

Transformer Online Partial Discharge Testing

INTRODUCTION

During an online Partial Discharge (PD) survey at a Queensland resort high levels of PD were detected while assessing medium voltage cables. Key location techniques showed the PD was not related to the cable but was emanating from a transformer.

TESTING PROCESS

PD measurements were obtained by placing High Frequency Current Transformers (HFCT's) at various Ring Main Units (RMU's) and connecting to the diagnostic testing device.

When monitoring PD on a cable you will also detect PD from any plant that is connected to that cable – be it a machine, transformer or piece of switchgear. By strategically selecting the best locations to perform PD monitoring the complete MV network was able to be assessed.

KEY OUTCOMES

High PD detected on cable network

Location techniques proved a transformer to be the source

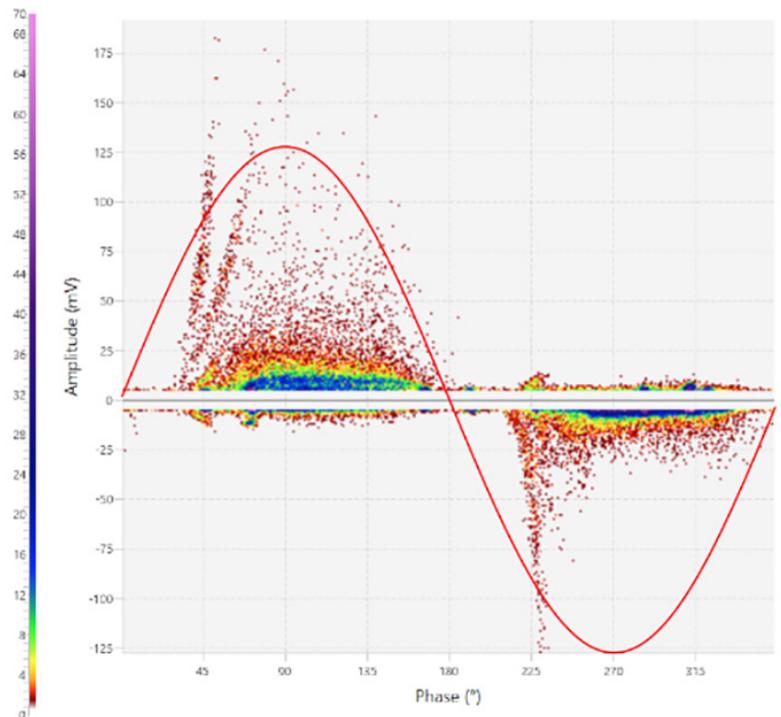
Transformer removed from service for repair

Despite transformers not initially being the primary focus of this PD survey, all assets were assessed through the strategic placement of monitoring devices.

The transformer identified was a significant risk to safety and reliability. Replacing it during a scheduled shutdown considerably improved the network



HFCT's



Phase resolved PD pattern

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When the high PD was detected it was imperative to determine the location. This was performed in the following steps:

1. Determining the PD direction using time of flight techniques
2. Analysing if the PD was from the end of the cable or within the cable. This was done using 'cable mapping' and measuring the PD reflection time
3. Once the PD was isolated to a kiosk, further timing measurements showed the discharge to be emanating from the transformer as opposed to the cable or switchgear
4. Transient Earth Voltage (TEV) sensors were used to determine the likely location inside the transformer
5. As a final confirmation the transformer was isolated and immediately the discharge vanished

Generally internal PD from a transformer will not produce a TEV signal as the tank acts like a faraday cage. TEV signals can emanate from the gaskets however, particularly when the PD is a high level, as was this case.

CONCLUSION

The transformer was substituted with a replacement while repairs could be made to the original.

Despite transformers not initially being the primary focus of this PD survey, all connected assets were evaluated during the testing process. The transformer identified was a significant risk to safety and reliability. Replacing it during a scheduled shutdown considerably improved the network.

TEV Sensor

