

# WHEN WERE YOUR VT FUSES LAST CHECKED?

*Both TEV and Ultrasonic need to be considered when attempting to identify Partial Discharge, and TEV Amplitude alone may not be an accurate indicator of the actual source due to the different signal pathways.*

**H**V Diagnostic Services was in Whangarei conducting regular 11kV Switchboard assessments of their local Zone Substations in October 2017. The Kioreora site containing aged BVP17 type switchgear exhibited both elevated TEV readings on one of the Incomers, and Ultrasonic activity from around the spouts of its installed Voltage Transformer.

## OUTAGE WAS RAPIDLY ARRANGED

The Switch Tank (CB truck) exhibiting TEV of 44dBmV was the highest, and 30dBmV above the Background Metalwork reference while the VT and surrounding Trucks weren't far behind. Severity measurements were high (where anything greater than 100 is cause for concern); Switch Tank 950@6ppc and VT 612@6.12ppc while double probing for signal direction identified the VT as the source, figure 2(Channel 2 located on VT triggers first).

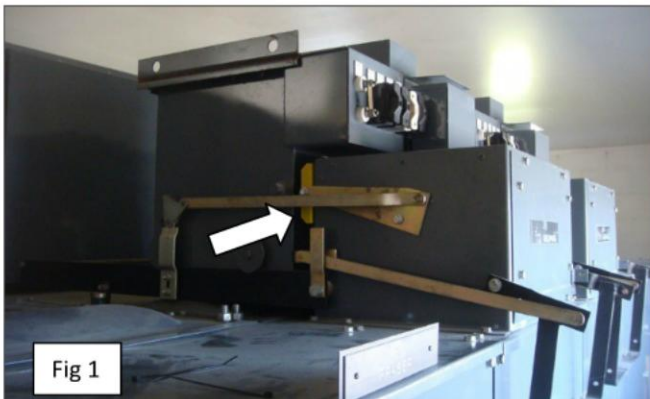


Fig 1



Fig 2

Ultrasonic activity (refer figure 1) was detected from the Blue Phase Bushing at 24dBuV at Gain 100, right on the cusp of requiring the Gain to be turned down, and further initiating the need for an

investigation. Following discussions an outage was rapidly arranged for the next day and an interim report submitted to the client that evening proposing inspection of the VT Spouts, Bushings and internal HV fuses.

HVDS staff were on site during the outage to assist & advise, and as speculated the HV fuses and plunger butt contact were in extremely poor condition per figures 3 & 4.



Fig 3



Fig 4

Upon sighting of the Blue phase fuse it was obvious that all three should be examined and unsurprisingly similar rates of surface deterioration were found on three of them (figures 5 & 6).

Fortunately some 'spares' were located within the Switchroom which looked as though they'd been there since day one which begs the question how often should these HV fuses be inspected over the course of a units lifetime? After a general clean-up they were ready to install and following restoration of the circuit a re-test confirmed that TEV readings had fallen significantly, the Switch Tank now 28dBmV, VT 34dBmV and Ultrasonic clear. However, similar

activity from its neighbour (refer figure 1) was now active with elevated TEV (influencing these retest values) and Ultrasonic present from the Red phase side, confirming it too would benefit from the same treatment.



Fig 5



Fig 6

Sometime later I mentioned my findings to EA Technology who were able to produce the Manufacturers original 'Inspection and Maintenance Procedure for Instrument Voltage Transformers' dated March 1998 which describes the possibility of electrical discharge to the moving portion contact assembly under certain conditions. A further modification was added in Nov 1999 which involved the introduction of a fine beryllium spring to the butt contact assembly improving electrical continuity between the retaining collar and plunger stem.

### SUMMARY

So in summary both TEV and Ultrasonic need to be considered when attempting to identify Partial Discharge, and TEV Amplitude alone may not be an accurate indicator of the actual source due to the different signal pathways. Greg Linton's 20 years of experience means that HV Diagnostic Services understands when more detailed measurements are required, and has uncovered a great many local examples of PD from right around New Zealand. Of equal value to the customer though, is our relationship with EA Technology allowing us to tap into 40 plus years of collective knowledge from their experts (headquartered in UK with offices worldwide). This also provides assurance that our services conform to international best practices, and can be of further assistance with a wealth of information on both current day scenarios and from a historical perspective, covering the evolution of switchgear and the various insulation systems used throughout.

HV Diagnostic Services updated their primary test Instrument halfway through 2018 to EA Technology's latest, the UltraTEV Plus2 featuring such enhancements as phase resolved plots, the ability to record measurements and screenshots internally, built in classification algorithms, Cable PD, NFC tags and more.

Contact your local PD Authority for more information.

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## SPECIALIST Condition Assessment Services, Products & Support



### Why HVDS?

- Experience with over 15 years of local NZ insight to share
- Expertise with a proven and successful track record
- Independent, knowledgeable and candid advice
- Consultancy incl. CBRM via our Australian colleagues

### Core Activities

- In service PD surveys for ground mount switch assets
- Overhead Ultrasonic, UHF and IR assessment in Switchyards
- VLF mapping of Cables, Offline and accurate
- Instrument Training, basic Calibrations and Spares

### Distribution Portfolio

- UltraTEV family of Testers, Alarms and Monitors, EA Technology
- Thermal Cameras - Entry level to Professional, Guide Infrared
- The Safety assured maintenance aperture system, Viewsafe UK



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