

# Case Study

## IIoT | Monitoring of Medium Voltage Switchgear using Online Partial Discharge and Temperature monitoring

*Production downtime on the crushing plant is one of the largest contributing factors to company profitability. Critical electrical substations assets and the reliability of the substation equipment has a significant impact on financial performance of the operations. Improvements in sensor technology and the ability to safely monitor medium voltage switchgear components on line makes it more attractive to look at IIoT and In time monitoring solutions.*



### Client Background

- The client operates one of the largest diamond mines in South Africa.
- Any production loss at the crushing phase of the operations has a significant impact on plant output.
- Unexpected failures on their electrical network can result in production losses ranging into millions of Rands.
- With future mine expansions and the introduction of additional plant capacity, the Engineering team want to implement IIoT condition monitoring on both old and new assets to improve plant reliability.
- The ability to prevent unexpected failures on electrical assets can reduce unnecessary scheduled maintenance and limit invasive investigations of switchgear components.
- IIoT improves substation safety online monitoring.

### Key Challenges

- Limited or no condition monitoring of critical electrical medium voltage substation equipment and assets has lead to previous failures which have had significant financial impact.
- Due to safety and process regulations and requirements, live electrical networks can not be inspected or opened at any time.
- Periodic off line visual inspections and testing have historically added some value, but are not predictive, and are typically only performed annually.
- IR scanning has had limited success as part of their Condition Monitoring approach. But this could only be done on some LV panels.
- Wired and battery sensors are not safe for use in medium voltage applications, and only with the introduction of passive wireless sensors can switchgear components now be monitored.

### Value add

- Realtime continuous monitoring of breaker and busbar temperatures with the advantage of monitoring partial discharge activity.
- Totally Passive Sensors which is critical for electrical installations.
- Wireless Sensor Technology.
- UHF Partial Discharge Detection.
- 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 due to arc flash incidents.
- Reduction in exposure to injury liability.
- Potential reduction in insurance premiums due to proactive condition monitoring on electrical networks.
- Operating temperatures and partial discharge levels integrated to plant SCADA system

### Martec Intervention

Martec, the sole distributor for Emmerson Intellisaw technology in South Africa, supplied, installed and commissioned Intellisaw Temperature and PD monitoring technology on critical 6,6kV circuit breakers and switchgear at the mine.

Failing circuit breakers poses a significant risk to plant production downtime costs, necessitating the monitoring of the circuit breaker contact and busbar temperature on these specific assets.

With the plant expanding, the engineering staff required a system that could safely be installed and rolled out to other equipment as and when required. As part of the clients drive to move to reliability centred maintenance, they took the strategic decision to install Intellisaw temperature monitoring on the 6,6kV switchgear panels for the crushing section of the operations.

Martec assisted the client in identifying the required non-intrusive sensors and hardware to enable the continuous monitoring of critical switchgear assets safely via their SCADA system. Installation was done during normal plant scheduled maintenance interventions.

### Tools and technologies

- SAW Wireless Temperature Sensors
- CAM 5 Interface devices
- UHF PD wireless sensors
- Humidity Sensors
- Industry standard communication options
- Ethernet SCADA integration
- Alarm and trip outputs with configurable limits