

WHY CONTINUOUS MONITORING FOR PD?

Partial Discharge activity can be notoriously intermittent making detection confusing for beginners and frustrating for even the experienced. The lack of a steady state signal for measurement can create uncertainty over results, raise unfounded questions on the accuracy of the measuring device or worse still, cause a drop in confidence surrounding the entire process for field personal and management alike.

So for Critical, or impossible to isolate switchboards a period of Continuous Monitoring can be a vital tool in assessing insulation integrity, whether this be in a permanent installation with full web integration or a more modest period over a shorter term.

Christchurch's HV Diagnostic Services operates three x 12 channel TEV Monitors, typically over a 7 day period and these instruments provide full precedence detection between channels allowing accurate pinpointing of activity, and are particularly useful in noisy environments. Obviously they are ideal for catching erratic Partial Discharges while the extended measurement window (as compared to any spot check) captures changes in both Network Operating & Ambient conditions,

both of which can influence the inception and extinction of Discharge activity.

REAL WORLD EXAMPLE

This real world example from our home town, January this year demonstrates the advantages of Continuous Monitoring and based on our initial Location Survey (below) was used to confirm exactly 'where' the source on CB13 Termination Box was originating, given that a level of 31dBmV had been observed directly on the Cable Gland during subsequent spot measurement.

A spare Monitoring slot was allocated and rather than spread probes evenly across the board and target chambers that hadn't been previously Monitored, we grouped them around the area of suspicion with the expectation of confirming a Location.

The Monitor Summary table (opposite) shows a cluster of activity centred on Channel 4, itself recording equal highest Amplitude, highest Number of Pulses, Pulse rate and therefore Severity.

Aerials 1, 2, 11 and 12 really haven't recorded anything so we can be confident that external noise is not a contributing factor here and the following photos document probe positions of Channels 3-6 as highlighted in the Summary table.

Graphing the data (overleaf) provides clear evidence that Channel 4 is positioned nearest to the source based on the instruments ability to measure the time of arrival of signal at the various probes. We can see a pretty steady 20,000 pulses on the Pulses 'First' graph across the 3 days, way out ahead of Channels

INITIAL LOCATION SURVEY

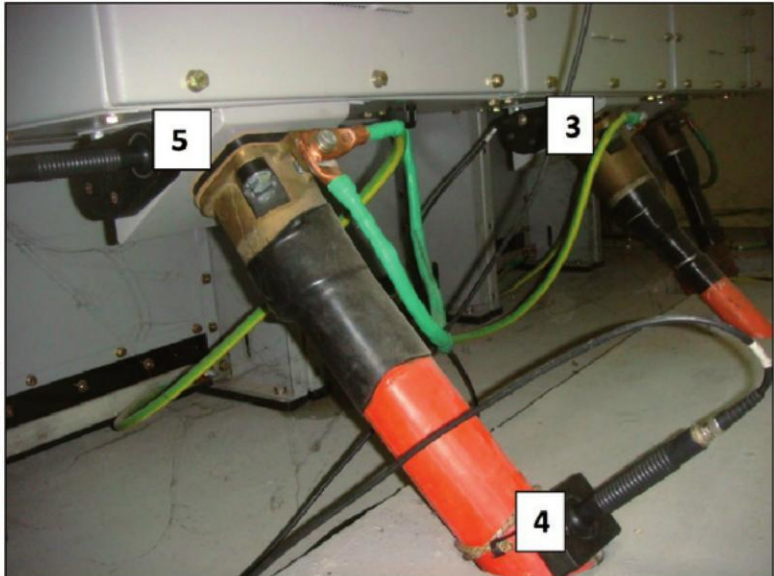
PANEL NAME	SWITCH POSITION (OPEN, CLOSED, EARTHED, ABSENT)	BUSBAR 1 UPPER/ FRONT	BUSBAR 2 LOWER/REAR	SWITCH TANK	CT CHAMBER	VOLTAGE TRANSFORMER	TERMINATION BOX	BAND JOINTS /END CAPS	
								BUSBAR 1	BUSBAR 2
Busbar Endbox							15		
CB10	C	9		14	4		15		
CB11	C	15		11	5	17	16		
CB12	C	8		9	3		21		
CB13	O	8		17	5		22		
CB14	C	13		11	13		-		
CB15	C	6		8	3	7	12	9	
CB16	C	8		6	6		9		
CB17	C	10		5	7		11		
CB18	C	9		6	4		8		

Continued over ▶

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MONITOR SUMMARY TABLE

Ch	Max Level	Nos of Pulses per cycle	Av Level	Short Term Severity	Nos of Pulses	% Pulses	Max Pulses per cycle	Assoc Level	% Time	Severity Long Term	
Short											
1	10	0.000	0	0	1633	0	0.002	0	81	0	0
2	16	0.000	0	0	735	0	0.023	0	21	0	0
3	28	0.074	25	2	530880	3	0.074	28	100	1	2
4	31	1.464	28	52	18224785	98	1.485	28	100	34	52
5	31	0.192	27	7	2208461	12	0.199	28	100	4	7
6	28	0.390	25	10	4556616	24	0.398	25	100	6	10
7	0	0.000	0	0	102	0	0.007	0	0	0	0
8	16	0.000	0	0	253	0	0.015	0	1	0	0
9	0	0.000	0	0	5	0	0.000	0	0	0	0
10	16	0.000	0	0	192	0	0.013	0	0	0	0
11	0	0.000	0	0	0	0	0.000	0	0	0	0
12	0	0.000	0	0	21	0	0.001	0	0	0	0
Total number of pulses				= 18651862							
Total number of sets of data				= 898							
12 channels connected, 14400 cycles per 5 minutes											



SPECIALIST Condition Assessment Services, Products & Support



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Why HVDS?

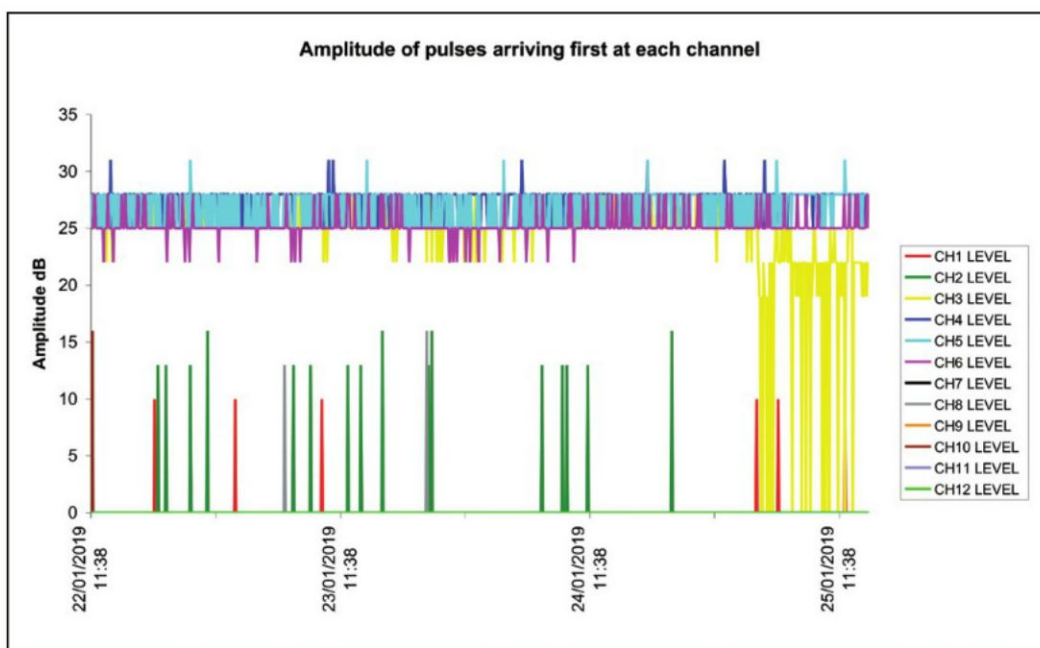
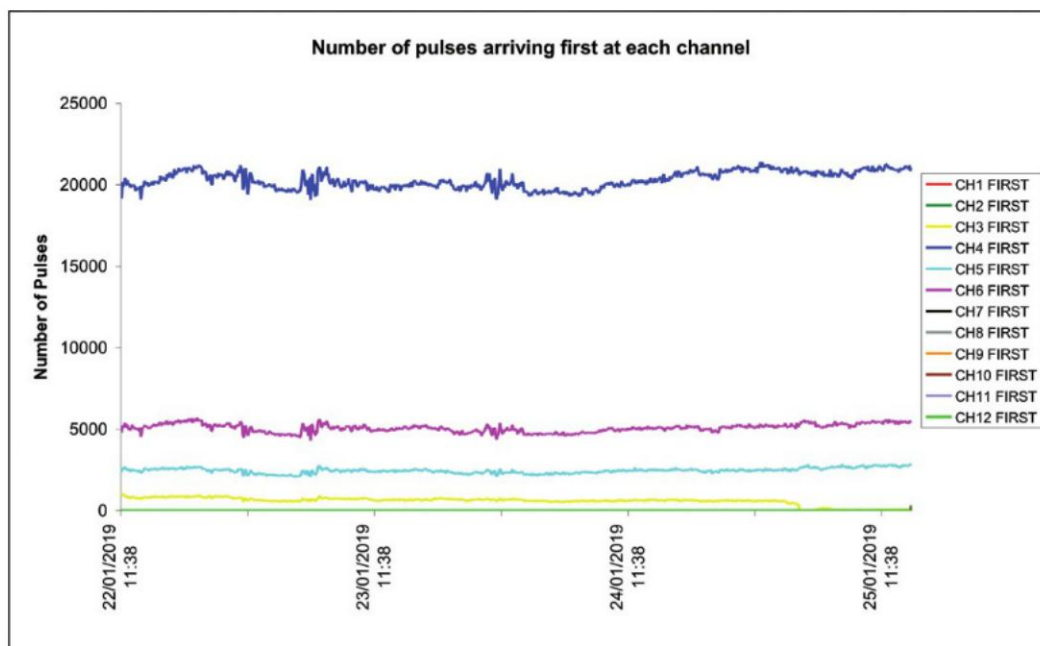
- Experience with over 15 years of local NZ insight to share
- Expertise with a proven and successful track record
- Independent, knowledgeable and candid advice
- Consultancy incl. CBRM via our Australian colleagues

Core Activities

- In service PD surveys for ground mount switch assets
- Overhead Ultrasonic, UHF and IR assessment in Switchyards
- 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



6, 5 and 3 while honours were shared on the 'Amplitude' graph, although a greater number of Navy Blue spikes justifies the slightly higher Average level (28 vs 27dBmV) in the Summary table.

This Substation had its switchboard replaced approximately 10 years ago and new XLPE cables were though-jointed onto the original PILC cable outside of the building. Based on the results it seems most likely that the joint is the source of discharge rather than the Termination, however with a moderate Short Term Severity of just 52 (refer Summary table) Annual Location surveys together with Continuous Monitoring on an 'as required' basis will be used to manage the risk in the short to medium term and identify further deterioration.

CONCLUSION

In New Zealand HVDS can provide a Nationwide Monitoring service in conjunction with our established PD Location survey's and our equipment is ideal for projects designed to cover many sites within a manageable timeframe, while there is at least one Utility running their own UltraTEV Monitor hardware and Zone Sub Monitoring program. In Australia, EA Technology has over 20 permanent PD monitoring systems contracted on multi-year terms and they provide the install, data analysis and regular reporting to the client for a monthly fee. Clients are also notified and provided with exception reports when alarm thresholds are exceeded and the service has quickly proven its value, preventing multiple failures through targeted intervention. The systems

are flexible and can be scaled in size while the equipment can be essentially hired, or purchased outright depending on your preferred financing model.

Contact your local PD Authority for more information.

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