

## PDS100 Application Note: Finding PD in Current Transformers

**A TSO maintenance policy comprising power factor measurement of transformers every 9th year and oil sampling only on suspicion, where visual inspection only for CTs is a fact: Would a partial discharge (PD) characterizing degraded insulation ever be noticed? Not very likely, but perhaps a screening method looking for RFI from degrading insulation could be useful?**



A switchyard consisting of 33 oil filled current transformers was selected. The survey was planned by a site map where survey points were marked along a walking path to make sure all CTs were visited. At the very beginning a baseline was established outside the high voltage area. This is done to capture all radio wave activity supposed to be in the area, also inside the switchyard. By walking through every predefined point inside the switchyard recording traces at each stop, the radio frequency interference (RFI) can be compared to the baseline.

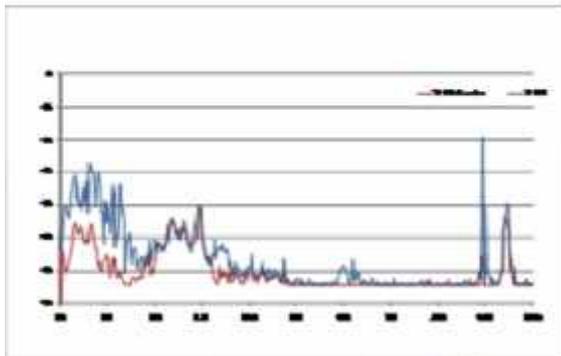


Figure 1

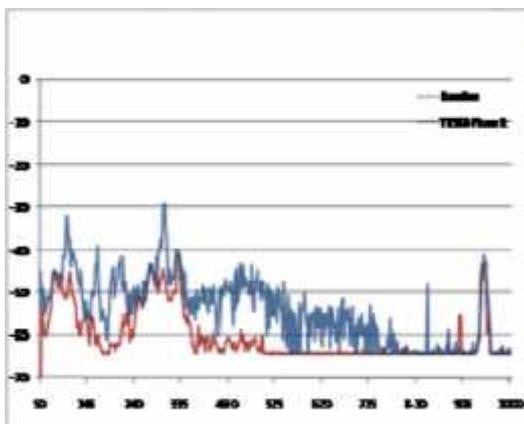


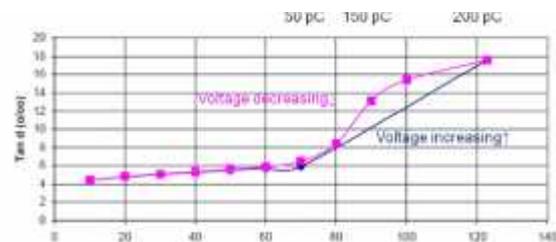
Figure 2

Figure 1 shows the **RFI pattern** (sweep from 50-1000MHz) a bit away from the suspected item and figure 2 shows how the RFI pattern was in close proximity of the suspected item. The baseline (the red trace) was obtained outside the switchyard.

A **dissolved gas analysis (DGA)** was taken and it showed a small to medium class partial discharge.

The suspected CT was taken out of service and brought to a laboratory and put to a test. A voltage source was applied and an electrical PD measurement was connected for measuring the apparent charge.

The PD ignited at 74kV (phase-GND, 128kV operating voltage) and the apparent charge was measured to 50-60pC. The extinguishing voltage was determined to 45kV (77kV operating voltage). At 120% operating voltage the apparent charge was 150pC.



A **tan delta measurement** showed slightly increase up to 70kV (0.43-0.59%) but it increased rapidly as the PD ignited at 74kV ending at 1.76% at 123kV.

### Conclusion:

The oil sample and lab test confirmed the findings in the change of the RFI patterns indicated by the PDS100. The survey of all 33 units was completed within one hour and covered all CTs (and also other apparatus). The test shows that even minor PDs can be detected by the RFI method. The PDS100 with a telescopic antenna can reveal the apparatus about to fail and prevent costly outages and collateral damage

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