PD Success – Twelfth Time's the Charm

Partial Discharge surveys are a powerful assessment tool that can find gross insulation problems within your HV plant from the very first survey. However activity of this type often evolves organically over time so where you are in the cycle relative to a defects' maturity can ultimately determine a successful detection, or put another way if it's not active when you're on site then you will be unable to identify it.

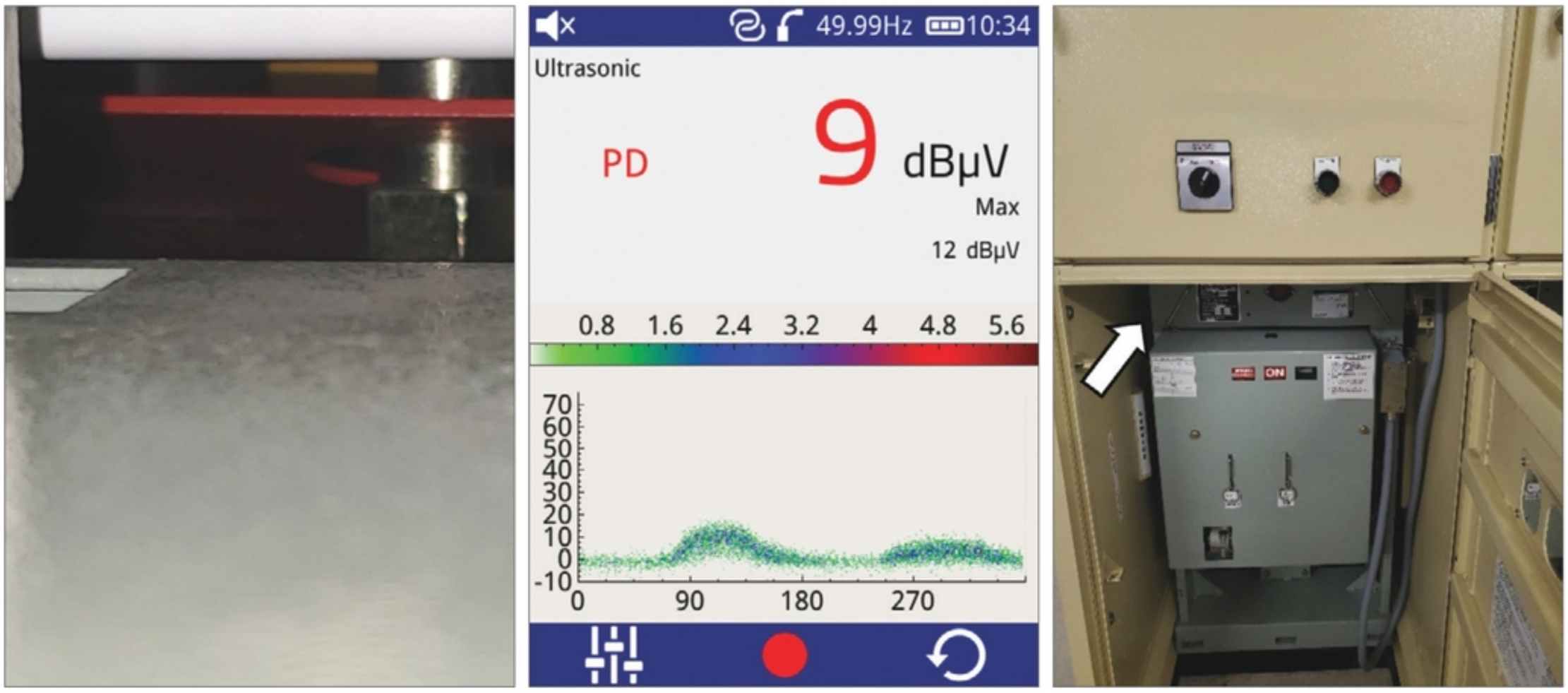

Figure 1

A key strength of the process is the capacity to trend over time and observe 'first-hand' the small changes that occur as PD develops ensuring that maintenance is deployed when, and only when it is actually necessary. The PD survey should not be thought of as an isolated one-off test but rather as an ongoing activity much like a 'Warrant of Finess' for the family car and in this way a regular, repeatable survey is paramount to ensure an appropriate data sampling period.

THE FACTS

This switchboard, installed in 2001 as a replacement to the original BVP3 gear was first benchmarked in August 2002 and has been surveyed 12 times over the ensuing years, or approximately every 2 years with clear results as might be expected of relatively young asset, up until our most recent visit.

Ultrasonic activity was detected from above the Circuit Breaker truck around the shutters on the 26 August 2024 and the Bus shutter could be seen hanging low (Figure 1). A relatively common occurrence, we have numerous examples for this specific type of equipment and while the max 12dBuV is considered only medium-low the PRPD plot confirms genuine surface discharge and an inspection was recommended to the Asset owner.

THE FINDINGS

Disappointingly we weren't present for the investigation approximately 2 months later on 31 October 2024 however photos of discharge to the epoxy-resin surface of the Truck as well as to the edge of the metal shutter were shared, showing significant damage. It appears self-evident that this has been active, on and off for quite some time and likely much longer than the 2 years since the previous survey – just how long is anyone's guess.

Cleaning the insulation surface is a straightforward procedure if caught early enough and leaving it in a glossy, polished state minimises future damage from tracking / treeing. Treating the blistered paint and rust on the shutter edge, a function of moist air mixing with the gases produced (such as ozone) prevents further degradation to components whilst crucially suppressing the atmosphere that allows PD to thrive (Figure 2).

Finally the mechanism generally needs some adjustment to ensure the shutter sits in the horizontal position when racked in service, well clear of the epoxy-resin body located beneath as this type of insulation does not tolerate surface contaminants, including undesigned 'metalwork' be that at earth potential or otherwise (floating).

THE SUMMATION

Ultrasonic surface discharge, like many forms of PD starts off slowly, gradually gaining momentum as the months and years pass until an intermittent source develops into something more continuous. At this point it becomes very much easier to identify and therefore the frequency between surveys is imperative – too long between visits means this type of defect can be easily missed, demanding a larger intervention due to increased damage when it is eventually found, or worse yet an undetected failure.

Ambient conditions such as Humidity and Temperature also play a role in whether something is active and available for detection vs dormant so controlling these environmental factors can contribute tremendously to the health of your HV infrastructure.

Figure 2

An annual PD survey is considered best practice providing good compromise between cost and coverage, perhaps 2 yearly for newer installations however intervals longer than this are not recommended due to the increase in risk profile. Alternatively, Permanent Monitoring options can be justified for critical infrastructure such as Airports, Hospitals or high value Production sites and an excellent article from EA Technology Australia posed the question in 2023, Issue 4 *Transmission & Distribution* "PD Testing of HV Assets: How often should we test?" can also be found online.

Contact HV Diagnostic Services or EA Technology for more information
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