

A.C. H.V. CABLE TESTING AT VERY LOW FREQUENCY

WHY V L F TESTING

For years the D C high voltage testing was used as maintenance and acceptance test for medium voltage cables. Later it was proved that DC high voltage testing was not an effective tool as maintenance point of view, as it was observed that, although cables passed DC high voltage test, premature failures of solid dielectric cables was recorded. The efforts were made to know the causes of failures, which indicated the presence of water trees, which were weakening the cable insulation. The defects remain undetected during D.C. High voltage tests.

In view of above, cable testing was required to measure capacitance and tan delta values. This measurement requires AC high voltage testing. AC (50Hz) high voltage testing requires a large capacity power source. Thus, test set will be a non-portable set. The power requirement is high due to high cable capacitance. This difficulty can be overcome by reducing the test frequency i.e. applying high voltage at 0.1Hz instead of 50 Hz.

The revised IEC standard 400.2, also recommends testing of cables at A.C. High Voltage with very low frequency. The DC high voltage testing is not recommended. The corresponding Indian standard is also under revision.

OUTPUT OF VLF TEST

There are several VLF waveforms that can be generated:

- ❖ V L F sinewave : A sinusoidal wave.
- ❖ V L F squarewave : A bipolar rectangular or square wave.
- ❖ V L F Cosine : A rectangular or trapezoidal waves.

All above waves operate at 0.1 Hz Frequency.

The VLF sine wave is most useful in detecting parameters like Insulation Resistance / Polarization Index, AC leakage current, Capacitance, tan delta and Partial discharge (voids) in cables.

RECOMMENDATION FOR MEASUREMENT

This technique of VLF testing of cables is an advance technique for testing of cables. The VLF testing is a non-destructive and offline test. It can be carried out on all high voltage cables up to 33 kV.

The applications of VLF testing are:

- Measurement of I.R. / P.I. value at rated voltage.
- Measurement of Capacitance and Tan delta.
- Measurement of leakage current.

IEEE / IEC recommends the tests to be carried out as:

- **Acceptance Test** : During manufacturing stage to obtain the base reference values. For future comparison and as Quality Assurance test.
- **Installation Test** : After installation / termination to verify the condition of joints. The main aim is to detect defects, if any during transport, storage or installation.

- Maintenance Test : To be carried out during operating life of cable.

This help in detecting joint failures, ageing of cables.

EXPERIENCE

Power-Linker group is already working for condition monitoring and diagnostic analysis of Transformers, Generators, Motors etc. for past few years. The features of VLF test set used by Power-Linker can be viewed at : <http://www.hvdiagnostics.com/PDF/HVA30-5%20High%20Power%20Model%20Rev2.pdf>

You may write to us for V L F Testing of any HV-MV cable or any other condition monitoring and diagnostic test carried out by POWER-LINKER.

CONTACT US

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