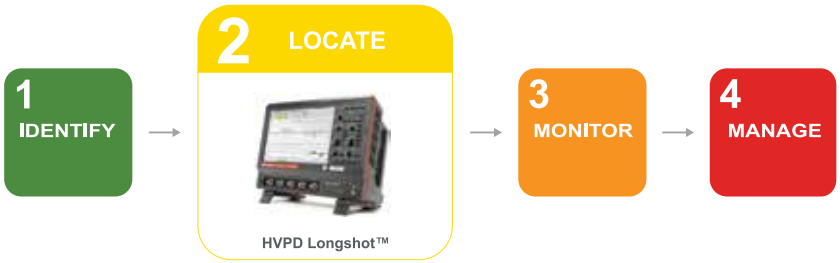
OLPD Testing and Cable Mapping of 33 kV XLPE Cables in a Light Rail System

CASE STUDY

- 10 kV Ex/ATEX Motors
- Transport
- HFCT/TEV Sensors
- HVPD Longshot™



Project

The transportation customer requested HVPD carried out On-line Partial Discharge (OLPD) testing on 33 kV cable joints. The testing was further to a number of recent faults within the customer's network, which led to disruption of the power supply to the light rail system.

This was a newly installed cable system that had been in service for just over 12 months before the faults started to occur.

Solution

On-line PD cable mapping using the HVPD Longshot™ test unit and Portable Transponder technology was used to carry out an on-line condition assessment of complete 33 kV cable network.

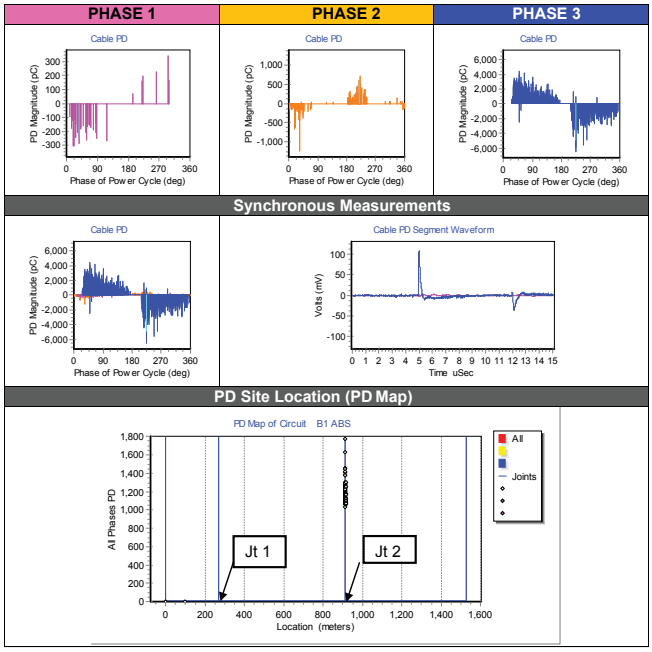
Investigations started with calibration testing with pulse injection HFCTs, followed by OLPD measurements and then cable mapping tests.

33 kV Cables

Testing on the 33 kV Cable Joints

Results

There were high levels of cable PD found on the Blue Phase of up to 6,000 pC with some crosstalk on the red and yellow phases. Using the cable mapping test technique it was possible to locate the source of PD on Joint Number 2 as shown below.



Cable Mapping Test Results

Out of over 50 circuits tested, major PD was detected within cable accessories on six of the circuits (11%) as shown in red in the table below. The levels of discharges detected put these 33 kV cables into red category, “Major concern, locate PD and then repair or replace”.

Criticality Number	Circuit	Comments	Peak Cable PD Level (pC)	Local PD Level (dB)	Cumulative Cable PD Level (nC/cycle)	OLPD Criticality (%)	Maintenance Action
1.	DUB to MPS1 C2	B Phase	25888	<10	247	97.4	Major concern, locate PD and then repair or replace.
2.	ABS to AH C2	B / Y Phase	9729	<10	120	90.3	
3.	BUR to HCC C2	B / Y Phase	3781	<10	12.3	78.7	
4.	BUR to HCC C1	B / Y Phase	3245	<10	7.9	78.1	
5.	ABS to AH C1	B / Y Phase	2920	<10	14.4	77.4	
6.	NHD to QYD C2	R Phase	2849	<10	15.0	76.2	
7.	ALQ to AHS C2	B Phase	1733	<10	4.6	70.6	Some concern, repeat test and regular monitoring recommended.
8.	MPS3 to BNS C2	R / B Phase	1337	<10	6.4	65.5	
9.	NHD to QYD C1	R Phase	887	<10	8.8	47.8	
10.	HCC to CRK C1	Y / B Phase	759	<10	2.5	39.2	
11.	AHS to SLD	Y / R Phase	705	<10	3.1	38.5	
12.	STD to ABH	Y Phase	238	<10	1.0	24.1	Re-test in 12 months.
13.	ALR to BNS C1	B Phase	184	<10	0.9	18.6	
14.	ALR to BRJ	No PD detected	0	<10	0	0	
15.	ALG to PMD	No PD detected	0	<10	0	0	
16.	ALG to KBW	No PD detected	0	<10	0	0	
17.	AQD to AQ2	No PD detected	0	<10	0	0	
18.	JDD to CRK	No PD detected	0	<10	0	0	
19.	ODM to JDF C1	No PD detected	0	<10	0	0	
20.	ODM to JDF C2	No PD detected	0	<10	0	0	

Top 20 Worst Performing Circuits

Conclusions and Recommendations

- The faulty joint on the blue phase cable was replaced and re-tested using the HVPD Longshot™ test unit to verify the repair was good.
- It was recommended that the PD activity found on the red phase was monitored closely.

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THE QUEEN'S AWARDS FOR ENTERPRISE: 2014

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