

Automated Video Monitoring Solutions for Substations

Exploring best uses
of automated video monitoring
solutions in substations.

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Substations are a critical component of the electrical power grid, and their safe and reliable operation is essential for ensuring the uninterrupted delivery of electricity to end-users. One innovative technology that has gained traction in the industry is automated video monitoring solutions for substations. These solutions use advanced video analytics to provide real-time monitoring and analysis of substation assets, enabling operators to quickly

identify potential issues and take appropriate action. It is key that for substation use, utilities seek out utility-grade solutions.

This whitepaper explores uses of automated video monitoring solutions in substations, such as their contribution to strengthening safety and security, and decreasing operations and maintenance costs.

Automated Video Monitoring vs. Conventional Video Systems

Without automated video monitoring solutions, utilities would have to rely on conventional video systems for insight into the status of their substations. Automated substation monitoring systems differ from conventional video systems in function and application. An automated 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 focused on physical security. While an automated substation monitoring system can provide both operational and security functions, the same cannot be said of a conventional video system.

Automated Video Systems

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 supervisory control and data acquisition, (SCADA), system. Operators are provided real-time visualization of the substation assets and are automatically notified when normal operating conditions are not being met.

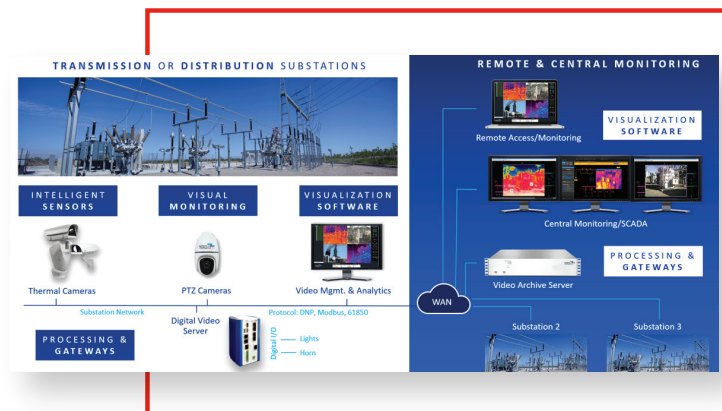


Figure 1: Video System Architecture

How Video Automation Works

The data obtained from 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. This poses a challenge for a single operator to be able to monitor all of the sensors in a substation at once, a task that becomes nearly impossible when there are multiple substations involved. The video and thermal analytics, therefore, 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

The Role of Thermal Monitoring

Continuous thermal monitoring detects abnormalities in the thermal radiation 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 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 predetermined 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:

The operation and maintenance of a substation are critical for ensuring its reliability, safety, and optimal performance. The maintenance of a substation involves regular inspections, testing, and servicing of the substation equipment to ensure that it is in good condition and operating at peak efficiency. Some ways that video visual monitoring helps with this include:

- 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:

The role of safety in a substation is critical and cannot be overstated. Substations are high voltage facilities that contain a large amount of energy, and the equipment within the substation can be dangerous if not handled correctly. Some ways in which visual monitoring helps improve safety are:

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

Summary

Utilities are faced with the challenge of maintaining and 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.

About Systems With Intelligence

Systems With Intelligence Inc. is a global provider of Touchless™ Monitoring Solutions for electric utility applications. SWI systems collect and analyze the data that allows utilities to increase safety and reliability while reducing operating costs. Coupling thermal monitoring and visual imaging technology with advanced analytic algorithms, Systems With Intelligence solutions automate remote site monitoring.

Systems With Intelligence products are engineered to operate in the harshest environments, withstand high levels of electromagnetic interference, static discharge and voltage surges found in industrial applications to ensure uninterrupted operation. Providing a monitoring system that operates reliably and connects seamlessly allows customers to remain focused on their operations.

For more information about
Video Automation Solutions
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