

Energy Harvesting Sensor for High Current Distribution Systems

Continuous temperature monitoring of switch cabinets and high current distribution systems

With the new energy-autonomous sensor mNODE, the Freiburg energy harvesting specialist company Micropelt can equip new and existing switchgear with continuous temperature monitoring, significantly increasing the safety and availability of the systems. Micropelt's energy harvesting technology makes this wireless sensor solution possible. The mNODE temperature sensor powers itself from the alternating electric field of the current-carrying conductor.

Harald Hellmann, Product Manager Sensor systems, Micropelt GmbH



Despite security measures, fires in electrical installations often occur with high damage, followed by loss of production. Reasons for this are typically hot spots caused by loose screws on bus bars, or loose terminal points. Also, aging effects in insulation, corrosion due to intrusion of dust or salt, and failure of fans or switching devices, as well as overload or irregular maintenance are often the reasons for such accidents. Especially in older plants or after conversion or extension, the risk increases. This risk can be significantly reduced by continuously monitoring the temperature at critical points within the switchgear. A timely warning helps to avoid this worst case scenario.

However, appropriate systems are not available. The usual scans with IR cameras are usually only moderately reliable and require a high level of competence in personnel. In addition, the retrofitting of large numbers of temperature sensors using wiring and integration into the control system is enormously expensive.

These considerations encouraged Micropelt, the energy harvesting specialist, to develop an energy-independent temperature sensor, which can be installed quickly and easily as a retrofit into existing switchgear.

The mNODE wireless sensor continuously monitors the temperature of low-voltage switchgear. It is powered by the AC magnetic field along the surface of the current-carrying conductor, using inductive energy harvesting. As little as 50 A of sensor current generates enough energy for temperature measurement and data transfer.

The mNode sensor can be clipped anywhere in the distribution system, because of its compact design and position independent fastening. Due to the self-insulating plastic housing, the mNODE sensor can also monitor critical points. The measured data is transferred with a robust, reliable, license-free 2.4 GHz radio using IEEE 802.15.4 standard, even in a shielded industrial environment. "Simply clamp the mNode sensor to the bus bar and it is ready for use, without any wiring effort," says Harald Hellmann, product manager of mNODE sensor system.



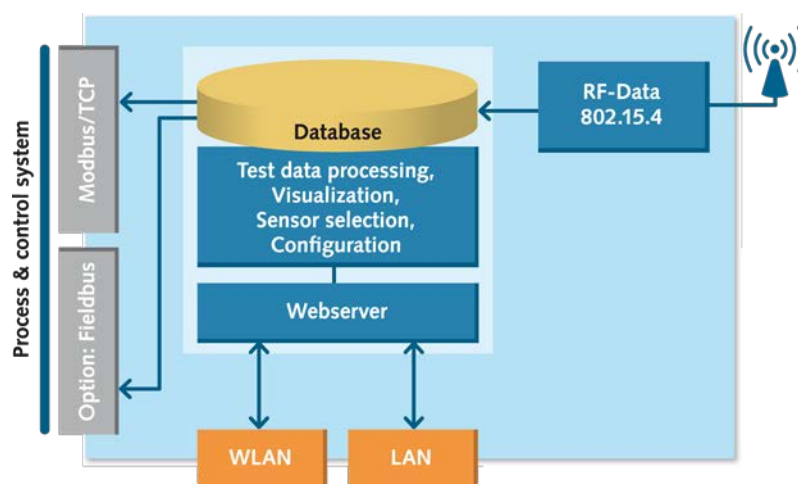
Self-powered mNODE sensor monitors temperatures in switch cabinets and helps to avoid accidents and interruptions during the operation of the system.

Sensor technology - detects defects early

Micropelt's monitoring solution increases the reliability and the availability of switchgear in low voltage power distribution equipment. Typical defects give can be detected by looking for increased temperature regions, for example on the surface of the bus bar or at the connections and the joints. Detected early, they can be repaired in time. "There is no faster and cost efficient way to add safety and reliability in new systems and particularly for a retrofit," says Fritz Volkert, CEO of Micropelt.

Technology solution for industrial infrastructure

The mNODE sensor captures the temperature measurements, transmits it to the NODE server (gateway) or directly to the control system PLC. The NODE server or the control system processes and stores the measurement data, performs plausibility checks, and calculates a trend analysis. When the user-defined threshold is exceeded, an alarm message is sent to the monitoring station and the mobile phone of the responsible person. Such active health monitoring helps plant operators to detect and avoid unforeseen failures and costly interruptions in advance. With



The NODE Server transmits the measurement data to the control system.

advance warning, internal or external specialists can be scheduled in time.

The Linux-based NODE server is used for the monitoring of distribution units or entire plants using more than five sensors, which process and transmit the data into the existing control system. These are individually configurable and use the communication protocol Modbus / TCP.

How to start? Use mNODE Evaluation Kit

For testing and evaluating the temperature monitoring system, Micropelt provides a test kit consisting of three mNODE sensors, a USB wireless receiver, as well as the SCOPE evaluation software. Using this kit, enables the sensor system to be pre-tested in already existing installations.



For test and evaluation, use the mNODE Eval Kit, which includes a radio receiver and the SCOPE analysis software.

About Micropelt

Micropelt develops and manufactures battery-free, wireless sensor and actuator solutions for building control and factory automation, self-powered by Energy Harvesting. Micropelt's intelligent deploy-and-forget systems scavenge electrical energy from waste heat or magnetic stray fields enabling user-friendly and smart solutions.

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