



TOTUS Detects High-Energy Electrical Discharges in a 300 MVA Transformer

CASE STUDY





CHALLENGE

Managing Hidden Arcing Risks

Internal transformer arcing represents a critical operational risk for utilities, as ongoing internal damage can escalate rapidly, potentially causing major insulation failure, forced outages, or catastrophic events.

Decision-making can be challenging, removing a unit prematurely affects asset availability and costs, while leaving it online risks potential deterioration. Utilities require clear, precise visibility of asset condition to act confidently. Detection of acetylene in transformer oil through Dissolved Gas Analysis (DGA) is a strong indicator of internal arcing, which is typically caused by high-energy electrical discharges that can lead to serious equipment damage if not addressed promptly.



EVENT

Early Warning Detected by TOTUS

In June 2019, a 300MVA autotransformer began showing early signs of internal deterioration. Over four weeks, TOTUS recorded step increases in acetylene concentration, rising from approximately 2.5ppm to 10ppm - an early indicator of developing thermal or electrical stress. During the same period, five high-energy partial discharge events were detected, each directly correlated with the acetylene spikes. Continuous monitoring also identified persistent PD activity localised on the H3 winding, pointing to an underlying defect causing intermittent arcing.

This critical real-time correlation between dissolved gas trends and PD activity provided a clear, early warning of internal arcing long before any visible symptoms or operational abnormalities emerged.

Figure 1:

TOTUS Online DGA record of step increases in acetylene correlated with high-energy electrical discharges recorded by TOTUS Online PD.

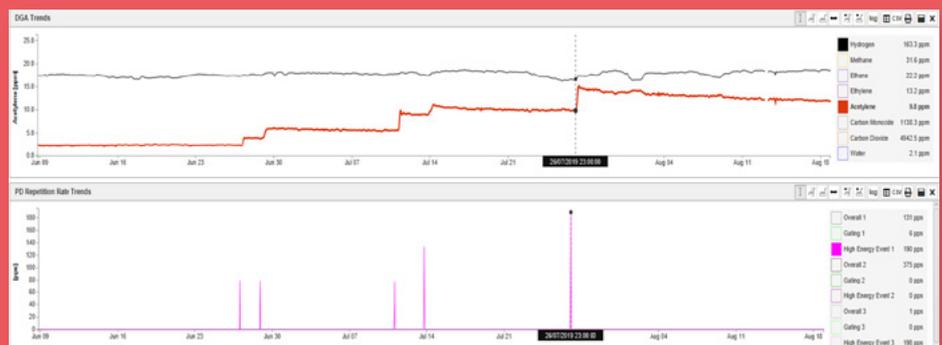
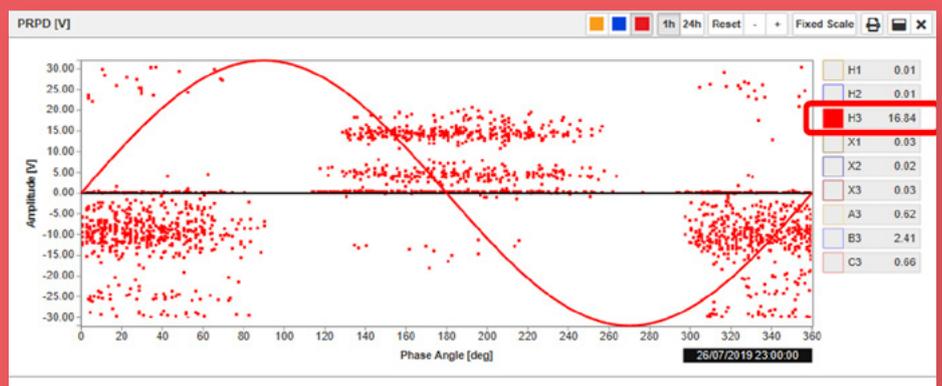


Figure 2:

TOTUS online PD shows a phase-resolved PD pattern displaying highest magnitude discharges on phase H3.



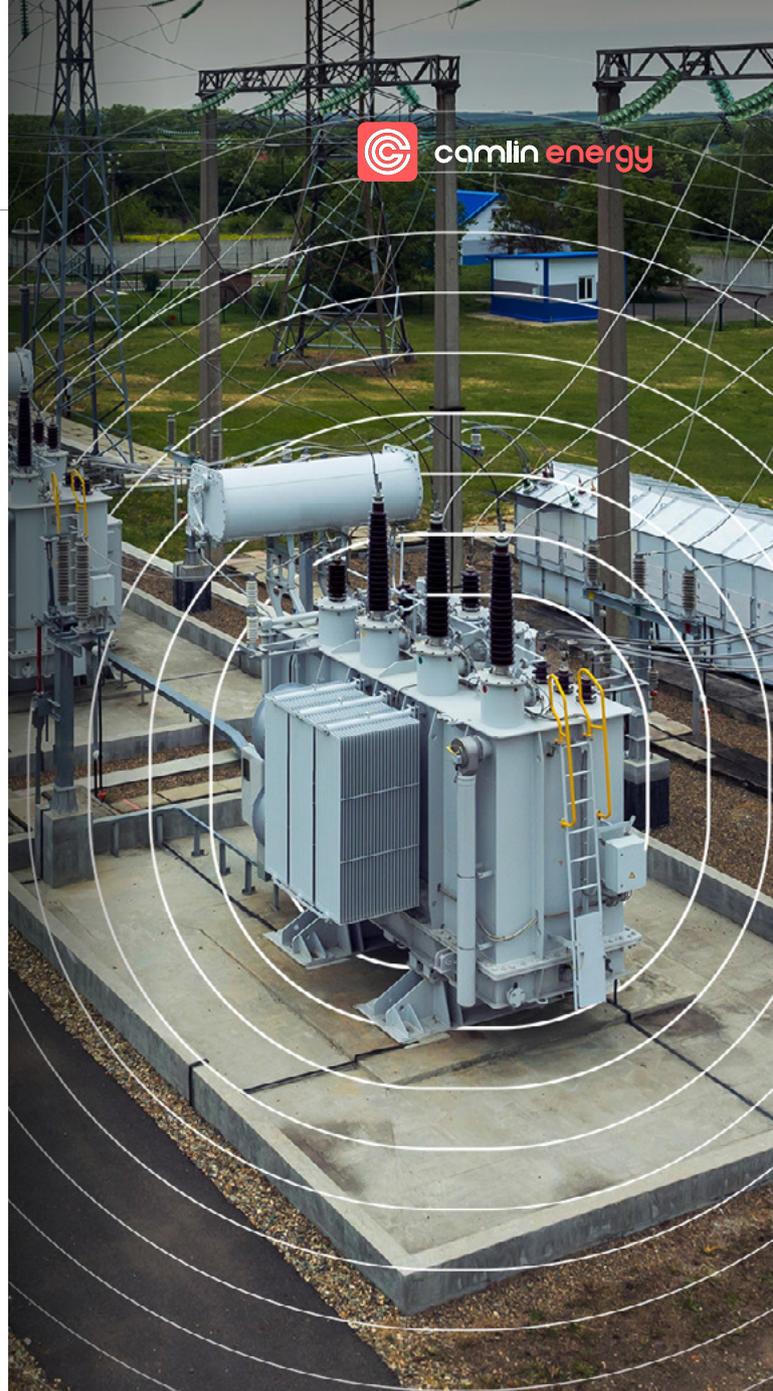


ACTION

Evidence-Based, Targeted Intervention

Instead of initiating a full shutdown, the utility made a controlled, informed decision to keep the transformer in active service, under enhanced surveillance while planning targeted offline testing of the H3 winding. This included winding resistance measurements, Power Factor testing, and additionally an internal inspection of the H3 connections.

The move to evidencebased decisionmaking enabled the utility to pinpoint the true location of the issue, preventing the ripple effects that come from treating every potential fault as a systemwide emergency. With the risk accurately isolated, the utility avoided widespread interventions and instead redeployed time, budget, and personnel directly to the asset that needed action.



OUTCOME

Operational and Commercial Impact

Technical outcome:

- ↘ Early detection of internal arcing before external symptoms appeared
- ↘ Localised risk to H3 winding, enabling **precise, targeted inspections**
- ↘ Avoided unnecessary removal of transformer from service

Commercial & Operational Impact:

- ↘ Maintained **network reliability** while taking corrective action
- ↘ Reduced risk of **catastrophic failure** and associated operational disruption
- ↘ Enabled **planned maintenance**, avoiding emergency shutdown costs
- ↘ **Focused resources** on the component that truly required attention