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Utilizing Touchless™ Monitoring to Overcome Maintenance Challenges

Explore the challenges utilities face with maintaining critical infrastructure and discover options to solve these existing issues.

The maintenance of critical infrastructure is a crucial aspect of ensuring uninterrupted service to customers. However, traditional maintenance methods can be time-consuming, labor-intensive, and costly, making it a daunting challenge for utilities. In response to these challenges, utilities are turning to Touchless™ Monitoring solutions that can provide real-time insights into the health of critical assets remotely.

This whitepaper explores the challenges that utilities face in maintaining critical infrastructure and how Touchless™ Monitoring can overcome them. It examines the key benefits of Touchless™ Monitoring, including reduced operating and maintenance (O&M) costs, improved reliability, and enhanced safety for both employees and customers.

What is Touchless™ Monitoring?

Touchless™ Monitoring is the automated collection of test and inspection data from remote sites and assets, providing utilities with the ability to monitor from virtually anywhere they have connectivity. The Touchless™ Monitoring system can not only collect, but analyze and alarm on any anomalies to allow utilities to take immediate remedial action if urgent attention is required. The system does a preliminary analysis on asset data and if any anomaly is found the alarm is recorded locally and forwarded to operators by email and to the SCADA system.

In addition to providing real-time visualization, inspections and alarms, the system will make the data available to SCADA, asset management and data aggregation systems such as PI for further analysis, trending, and integration. As utilities move towards Condition-Based Maintenance, it becomes increasingly important to track ongoing asset health so maintenance, repairs, and product life cycle can be planned.

The Benefits of Touchless™ Monitoring

Touchless™ Monitoring allows utilities to monitor the condition of critical assets remotely, providing real-time insights into the health of these assets without the need for on-site visits by technicians. This technology provides several key benefits to utilities:

- **On-line thermal asset data to enable Condition-Based Maintenance**
- **Increased service reliability and customer satisfaction**
- **Reduction in equipment failures and outages**
- **Improved employee and public safety**
- **Reduction in O&M costs**

Touchless™ Monitoring can play a large part in overcoming the current challenges that utilities are facing, such as keeping aging equipment and assets in good working order with limited manpower while at the same time, reducing operating and travel costs. An effective system will provide visibility to the thousands of unmonitored sites and assets.

Utility Maintenance Challenges:

Maintenance is a critical function for utilities, and ensuring the reliable and safe operation of critical assets is of the utmost importance. However, maintaining these assets can be a significant challenge, with utilities facing a range of issues such as:

- **Failures from aging equipment**
- **Limited manpower for maintenance**
- **Providing visibility to unmonitored sites**
- **Reducing travel costs**
- **Missing failure signs**
- **Improving employee safety**
- **High cost of installing monitoring systems**

Industry Statistics

- **70% of power transformers are 25 years or older**
- **15% of total O&M budget is planned maintenance**
- **Up to $9m of asset breakdowns due to manual inspection**
- **20% of total O&M budget due to travel time costs**
- **+100k us subs & underground vaults have no visibility**
- **Up to 75% of project costs are due to installation of sensors**
- **Up to 80 workers die annually from injuries in the utility industry**

How Touchless™ Monitoring Overcomes Maintenance Challenges

Aging equipment is more likely to fail and requires more monitoring and maintenance as insulation breakdown and corrosion becomes more prevalent. Electrical components will heat up as insulation breakdown and corrosion occurs and these components can be monitored using infrared technology. Thermal sensors perform automated scans and analytics on the fly that track and alarm on critical conditions. The automated monitoring is done 24/7 and allows the utility to perform Condition-Based Maintenance instead of time-based. Importing the data into an asset management application allows utilities to track of asset health and plan and prioritize life cycle management.

Return on Investment

- **Up to $15m in preventable transformer failures & lost revenue**
- **Up to 50% reduction in planned maintenance o&m costs**
- **Up to 20% decrease in breakdowns due to real time alarms**
- **Up to 50% reduction in travel time costs**
- **Up to $20m in preventable damages & wide scale blackouts**
- **30 min to get up & running with IOT or mobile**
- **Up to 100% of site & live equipment can be remotely viewed**

The Role of Automated Thermal Monitoring

Thermal monitoring using infrared technology is widely used by utilities but it is usually done manually and on a periodic basis. Manual scanning is good for finding persistent hotspots in the electrical system, but automated thermal monitoring has several advantages.

Automated thermal monitoring can:

- **Detect transient problems that only occur under specific load and weather conditions**
- **Detect faults that occur between scheduled periodic scans**
- **Capture data that can be correlated with voltage and current data**
- **Integrate data for trending and condition based maintenance**
- **Provide visibility to remote and difficult to access locations**

Being able to monitor remotely save utilities time and cost, and reduces their carbon footprint. It keeps employees more out of harm's way and allows them to perform more meaningful duties than driving for hours to remote sites.

Saving O&M Costs and Improving Safety

One of the key benefits of Touchless™ Monitoring for utilities is the potential to save on operation and maintenance (O&M) costs while improving safety. By enabling remote monitoring and real-time data analytics, Touchless™ Monitoring can:

- **Save travel time and cost**
- **Allow resources to be deployed more efficiently**
- **Reduce employee exposure to hazardous areas**
- **Optimize the operation and maximize the life of high value assets**

The advancement of technology has contributed greatly to lowering the cost and size of hardware for sensor technology, all while increasing the power and capability.
The decreasing cost of high-speed networks makes deployment of sensors easier and more cost effective.

Automated thermal sensors are truly "touchless" sensors, unlike a traditional temperature sensor, a single thermal sensor can scan hundreds of points in a substation without a physical connection. This means deployments can be faster and easier without having to take an outage to install the system.

Visual and Thermal Monitoring System

Touchless™ Monitoring is a comprehensive system that utilizes both visual and thermal monitoring technologies to provide utilities with real-time insights into the condition of their critical assets. The system includes several features to improve asset monitoring and increase employee and public safety.

Asset Monitoring

Asset monitoring is a critical function for utilities to ensure the reliability and safety of their critical assets. Touchless™ Monitoring provides utilities with a comprehensive asset monitoring system that utilizes advanced technologies to provide real-time insights into asset performance and condition

Some key features include:

- **Thermal and Visual Inspections**
- **SCADA and Asset Management Integration**
- **Automated Thermal Data Collection**
- **Trending Reports**
- **Real-time Alerts**
- **Automated Analytics**

Improved Safety for Employees and Public

Touchless™ Monitoring provides utilities with improved safety measures for both employees and the public. By reducing the need for site visits, the system can significantly decrease employee exposure to hazardous areas and reduce the risk of accidents. The following are some of the ways in which the system improves safety:

- **Reduced Site Visits**
- **Situational Awareness**
- **Intrusion Deterrent**
- **Procedure Monitoring**

Providing visibility of remote sites through visual inspections can be done on a more regular basis from the control center, consuming less time and resources. This allows utilities to ensure that everything in the substation is in good working order, conditions at the site are clean, safe, and secure.

High-power, high-resolution Pan/Tilt/Zoom, (PTZ), cameras give operators the ability to get close up views of gauges, nameplates, valves, switch settings, and connections. The cameras allow the utility to have visual confirmation of who is coming and going from the remote site, ensuring they are authorized and that safety procedures are being followed.

Touchless™ Monitoring Solutions allow control centres to:

- **Check gauges, nameplates, switch settings**
- **Check fluid levels and leaks on the transformer and bushings**
- **Inspect backup battery banks**
- **Check fences and gates are intact**
- **Check for wildlife intrusions**

The Role of Thermal Infrared Imaging

Thermal infrared imaging allows users to ‘see’ temperatures from objects as they emit thermal radiation. This is used in electric power applications to find hotspots that are a result of equipment operating with a fault condition that could lead to a failure.

The heat build up could be due to a number of problems including degraded insulation, fluid leakage or high resistance connections.
The automated system patrols the site, focused on gathering data from key systems such as bushings, transformers and load tap changers. The monitoring system provides a thermal image but more importantly it provides detailed temperature data that can be analyzed and trended, providing critical asset health data and alarms. The asset data allows utilities to plan and prioritize condition-based maintenance.

An integrated system will provide the data directly to SCADA or asset management applications so readings can be correlated with other conditions such as load and weather data.

Thermal infrared imaging allows users to monitor all primary and secondary equipment, including:

- **XFMR Bushings, Main Tank, OLTC, Cooling System**
- **Breakers, Switches**
- **VTs, CTs, Arrestors, Insulators**
- **Batteries, Cabinets, Panels**

Common Causes of Transformer Failures:

- **17% of transformer failures are due to bushings**
- **20% of transformer failures are due to tap changers**
- **4% of transformer failures are due to windings**

Electric power substations have high levels of electromagnetic radiation, voltage surges and interrupts, and are often located in areas with limited bandwidth. A substation monitoring system must be designed to operate reliably in these conditions and must have an architecture that will allow it to function even if connectivity to the site is interrupted. Ideally the system will have a direct connection to SCADA, asset management, and data aggregation platforms such as PI. This allows the data to be further processed and correlated with data from other systems and displayed on a common HMI.

Summary

Thermal imaging is a proven technology that utilities deploy on a periodic basis to find hotspots in the system that indicate problems that can lead to costly failures and outages. Developments in processing power and communications has allowed the automation of thermal imaging that can be deployed in a cost-effective manner. In the past, installation costs could be the same or more than the monitoring system itself, but new, Touchless™ thermal sensors are non-invasive, easy to install and don't require outages for their installation. An automated monitoring system can reduce maintenance costs for utilities while improving safety and reliability. Visual and thermal inspections can be done safely, remotely, and more often from the control center providing more up to date information. With automated inspections, transient conditions aren't missed, the system is monitoring during all load and weather condition so utilities can track and trend assets in a consistent manner. Providing asset health data integrated with SCADA and asset management applications, utilities can plan and prioritize maintenance with Condition-Based Maintenance programs that optimize resources and equipment.

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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 Utility Grade Video Automation Solutions for Substations please contact:

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