



APPLICATION NOTE: TOUCHLESS™ MONITORING FOR WIND TURBINES

The Problem

On site inspections of wind turbines cost time, travel and can be physically demanding and dangerous. Wind farms are usually in remote locations requiring extra time and logistics to get to sites with the proper equipment. Inspecting the equipment inside the wind turbine is labor intensive and requires specially trained personnel with the physical ability to access the equipment inside the nacelle. With the growing number of wind turbines being installed, and with the issues of on-site inspections a concern, wind farm operators are recognizing the value of online condition monitoring. Through automated and early detection of faults, more serious failures can be prevented through condition-based maintenance that allows operators to optimize resources and reduce repair costs. There are a number of condition monitoring systems for wind turbines to monitor both electrical and mechanical systems that operators can consider for their site.

Background

This windfarm operator wanted an online monitoring system that could detect faults that would allow them to schedule maintenance before more serious problems developed. Time-base maintenance was often performed on healthy systems and was costing the operator valuable resources that could be deployed for more urgent issues. The operator was familiar with infrared technology and how it could be used to detect hotspots in electrical systems. Infrared sensors detect the excess heat emitted through arcing in failing insulation or poor electrical connections. Infrared technology is a proven technology that has long been used by utilities for inspections of transformers, busbars, breakers, switches and other primary and secondary substation equipment. Additionally, infrared sensors can detect faults in other electrical and non-electrical wind turbine sub-systems such as the generator, gearbox, bearings, and cooling system. Major benefits of infrared sensors are that they are non-invasive; no physical connection is required to acquire the readings and secondly the system can be operational and under load during the thermal



Figure 1 – Access to the nacelle requires special training and equipment.

inspection.

The Solution

The IM500 SWITCH™ Module is an IoT sensor with onboard thermal and visual imagers and built-in wireless communications. An IM500 takes temperature readings on live systems and will detect overheating bearings, bushings, electrical connections, insulators and motors – even in enclosed and confined spaces. Due to its small size and low power requirement, the IM500 can be installed quickly using high powered magnetic mounts to keep the unit in place.

The IM500s are pre-programmed to take snapshots that give operators a visual and thermal view of the system. The thermal data is collected, stored, and analyzed on a continuous basis. The Systems With Intelligence dashboard provides a comprehensive view of the data providing graphs of the temperature points along with visual and thermal images. Alarm thresholds can be set in the dashboard, so operators are alerted instantly if temperatures are exceeded. The data and alarms can be sent to SCADA or PI systems through the Systems With Intelligence ISG500 Sensor Gateway, allowing the utility to trend the data and use it in a condition-based maintenance program.

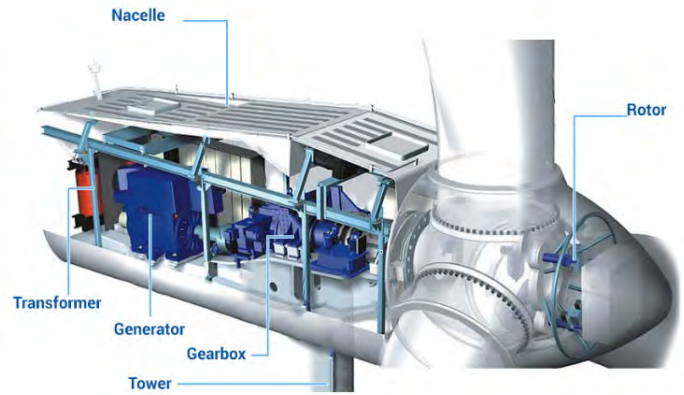


Figure 2 – Electrical and mechanical systems inside the nacelle can be monitored with infrared sensors.

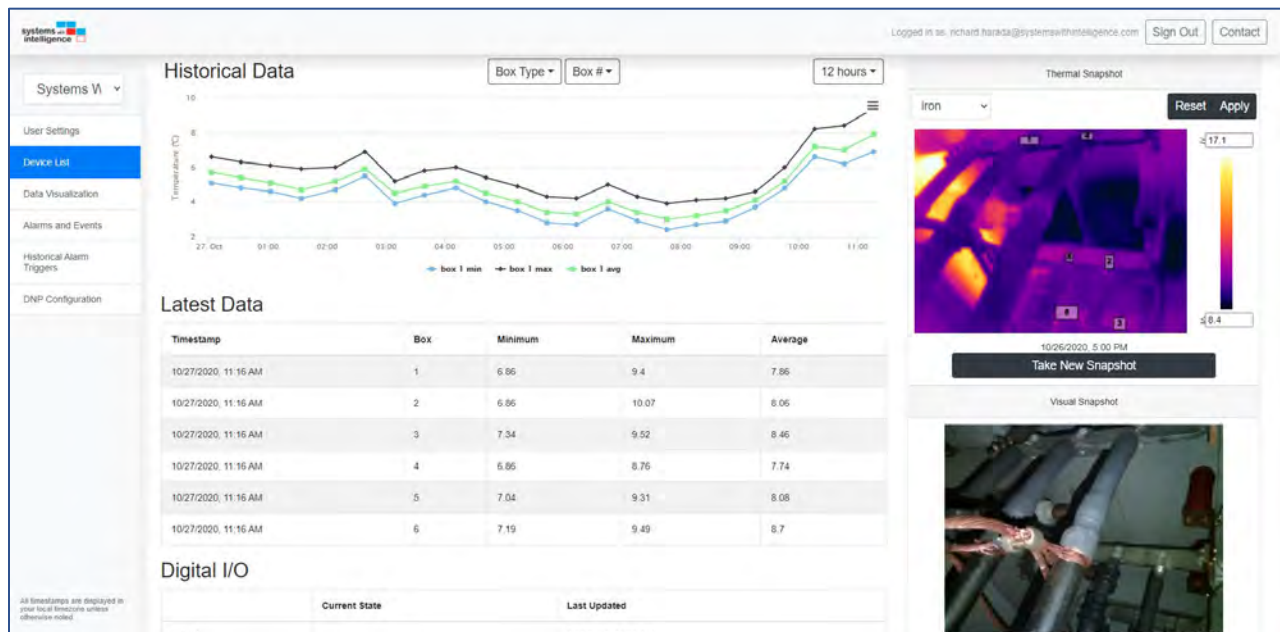


Figure 3 - Comprehensive dashboard provides status, trending and visualization information

Summary

The IM500 allows this windfarm operator to perform Touchless Inspections, with 24/7 monitoring on sites and equipment that would otherwise be difficult, costly and time-consuming to inspect. The IM500 provides visual and thermal imaging of equipment inside the nacelle without sending personnel to site. The IM500 installs quickly and easily due to its small and lightweight form factor, low voltage requirements and built-in communications. Temperature data is sent to SCADA or PI applications for further analysis, trending and input to asset management applications. Continuous thermal monitoring ultimately improves safety and reliability while reducing operating costs.

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