JICABLE'07
Rapporteur's Session Report

C.7.2 SESSION : DIAGNOSTICS & MAINTENANCE

Chairman : G. BOULBOL, LIBAN CABLES SAL, Lebanon
Rapporteur : B. DHUICQ, SILEC CABLES, France

Papers presented at the C.7.2 poster session cover three main topics :

Diagnostics:

Results of dielectric losses and Partial Discharges (PD) measurement on cable lines are presented as a diagnostic way to assess the conditions of the cable system, estimate its reliability and schedule maintenance or replacement programs.
Use of wireless sensors is investigated in order to inspect and monitor cables in the field of PD analysis, thermal infrared detection of hot spots and dielectrometry,
WIMAX telecommunication between wireless sensors and host computerized control platforms has been studied for application to data acquisition on underground cable systems.
Damped AC voltage generation and PD diagnosis are used for assessment of the insulation conditions of distribution power cables.

Partial Discharges Measurements:

A paper shows the interpretation of PD measurements resulting for an extensive use of Damped AC tests on MV cable circuits and the possible evaluation of the conditions of the network.
The sensitivity of VHF/UHF PD detection systems is thoroughly investigated : calibration difficulties are discussed.
PD measurements and localising have been conducted on PILC and extruded cable circuits by injection of 50Hz voltage from a resonant transformer : results are presented showing the identification of on-going defects such as insulation aging or badly installed accessories.
UHF PD detections on termination by means of capacitive and inductive sensors are compared : both methods are suitable for on-site PD detection and results are correlated to the ones of the IEC60270 method.
On-site PD detection on distribution MV cables is analysed on the physical point of view and HV power sources are discussed : power frequency voltage in the range of 20-300Hz is preferred to VLF or DAC voltage in order to keep the normal PD pattern.
PD measurements under damped AC oscillating wave test voltage have been implemented on HV cable circuits showing the possibility to make non-destructive PD diagnostics after laying or during operation on cable circuits up to 220kV with cost-effective equipment.
Capacitive plan type UWB PD sensors are investigated and compared to inductive HFCT (High Frequency Current Transformer) sensors. PD measurement results are similar; but reduction of disturbances and cost effective sensors appear to be the advantages of plan type sensors.

Cable Maintenance:

Oil leaks on oil-filled cables are localised by the use of a volatile tracer mixed with the cable oil and its detection on surface. Compared to other existing methods, this promising one has the advantages to avoid the de-energizing of the circuit and to reduce cost and time of oil research.
Hydrogen generation within oil of oil-filled cables makes operation not reliable since bubbles can appear when pressure lowers and be at the origin of Partial Discharge and degradation. H2 elimination was conducted by bleeding of H2-loaded oil from semi-stop joints to collecting tanks. This method shows efficiency to pin-point the gas location and to reduce the unavailability of the circuits.
Distribution extruded cable rejuvenation has been in application with phenylmethyldimethoxysilane as impregnating fluid for 19 years. By comparing treated cables to non ones subject to water treeing, the improvement of electric performances has been demonstrated. In parallel, new rejuvenating fluid containing no phenyl radical, have been developed.
A non-destructive and on-line method for estimating future performance of cable systems is presented : the technique measures high frequency signals by sensors placed at discrete locations along the cable system; pre-discharge signals can be detected for early diagnostic of system.
Diagnostic of MV accessories is realised by Time Domain Spectroscopy (TDS). Dielectric losses are assessed during polarization and depolarization. Joints affected by hot spots show significant non-linearity in the polarization and depolarization modes. TDS can distinguish between global (cable system losses) and local (accessory losses).