

Client Reference

Online Condition Monitoring for Gas Power Plant Generators

Online condition monitoring will provide information on the reliability of these generators. These critical assets should be online monitored to ensure operation within safe limits with early warning alarms indicating signs of deterioration and possible failure. An online monitoring system complements a proactive maintenance tactic.



Client background

The client is an integrated chemical and energy company that produces a range of high-value product streams, including liquids, fuels, chemicals and low-carbon electricity. A few years ago the client began producing power from a newly built gas engine power plant which has an export capacity of 140MW and is one of the largest power plants in South Africa using gas. Given the criticality of the plant, generators in an electrical network must be kept to a high reliability and maintenance standard to prevent premature failure. Recently the client conducted a routine annual shutdown of the generators in the power plant, where Martec conducted a visual inspection and identified defects which might result in a catastrophic failure. Should the client experience downtime of this critical electrical plant, the result would be a loss of production and revenue from exported power generation.

Key challenges

- No early warning continuous in-time monitoring systems were available to proactively warn the client of severe deviations.
- Plant production is heavily dependent on these generators, hence making them critical and unavailable for out of service periods. This is a burden on its maintenance programme.
- Partial discharge (PD) assessments were not part of the maintenance programme.
- The identified defects could not be repaired until the next shutdown, so monitoring was recommended.
- Although there are plans to repair generators in the next shutdown, they will still add to the risk because of the present condition of the insulation system in the stator windings of these electrical machines.

Value add

- Martec installed a monitoring system for four days which recorded PD Qmax and pulse count levels every three hours during normal operation of each generator.
- Additional parameters such as load, temperature and humidity were used for correlation with PD deviations.
- The condition of the generators could be viewed in real time with respect to PD which enabled confident risk assignment levels.
- Complementing sensors (RTDs and capacitive) were used to enable defect identification at different areas of the stator winding based on sensor location.



Martec intervention

Martec intervened to accomplish the following objectives during the annual shutdown:

Conducted a visual inspection of the stator windings in all generators to identify visible signs of insulation deterioration and partial discharge.

Compared visual images of identified defects to other generators of similar construction in the industry.

Submitted a visual inspection report which included defects identified, risk condition level and recommendations to the client.

Martec intervened to accomplish the following objectives to prevent failures:

Recommended a permanent in-time monitoring solution be installed to monitor the defects' development.

Analysed trends of time series data providing an indication of the assets' health status.

Provided threshold detection (warning and alarm limits) of specified parameters which will raise alarms to notify relevant personnel of potential defects ahead of time and prior to failure.

Create an extendable IIoT framework that can seamlessly integrate the monitoring solution with a web application raising notifications and communications.

Tools and technology

- Dynamic Ratings Rotating Machines Monitor (DRRMM) and PD Frequency Spectrum Analyser (FSA) - capable of multiple sensor integration.
- PD analysis software - Athena and PD viewer - very effective filtering, assisting in PD identification.