PARTIAL DISCHARGE CABLE MAPPING

Required to test a new XLPE circuit and recognise that DC is no longer relevant, then VLF Partial Discharge Cable Mapping could be the appropriate option.

By Greg Linton, HV Diagnostic Services Ltd

If you are plagued by older cables with suspected insulation damage and standard tests are indicating problems, Cable Discharge Mapping can determine exactly where and how widespread the damage is.

The EA Technology Cable Mapping system was originally designed for condition assessment of aged PILC circuits and is still the most reliable method for gaining an accurate picture of insulation condition along the cables entire length. Following the discovery of DC's negative side effects, VLF testing has become the default standard for acceptance testing of new XLPE cable.

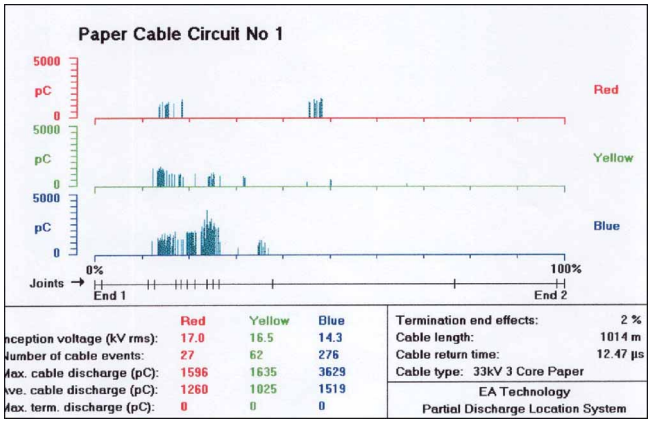

Figure 1 – Replacing approx. 200m of cable near End 1 would improve circuit reliability by removing a problematic section containing many joints.

ALTERNATING AND DISCHARGE FREE WAVEFORM

The **V**ery **L**ow **F**requency generator creates its own sine wave at the selected frequency starting from pure DC. The result is a smooth, alternating and discharge free waveform suitable for energising lengths of cable up to a voltage of 33kV. Circuit length limits are dependant upon the cable type and construction with 3km typical for PILC circuits. Newer XLPE runs of up to 10km have been successfully mapped in New Zealand and it is this "solid dielectric" insulation that does not tolerate the polarisation process brought about by traditional DC Hipot testing.

TESTING PROCEDURE

The test equipment is mounted in a cargo van and requires access to within 25 metres of the test subject as well as a standard 10A mains supply. Connection is normally made via the cable termination or spouts of Switchgear, although outdoor potheads and pole terminations in the switchyard can be used if no other option is available. While testing requires the removal of the cable from service and its disconnection at each end, the mapping itself takes only 2hrs to complete with all 3 phases being "soaked" for a minimum of 20 minutes each. Depending on access requirements and with efficient organisation, Mapping of 3 cables per day is generally achieved.

Figure 2 – The instrument control and data capture equipment plus connection to VLF generator out the back of vehicle.

The test voltage can be raised to 20–30% above the normal Phase to Earth voltage (i.e. 6.35kV RMS for 11kV) with frequencies of 0.1 – 0.5Hz typically used. This is ultimately determined by the Cable type and length with the frequency directly affecting the total current available from the test set to "charge" the cable.

The benefits of this particular method are:

- The three phases can be tested individually
- Testing is between phases as well as to earth
- Inception Voltage is recorded which is often below working voltage
- Test Voltage can be raised above working voltage to emulate tap changes
- No need to insulate cable sheath from cable box
- Testing includes terminations at each end

For enquiries on the PD Cable Mapping Service:
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