

INSTRUMENTATION LABORATORY

The Instrumentation Lab at PSTI is equipped with an Automatic Capacitance and Tan Delta Test set and a Power Analyser.

Automatic Capacitance and Tan Delta Test Set

Brand : Eltel

Model : ACTS-12K Plus



Power Factor testing of electrical insulation is one of the most recognised and highly regarded procedures in both preventive maintenance process and manufacturing of electrical power apparatus. The power factor of the electrical insulation, the ratio of power loss to volt-ampere is a measure of the quality of the insulation

The test set can be used for shop or field testing of electrical insulation at voltages upto 12 kV. The test set provides information on : Voltage, Current, Capacitance, Power, Power factor/Dissipation factor, Frequency & Interference current.

Equipments that can be tested:

Distribution and Instrument Transformers, Bushings, Bus and Line CVTs, Transformer Oil etc.

Power Analyser

Brand: Yokogawa

Model: CW240

The Power analyser is a powerful tool for simultaneous measurement of power, voltage fluctuations, harmonics and waveforms. It can be used to measure all the relevant items necessary for a power quality analysis.

Key features of the analyser are highlighted below.

- Electric energy measurement: Integrated values of active, regenerative, reactive power quantities (leading/lagging)
- Instantaneous measurements: Volts & Amps per phase & average, Watts, Vars, VA, Power Factor, Phase Angle, Frequency
- Demand measurement: Maximum power demand during selected interval
- Waveform measurement: One cycle of voltage or current with 20x zoom capability Voltage fluctuation measurement: Dips/swells/ instantaneous power failures

- Harmonic measurement: Displays each order from the 1st to the 50th harmonic Leakage current measurement with optional 2 Amp clamp-on CT's

Insulation Resistance Tester

Brand: Megger

Model: MIT 1020/2



Insulation Testing as part of a predictive/preventive electrical maintenance program is becoming increasingly rigorous and demanding. The MIT1020/2 is a microprocessor controlled 10 kV insulation tester offering measurement capability of upto 35 terra ohms.

The industry standard IR test procedures i.e, Step Voltage, Polarisation Index and Dielectric Discharge tests can be run automatically on cables, insulators, transformers, generators etc..

BDV of Oil Test Set

Supplier: Nisha Engg. Corporation



The Dielectric Strength of different samples of Transformer oil can be tested with the help of this 100 kV Oil Test Set.

HIGH VOLTAGE LABORATORY

Supplier: W.S Test Systems Pvt. Ltd.

The High Voltage Laboratory is equipped with a 280 kV Impulse Voltage Generator set up, comprising of a 220V/100kV HV transformer, Rectifier, Impulse Capacitors, measuring capacitors and resistors.



This is a 2-stage impulse voltage generator, with each stage representing 140kV DC. The set up is augmented with a CRO, for analysis of the waveforms. AC, DC and Impulse withstand tests can be conducted on electrical power equipments of upto 33kV.



POWER SYSTEMS STUDIES LABORATORY

The Power Systems Studies laboratory is equipped with transmission and Distribution System Software.

Transmission Systems Studies Software:

Brand: MiPower

Supplier: PR&DC Ltd.

Studies such as Load Flow Analysis, Short Circuit Studies, Transient Stability Studies and Relay Co-ordination Studies can be conducted.

Distribution Systems Studies Software:

Brand: Neplan

Supplier: ABB Ltd.

Studies such as Load Flow Analysis, Short Circuit Studies, Optimal Capacitor Placement, Network Reduction and Optimal Separation Point can be conducted .

Distribution Systems(<66kV) Studies Software:

Brand: Ecodial, ID Spec

Supplier: Schneider India Ltd.

Distribution Systems below 66kv can designed and analysed using this Schneider software.



RELAY TESTING LAB

In modern power system to have a normal operation of the system without electrical failure and damage to the equipment, two alternatives are available with the designer, one is to design the system so that failure can not occur and the other is to accept the possibility of faults and take steps to guard the ill effects of such faults. Although it is possible to eliminate faults to a large extent by careful system design, insulation

coordination, current protection and maintenance, it is obviously not possible to ensure cent percent reliability and therefore the possibility of faults must be accepted and the necessity of protection scheme must be realized by adopting various protective relays

The Relay testing lab in **PSTI** is equipped with different types of relays like Solid State Relay, Electromechanical Relay and Numerical Relay (Microprocessor based Relay)

Solid State Relay:

The following tests can be conducted under solid state relay.

1. Distance Protection or Transmission Line Protection (Distance Protection relay-RAZFE)
2. Differential Protection (Differential Relay-RADSB)
3. Over current Protection
4. Restricted earth fault Protection

Electromechanical relay:

The following tests can be conducted under Electromechanical relay.

1. Over current Protection (Instantaneous over current relay and IDMT over current relay)
2. Earth fault protection (Instantaneous and Definite time earth fault relay)
3. Distance Protection (Phase to Neutral, Phase to Phase and Phase fault injection)

Numerical Relay:

The following tests can be conducted under Numerical relay.

1. Over current Protection (Non directional over current relay)
2. Earth fault protection (Non directional earth fault relay)
3. Over/Under frequency protection (Over/Under frequency relay)
4. Differential Protection (Differential Relay)
5. Generator Protection (Generator Protection Relay)
6. Motor Protection (SEL Relay)
7. Distance Protection (SEL Relay)



DESPATCHER TRAINING SIMULATOR

A state of the art Despatcher Simulator Training is procured by Power Systems Training Institute for training System Operators.

Supplier: AREVA T&D India Ltd.



The Simulated Network comprised about 1400 stations and 4000 buses with generation voltages and 110kV and above network. The actual network of National Load Despatch Centre as on April 2010 conditions is simulated in the DTS. The databases, displays, events, applications etc. are implemented as per state of art Load Despatch Control Software.





The DTS has the following training capabilities

- ◆ Control of active power flow to maintain transmission levels within permissible operating limits by taking appropriate measures (generation control and load management).
- ◆ Control of reactive power flow and voltage by adjustments of Automatic Voltage Regulator (AVR) set points, transformer taps and switching on/off shunt reactive elements, line switching, Static Var Compensators, Load shedding, etc.
- ◆ Control system parameters with Primary, Secondary and Tertiary controls
- ◆ Training in dynamic behaviour of power system between steady states including response of different power plants to frequency fluctuations, automatic generation control signals and effects of power plant operator actions.
- ◆ Training in recognition of critical system conditions such as insufficient generation reserve, insufficient reactive support, transmission line overloading etc.
- ◆ The dispatcher can practice use of the load frequency control and economic despatch functions for following the system load. The trainee can have exercises on units' ON and OFF control, adjusting regulating limits in co-ordination with power plant operators.
- ◆ Through the SCADA displays, the dispatcher can open and close circuit breakers for removal or reconnection of transmission lines. He can co-ordinate with the sub-station operators.
- ◆ The dispatcher can practice procedures for restarting a power system from black start, re-energizing transmission lines, loads and re-synchronizing islands.
- ◆ Training on Regulatory issues like Availability based Tariff, Open Access, Free Governor Mode of Operation, etc.

- ◆ Represent the switching schemes of sub-stations as in actual practice and train the operators in charging / disconnection sequences of transmission lines / feeders.

The DTS of PSTI is the most appropriate Lab environment for training of System Operators on the realistic conditions of Indian Power Network.