the conditions at the site and determines if an alert should be sent to the operations and control center. A typical substation can have several video sensors deployed and it is not possible for operators to constantly monitor them all, especially if there are multiple substations involved. The video and thermal analytics automate the monitoring process and provide the alerts directly to the utility SCADA system when further action is required. Operators can open the alert message to view a video snapshot of the event and open a real-time video feed from the substation to view the live scene. All the video and alerts are recorded at the substation for review and archiving.

Figure 2: Embedded Video Snapshot

Thermal Monitoring

Continuous thermal monitoring detects abnormalities in the heat radiated from components or assets. Excessive heat is often the result of current flowing in unwanted areas resulting from insulation breakdown around joints, splices or in components such as bushings or arrestors and is often an early indication of an impending failure. Insulation breakdown can be accelerated by partial discharge or failing joints and if not detected can cause a line to ground or

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line to line fault resulting in a costly unplanned outage.

Thermal monitoring can also detect faulty cooling systems in transformers that result from failing pumps, blockages or leaks. In the best case, abnormally high operating temperatures in transformers causes premature aging, in the worst-case it causes failure.

Thermal analytics process the temperature readings and compare them between maximum and minimum thresholds and the rate of temperature change within each temperature zone. Temperatures exceeding pre-determined thresholds will automatically send an alert to the operator through the SCADA system so corrective action can be taken. The type and severity of the fault will determine if immediate action is required or if maintenance should be scheduled to restore the condition of the asset.
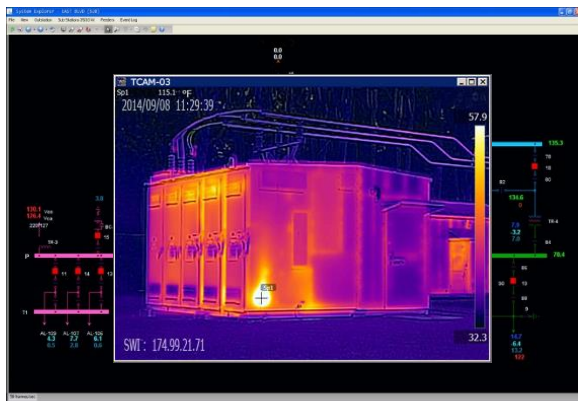

Figure 3: Real-time Remote Thermal Imaging

Visual Monitoring

Visual monitoring has multiple operational, maintenance and safety applications in a substation that can be done without sending a crew to the site:

Operational/Maintenance:

- Automated detection of events such as arc flash and switch arm movement
- Confirmation of remote controlled operations such as switch opening/closing
- Detection of animals around lines, switches, transformers

Safety:

- Ensuring safe conditions for the public and work crews at remote sites
- Witness and record that proper operational procedures are followed
- Intrusion detection, tampering, vandalism

Summary

Utilities are faced with the challenge of maintaining/improving service reliability without increasing costs. Video automation can remotely predict failures before they happen and detect and diagnose problems when they do. Video analytics automate the monitoring process to minimize the workload on operators and provide visual confirmation of the conditions at the substation.

For more information about Video Automation Solutions for Substations please contact:

Sales@systemswithintelligence.com

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