

Case Study

Temperature monitoring of Low and Medium Voltage (LV and MV) switchgear using Surface Acoustic Wave (SAW) Technology

As a key asset in our electric network, switchgear is one of the most vulnerable links in our power grid as it has moveable parts that are rarely exercised under normal operating conditions. They are subject to overheating because of overload, corrosion, loose connections and challenging environmental conditions. Left unattended these conditions can lead to failure of the switchgear, resulting in costly damage to the asset and surrounding equipment and, in extreme cases, severe worker injury and even death. New technology to monitor our switchgear is essential.



Client background

- The client has a significant in-house electrical generating capacity. They operate a large electrical network ranging from 220V up to 132kV.
- The loss of generation capacity affects not only a specific section of a plant, but also plant processes downstream.
- Unexpected failures on their electrical network can result in production losses that can cost up to millions of rands per hour.
- Until recently it has not been technically possible to monitor live electrical components safely and reliably with traditional temperature monitoring sensors.
- The ability to prevent unexpected failures on electrical assets can prevent unnecessary scheduled maintenance and limit invasive investigations of switchgear components.

Key challenges

- Safety and process do not allow for the opening or inspecting of any live electrical networks at any time.
- Certain assets on the electrical network are expected to be maintenance free for a minimum of four years before any scheduled maintenance takes place.
- Infrared scanning has had limited success as part of their Condition Monitoring (CM) approach but could only be done on some LV panels.
- Being able to monitor breaker contact temperature directly on an 11kV busbar has now allowed the client to extend circuit breaker life expectancy by reducing electrical load on an asset when breaker contact temperatures exceed predefined design limits.
- Identify possible unbalanced phase loading on their LV boards.

Value add

- Real time continuous monitoring of breaker and busbar temperatures
- Totally passive sensors which are critical for electrical installations
- Wireless sensor technology
- No requirement for battery replacement on temperature sensors
- 15-20 year life expectancy on the sensors with no maintenance required
- Broad operating temperature range
- Sensors are unaffected by voltage and current spikes
- Reduction in potential injury or death caused by arc flash incidents
- Reduction in exposure to injury liability
- Potential reduction in insurance premiums because of proactive CM on electrical networks
- Optional partial discharge monitoring for MV assets

Martec intervention

Martec, as the sole distributor for Emerson Intellisaw technology in South Africa, was asked to supply, install and commission Intellisaw temperature monitoring technology on critical 525V and 11kV circuit breakers at a large petrochemical operation.

The 11kV switchgear has been in operation for 25 years. However, replacement spare parts and/or circuit breakers are no longer commercially available. The risks to the plant and specifically production downtime costs if this switchgear fails are significant, hence the need to monitor circuit breaker contact and busbar temperatures on these specific assets.

As part of the client's drive to move to reliability centred maintenance, the client took the strategic decision to install Intellisaw temperature monitoring on their new 525V switchgear panels.

In conjunction with the project electrical consultant and the client, Martec identified the required sensors and hardware to allow the client to continuously monitor critical switchgear assets safely with non intrusive sensors and technology which are monitored continuously via the client's SCADA system.

Tools and technology

- SAW wireless temperature sensors
- CAM 5 interface devices
- UHF PD wireless sensors
- Humidity sensors
- Industry standard communication options
- Alarm and trip outputs with configurable limits