HV DIAGNOSTIC SERVICES LTD

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PARTIAL DISCHARGE MAPPING OF HIGH VOLTAGE CABLES

Non-destructive technique for condition monitoring and assessment of high voltage cables up to 33kV

Hamer Technology Test Van

Benefits

- ***Quantitative measurement of cable condition provides a sound engineering base for investment decisions***
- ***Commissioning tests on XLPE cable installations***
- ***Location of potential failure sites***
- ***Graphical presentation of results for ease of interpretation***
- ***Non destructive technique involving minimum network disruption***

Background

High voltage cable networks represent high capital investment. Hence decisions about replacement, repair or continued use should be based upon good engineering knowledge. Cable discharge mapping provides this for the whole length of the cable, thus enabling decisions to be made with the fullest available information.

Information provided by partial discharge mapping may allow deferment of replacement or a decision to replace only part of the cable with the resultant very large savings.

The technique has also been applied in commissioning of new XLPE installations.

Technology

Partial discharges in the insulation are the main cause of ageing in high voltage paper insulated cables. The discharges are responsible for much of the deterioration seen in the insulation wall, such as pinholing and electrical treeing, and eventually lead to the breakdown of the insulation.

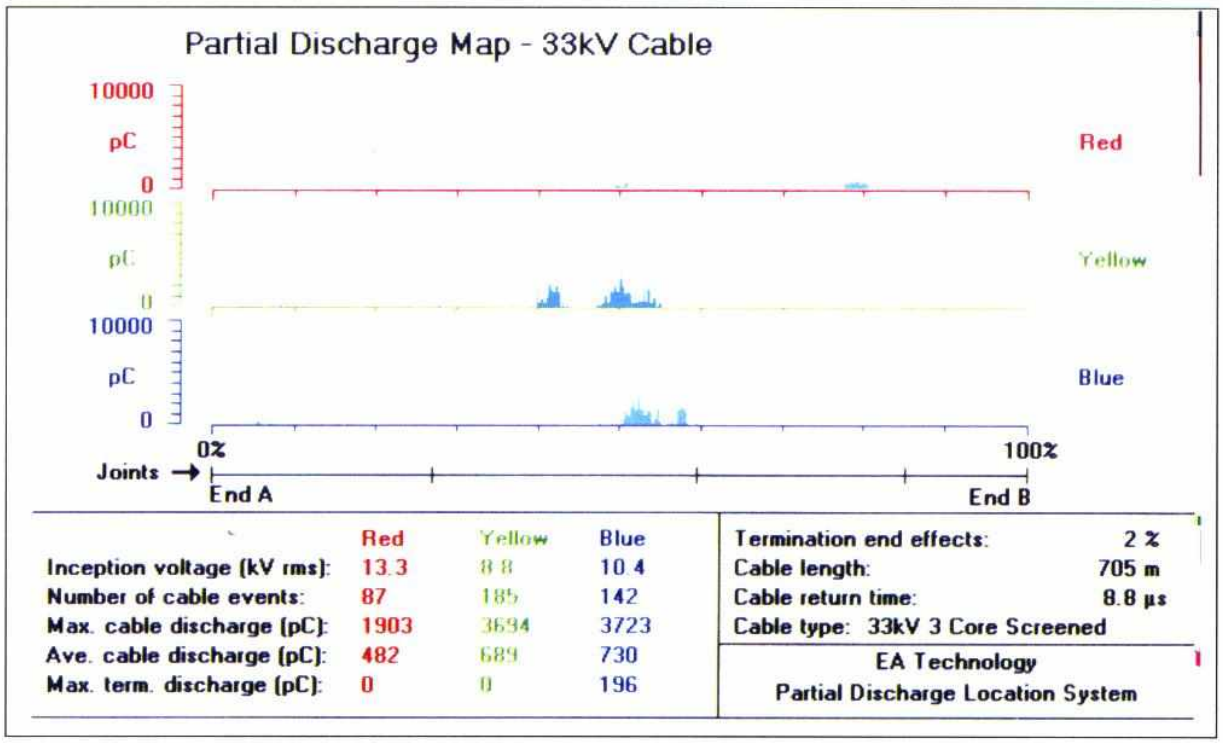
The technique uses a Very Low Frequency (VLF) high voltage power supply to energise long lengths of cable from a standard mains outlet. All test equipment is portable allowing tests to be conducted with maximum efficiency and minimum outage time.

Equipment

A 40kVpeak Very Low Frequency (VLF) power supply has a variable voltage and frequency output allowing tests to be carried out on long lengths of high voltage cables up to 33kV with 30% overvoltage. All high voltage parts are fully enclosed and access is interlocked allowing safe operation even in public areas.

Associated instrumentation provides information on any partial discharge activity which is analysed using a new PC based software package and finally displayed as a partial discharge map. The map highlights potentially problematic areas of cable and allows comparisons to be made between different phases and joint positions.

(PTO For technical information)



Typical 33kV Partial Discharge Map

Procedure

- The output from the VLF Generator is applied separately to each core to obtain individual test results on each phase
- Having two cores earthed while the third is under test, ensures that Phase to Phase as well as Phase to earth results are obtained.
- As the test voltage is raised from zero, the inception voltage of the Partial Discharge, [which can often be below working voltage], is recorded.
- The test voltage can also be raised above working voltage to anticipate tap changes.
- This cable mapping equipment is ideal for commissioning new cable installations.

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Specifications

Voltage [DC peak]:	40kV
Current [peak]:	40mA
Frequency Range:	typically 0.05 to 1.0 Hz
Metering:	Voltage Dividers
Power Supply Input:	220-240V 50Hz AC [Controlled]
Electrical protection:	Output overcurrent protection - current limited by HV stacks during short circuit.
Coupling Filter:	40kV rated 30MHz bandwidth
Buffer Amplifier:	DC – 30MHz bandwidth. Battery powered.
Pulse Generator:	Pulse width 200ns/1s
High Voltage Cable:	25 meters 75kV rated
Instrumentation:	Variac, Oscilloscope, Function Generator.
Computer:	Laptop c/w GPIB interface card