University of Bologna
Dept. of Electrical Engineering
Lab. of High Voltage Engineering and Materials Science (LIMAT

Tutorial course: Diagnosis of high voltage insulation systems

Bologna, June 18-22, 2007

Purpose

The course is aimed at providing basic knowledge concerning modern techniques for the diagnosis of insulation system. Particular attention will be paid to diagnosis by partial discharge detection and analysis

The intended audience is maintenance operators coming from production, transmission and distribution utilities as well as large industrial plants (e.g., refineries, chemical plants, pulp industry)

Background
A master degree in Electrical Engineering is required.

Structure of the course
5 days intensive course, 7 hours per day
Teaching: 20 hours
Laboratory: 15 hours

Cost
A registration fee of 2500 euro should be paid in advance through wire transfer.
Wire transfer data
Bank: UNICREDIT BANCA
Country: IT
CIN: EUR 84 CIN Y
ABI: 02008
CAB: 02452 C/C 000002858985
BIC: UNCRIT2BZ11

Venue
Lab. of High Voltage Engineering and Materials Science (LIMAT)
Dept. of Electrical Engineering
Faculty of Engineering
Viale Risorgimento 2, 40136 Bologna, Italy

Website (check for updates)
www.limat.ing.unibo.it/tutorial_course.htm

Program

General issues
- Diagnostic principles: diagnostic properties, residual life and related issues.
- Taxonomy of partial discharge (PD) phenomena. Physics of PD in internal voids.
- Artificial intelligence approaches to diagnosis of insulation systems: PD source identification.
- PD detection and measurement issues: (1) apparent charge and the abc circuit, (2) Calibration (3) PD detector bandwidth issues (4) Sensors (5) Lumped versus distributed parameter objects: pitfalls of calibration, sensitivity checks.

Power cables
- Degradation mechanisms for oil-filled and polymeric power cables
- Testing techniques, online versus offline measurements
- Supply systems: VLF, resonant and OWTS systems
- Partial discharge detection and analysis issues: (1) Sensor selection (2) Propagation issues (3) PD location techniques (4) Work cases

Rotating machines
- Design and manufacturing of rotating machines
- Degradation and failure mechanisms
- Bulk diagnostic techniques (tandelta, PI,…)
- PD in rotating machines: (1) Couplers (2) PD taxonomy for rotating machines (3) Online versus offline measurements (4) Automatic identification techniques (5) Work cases
- Converter-fed machines: (1) Degradation mechanisms (2) PD detection issues

Transformers
- Design and manufacturing of oil/paper insulation systems
- Oil/moisture equilibrium: effects on transformer reliability and degradation rate
- Bulk diagnostic techniques (DGA, power factor testing, etc)
- PD in transformers (1) PD detection issues (2) Behavior of PD in oil/paper insulation systems (3) Work cases

Other insulating systems
- Outdoor insulators, GIS