The Journal of CPRI - A Golden Jubilee Edition,
Vol. 8, No. 2, 2012 pp. 235–242

Regional Testing Laboratory, Noida

The Regional Testing Laboratory (RTL) at Muradnagar has been functional since 1992 to cater to the growing needs of northern power utilities and industry. Due to the proximity and inconvenience to the clients the unit has been shifted to Noida and the laboratories have become functional since June 2009. The important facilities cover Cables Testing upto 33 kV, High Voltage Laboratory for testing Insulators and Transformers and Transformer Oil Testing Laboratory. The new facilities for testing of Energy Meter and Diagnostic Testing facilities have been created at the new centre. A large number of clientele covering utilities and industry has been established over the years. The unit is having ambitious plans of augmenting facilities for Diagnostic Testing and also set up new facility to cover more products.

1.0 TESTING AND CERTIFICATION

The RTL, Noida has facilities for testing and certification of **C**urrent Transformers and Potential Transformers up to 66 kV, Distribution transformers up to 1 MVA, Insulators and Isolators up to 33 kV, HT cables up to 33kV and Distribution cable accessories. Dry and wet power frequency Voltage withstand test Standard lightning Impulse Voltage withstand test are also taken on power equipment up to 66 kV voltage rating, Bus ducts, Insulators, HV switch gear and HT Fuse units.

1.1 High Voltage Testing Laboratory

The facilities available are as follows

- Impulse voltage generator, 600 kV, 15 kJ
- Power frequency testing transformer, 200 kV, 15 kVA
- Wet test arrangement
- Temperature rise test facility up to 2000 A for three phase test and 5000 A for single phase test
- Sphere gap 250 mm diameter
- Digital Mega ohmmeter
- Digital Impulse Measurement System

Some of the major tests performed are:

- Lightning Impulse Voltage Withstand test
- High Voltage and Power Frequency Withstand test (Dry & Wet conditions)
- Temperature Rise test

IMPULSE VOLTAGE WITHSTAND TEST SET UP

- Visible Discharge test
- Porosity test
- Temperature cycle test

250 kV 125 kVA PD FREE TRANSFORMER

1.2 Cables Testing Laboratory

Cables laboratory has specialized facilities and expertise for testing and evaluation of cables up to 33 kV and cable accessories up to 11 kV. Various utilities and cable manufacturers in the region are utilizing test facilities. New test facilities for testing Flame Retardant Low Smoke cables have been established.

The facilities available are as follows:

- DC voltage test facility 80 kV DC, 50 mA
- AC Power frequency test facility up to 60 kV, 150 mA
- Profile Projector
- Thermal stability test set up, 4 shell ageing ovens up to 250°C
- Universal testing machine of 50 kN capacity
- Conductor Resistance measuring bridge
- Capacitance and Dissipation factor measuring bridge
- IR measuring instrument
- Hot set Apparatus
- Air bomb oven (pressure vessel)
- Partial discharge test set up to a test voltage of 100 kV(RMS)
- Loading coils up to 2000 A at 5V
- Humidity Chamber
- Flammability tests (single, bunched cables and Swedish Chimney method)
- Ageing oven with 4 bushings at 15 kV
- Oxygen Index test apparatus
- Temperature Index test apparatus
- Halogen acid generation test apparatus
- Smoke Density test apparatus

PARTIAL DISCHARGE TEST SET UP

100 kV SMOKE DENSITY TEST APPARATUS

Some of the major tests performed are:

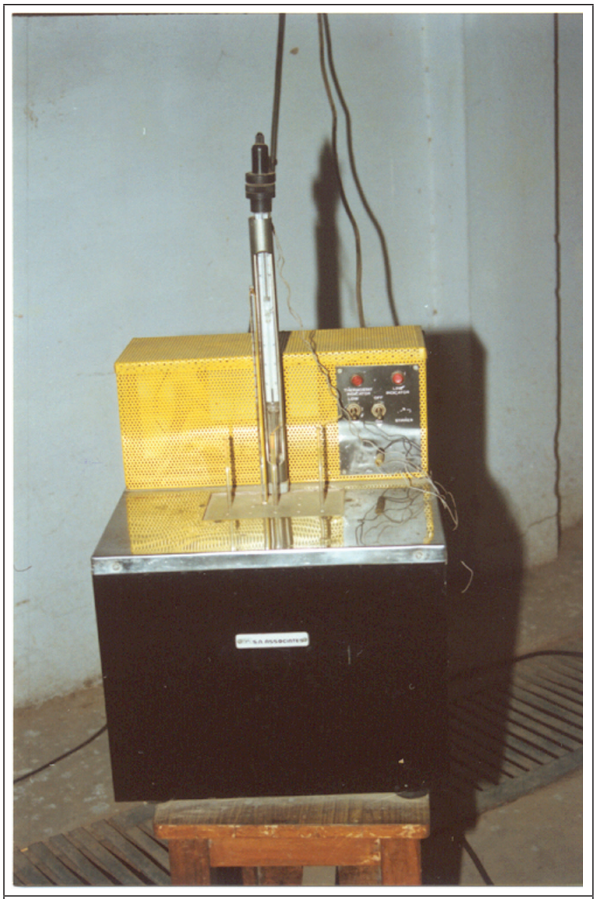
- Partial discharge test up to 100 kV

KELVIN DOUBLE BRIDGE (CONDUCTOR RESISTANCE TEST)

- Dielectric power factor test
- Heating cycle test
- Impulse Voltage withstand test
- HVAC & HVDC test
- Conductor resistance test
- Tensile strength and elongation at Break test
- Thermal Stability test
- Hot set test
- Heat shock test
- Water Immersion test
- Water absorption test
- Humidity test
- AC Voltage withstand test with cyclic current loading
- Ageing test in Air Oven
- Hot Deformation Test
- Insulation resistance test
- Shrinkage test
- Flammability test
- Various tests on steel armouring materials

1.3 Liquid Dielectric Laboratory

The laboratory is equipped with facilities to carry out testing and certification of mineral insulating



THERMAL STABILITY TEST APPARATUS

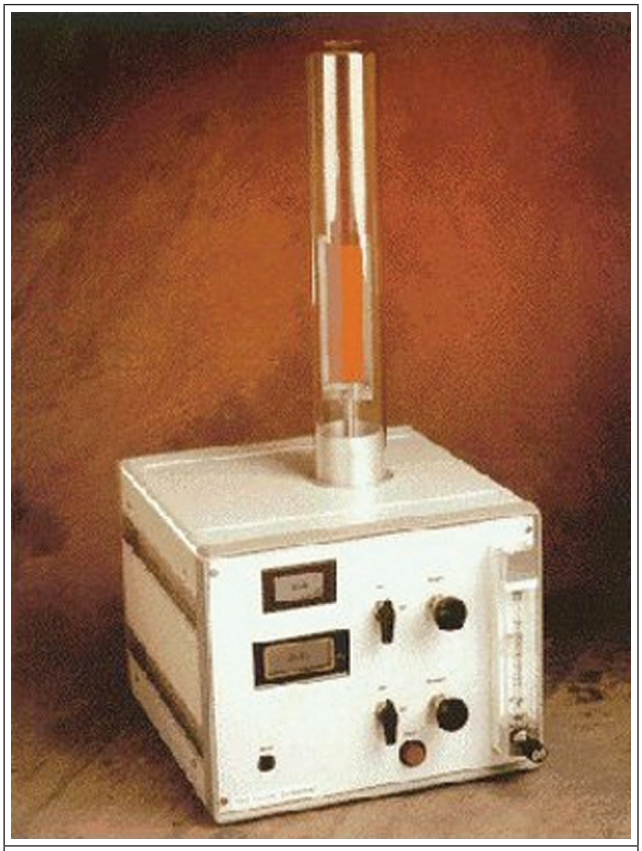
UNIVERSAL TESTING MACHINE (FOR TENSILE STRENGTH TEST AND ELONGATION TEST)

oils, in-service oil in power transformers as per IS:1866-2000 for maintenance purposes.

The laboratory is being used by various electrical utilities for assessment of condition of the oil using electrical and chemical tests and internal condition of transformers by Dissolved Gas Analysis (DGA). The laboratory is also having test facility to assess the condition of solid insulation by *Furan analysis* using High Performance Liquid Chromatography.

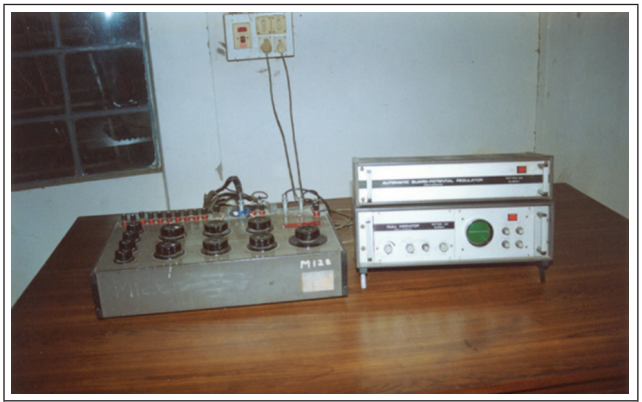
Major equipments are

- Break down Voltage Tester
- Tan delta and Specific Resistance Bridge
- Interfacial Tensiometer
- Gas Chromatograph
- Moisture Analyser
- Flash Point Apparatus
- High Performance Liquid Chromatograph



OXYGEN INDEX TEST APPARATUS

HALOGEN ACID GENERATION TEST APPARATUS

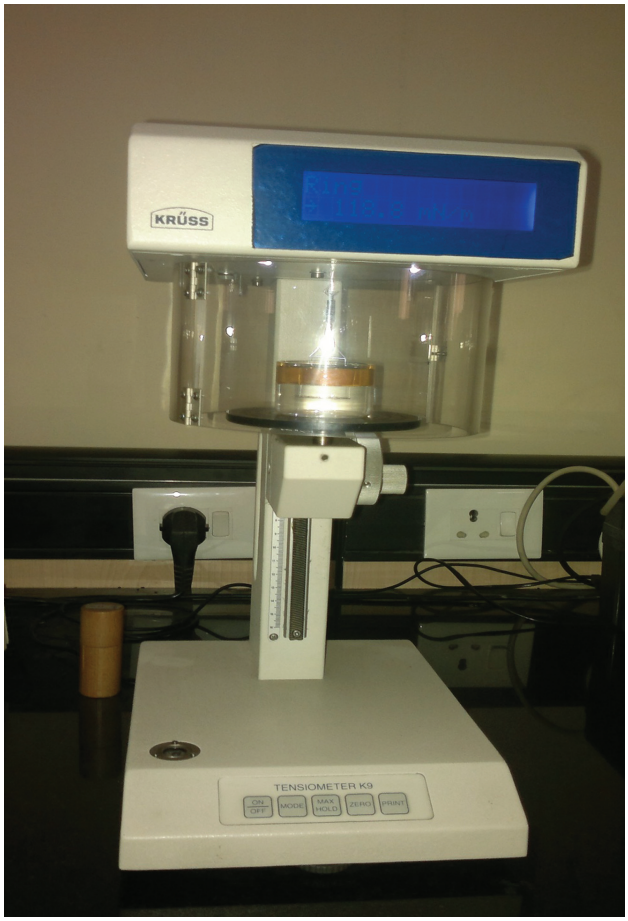


SCHERING BRIDGE

GAS CHROMATOGRAPH

Some of the major tests performed are:

- Dissolved Gas Analysis test
- Interfacial Tension test
- Flash Point test
- Neutralization Value test
- Electrical strength test
- Dielectric Dissipation factor test
- Specific resistance test
- Water content test
- Sediment and sludge test



TENSIOMETER

HIGH PERFORMANCE LIQUID CHROMATOGRAPH

1.4 Energy Meter Testing Laboratory

The Energy Meter Testing laboratory is well equipped with the state of the art instrumentation to undertake Acceptance Tests on Electromechanical and Electronic Energy Meters of class 0.5 to 2.0 accuracy as per the requirements of National and International standards. The following tests are covered under Acceptance test.

- Limits of error
- Starting current test
- No-load test
- Meter constant
- Repeatability of error
- Power consumption.

Mobile Energy Meter testing laboratory has been established for on-line testing of in-service energy meters at consumer premises on behalf of Power Utilities, Electricity Regulatory Commission and Public Grievances Cell.

The on-line accuracy measurement for in-service meter at Consumer premises is carried out with prevailing loads as per IS:15707, 2006 Standard. More than 2000 m have been tested at Consumer premises on behalf of Public Grievance Cell, Govt. of Delhi. The mobile testing laboratory is accredited by NABL and conforms to IEC/IS 17025 Standard.

MOBILE ENERGY METER TESTING LABORATORY (OUTSIDE VIEW)

1.5 Diagnostic Test Facilities

To check the healthiness of substation equipments like power transformers, CT's, PT's, CVT's, circuit breakers, lightning arrestors the following checks are performed as per the requirement of the clients.

- Thermo vision scanning to check the external thermal faults of the substation equipments
- Tan delta and Capacitance along with leakage reactance measurement to check the healthiness of the dielectric insulation of transformer windings and bushings, CT's, CVT's, etc.

MOBILE ENERGY METER TESTING LABORATORY (IN SIDE VIEW)

1.5.1 Mobile test facility for onsite accuracy testing of CTs & CVTs

RTL, Noida has established unique Mobile Test Laboratory for on-site accuracy testing of EHV class CTs and CVTs. The mobile unit is equipped with

- Facility for conducting on-site accuracy testing of CTs and CVTs (up to 0.2 class) as per National/International standard.
- Unit is fitted with high accuracy and high precision test equipment, current and voltage sources of appropriate ratings for testing of CTs and CVTs up to 400 kV rating both in substations and power stations.
- Unit is also equipped with automatic system for measurement of Tan delta and Capacitance on CTs & CVTs.
- Period testing and trend monitoring in the dielectric properties would go a long way in assessing ageing status of the CTs & CVTs and thereby enhancing reliability and availability of the system.

MOBILE TEST FACILITY FOR CTs AND CVTs

Major test equipments of Mobile Test Laboratory are:

- Vehicle duly mounted with crane
- Series resonant transformer of rating 300 kV, 300 kVA
- High current source of rating 2000 A, 15 V
- Coupling Capacitor – 50 pF, 300 kV rating
- Automatic CT/CVT test set

- Electronic Voltage Divider
- Standard Capacitor
- Current Comparator
- Programmable Voltage and Current Burdens
- Automatic Tan delta and Capacitance testing system.

BIBLIOGRAPHY

[1] L.N. Giri, Arvind Pandey, M.K. Jaiswal. "Role of tan delta testing in substation condition assessment" seminar on *Condition Monitoring of Sub-Station Equipment* at RTL, Noida, 29th March 2011.

[2] Dr. Pritee Goyal, S.N. Barua. "Condition monitoring of power transformers by oil testing properties" seminar on *Condition Monitoring of Sub-Station Equipment* at RTL, Noida, 29th March 2011.

[3] Arvind Pandey, L.N. Giri M.K. Jaiswal and B.M. Mehra. "Infrared thermogrphy for condition monitoring of substation equipments" seminar on *Condition Monitoring of Sub-Station Equipment* at RTL, Noida, 29th March 2011.

[4] L.N. Giri, Arvind Pandey, and B.M. Mehra "Mobile test laboratory for online accuracy testing and condition monitoring of EHV class instrument transformers" seminar on *Condition Monitoring of Sub-Station Equipment* at RTL, Noida, 29th March 2011.

[5] P.V. Satheesh Kumar, Vipul Sharma and M.K. Jaiswal. "Type testing of power cables as per Indian and International standards" *Tutorial on Design and testing of Power cables* at RTL, Noida, 17th August 2011.

[6] L.N. Giri Arvind Pandey, Jaiswal M.K. and Mehra B.M. "Condition monitoring trechniques for electric cables" Tutorial on *Design and testing of Power cables* at RTL, Noida, 17th August 2011.

[7] P.V. Satheesh Kumar, Vipul Sharma "FRLS testing on cables" Tutorial on *Design and testing of Power cables* at RTL, Noida, 17th August 2011.

[8] P. Sadashiva Murthy "Characterization of polymers in power cables" Tutorial on *Design and testing of Power cables* at RTL, Noida, 17th August 2011.

[9] P. Sadashiva Murthy "Characterization of polymer components of energy meters" Workshop on *Energy meter testing and evaluation* on 24th Sep. 2011 at STDS, Bhopal.

[10] P. Sadashiva Murthy "Condition monitoring of power transformers by liquid and solid insulation" Workshop on *Latest trends in power equipments condition monitoring* at RTL, Noida, 19th October 2011.

[11] Arvind Pandey, L.N. Giri M.K. Jaiswal and B.M. Mehra "Condition monitoring of power transformers and substation equipments", Workshop on *Latest trends in power equipments condition monitoring* at RTL, Noida, 19th October 2011.

[12] L.N. Giri, Arvind Pandey, and B.M. Mehra "Diagnosing testing of Instrument transformers" Workshop on *Latest trends in power equipments condition monitoring* at RTL, Noida, 19th October 2011.

[13] L.N. Giri, Arvind Pandey, M.K. Jaiswal "Dielectric condition assessment of transformers and bushings", Workshop on *Latest trends in power equipments condition monitoring* at RTL, Noida, 19th October 2011.