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Electrical Appliances Technology Division

Domestic Electric Appliances Testing facility was a part of Insulation Laboratory during 1976. Further battery testing facility and Relay testing facility were added. An off shoot of this activity was formation of a new Division called Distribution Division with main aim of taking R&D activities in the Distribution System, Optimization studies and also caters to the testing and certification of Domestic electrical appliances, batteries and Relays. During the period from 1985 to 1995, this division has added new facilities for testing of fans and also environmental testing of panels, In mid nineties, the Distribution Division leaded to the formation of Electrical Appliances Technology Division with main intension of Environmental testing of panels, testing and certification of Domestic Electrical Appliances, Fans, Relays and Batteries. With the enactment of Electricity Conservation Act 2001 and BEE's prime program of Standards and Labeling of Electrical Appliances, The Division has shifted its activity towards check testing of appliances viz. Refrigerator, Air conditioner. TFL and Ceiling Fan under Standards and Labeling Program for star rating. Many State of the art test facilities have been established in the Division for this purpose and the Division is having ambitious plans for setting up of new facilities for testing of Motors and also augment the existing facility to cover more products viz. T5 lamps, Refrigerators up to 2.5 m high, Batteries of various types and also to increase the bench capacity for testing.

1.0 PREAMBLE

The Central Power Research Institute (CPRI) came into existence in 1960. It was functioning as a department of the then Central Water and Power

Commission (Power Wing). The recommendations of the Committee set up by the Ministry of Energy in 1975 were accepted by the Government of India and the Institute was reorganized as an autonomous society and registered under Karnataka Societies Act in January 1978.

The multi-disciplinary complex at Bangalore is devoted to testing, certification, consultancy, research and development of all types of electrical equipment used in power systems. One of the main laboratories was Insulation laboratory which had the facilities for testing and certification of Solid Dielectric materials

2.0 INITIAL DEVELOPMENTS (1976–1985)

In the year 1976 Ministry of Industry, Government of India had issued "The Household Electrical Appliances (Quality Control) Order" which made certification compulsory for the manufacture, sale or distribution of domestic electrical appliances. In pursuance of this quality control order of Ministry of Industry, the then Indian Standards Institution (Presently Bureau of Indian Standards), had requested CPRI to establish the necessary facilities for testing and evaluation of all domestic appliances as per the relevant national standards. Accordingly, CPRI had established the Domestic Electrical Appliances Testing Laboratory which started functioning as a part of then Insulation Laboratory.

Facilities created for evaluation of as many as 40 products which came under the list of domestic electrical appliances and accessories. The test

charges have also been kept most moderate since the domestic electrical appliances were mostly manufactured in the small scale sector.

3.0 DISTRIBUTION DIVISION (1985–1995)

During Mid-Eighties, A New Division has been established by name "Distribution Division". This Division was planned to undertake R&D problems on distribution systems as well as on distribution equipment. The activities of the Division were – Optimization studies on distribution system as well as failure analysis of distribution equipment. Further the scope of the Distribution Division was enhanced to cover wide range of R&D problems faced by the manufacturers of electrical equipment as well as the operation problems of electricity undertakings.

The laboratory facilities under this division were:

(a) Domestic Electrical Appliances Laboratory with facilities to test domestic appliances as per Indian Standards Specifications.

(b) Relay Testing Laboratory to test relays as per Indian and International Standards.

(c) Battery Testing Laboratory to test batteries as per standards.

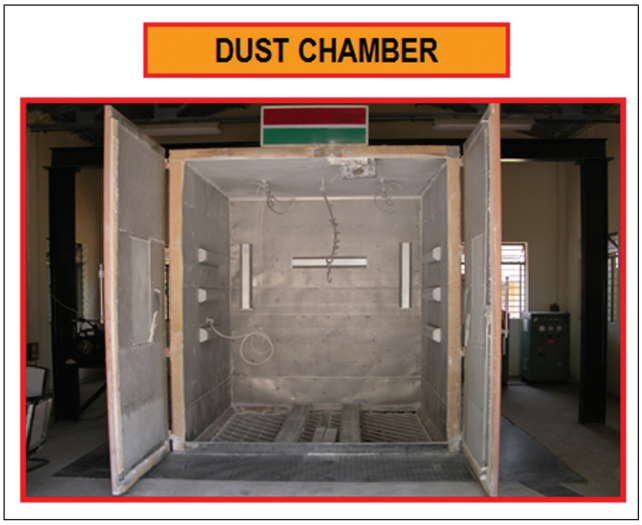
In addition the Distribution Division was also undertaking planning of various capital projects for the future expansion of the Institute

In the year 1985–1986, the division had added one more area in its activity by establishing Ingress Protection Laboratory for IP 55 Testing of Panels, Distribution boards, etc.

During 1987–1988, the activities of the Distribution Division was further expanded by including Short circuit laboratory.

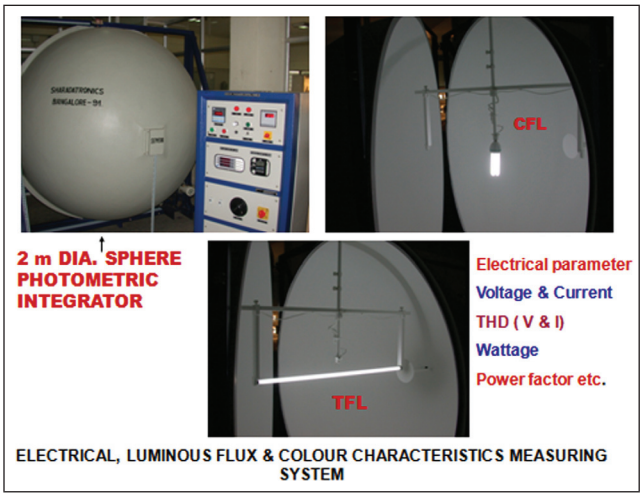
In the short circuit laboratory, facilities to undertake high power tests for certification and development of switchgear, fuse gear and power system apparatus were available. The laboratory was also undertaking applied research through actual testing and assists in the development of indigenous products. This laboratory at Bangalore had a short circuit test capacity of 50 MVA.

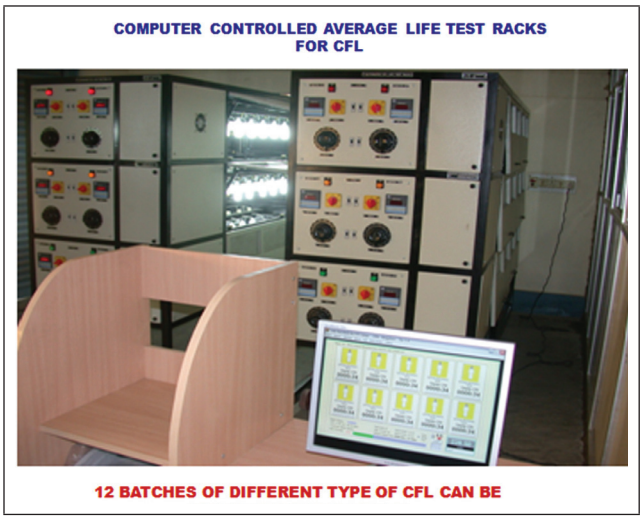
BATTERY TEST EQUIPMENT



Further during the year 1988–1989, the activity of Distribution Division was extended to testing and certification of Tubular Fluorescent and

Incandescent lamps by setting up an Illumination Laboratory. This laboratory had also carried out several projects in the area of evaluation of energy efficient lamps.





During the year 1990–1991, Fan testing facility was established under Distribution Division.

The fan testing laboratory was established to test Ceiling fans and Table fans as per Indian standards and also to cater to the needs of BIS.

The equipment facilities added were:

(a) Humidity Chamber

(b) Endurance Testing Equipment for DP Switches

(c) Vibration Test Apparatus for Automotive Batteries

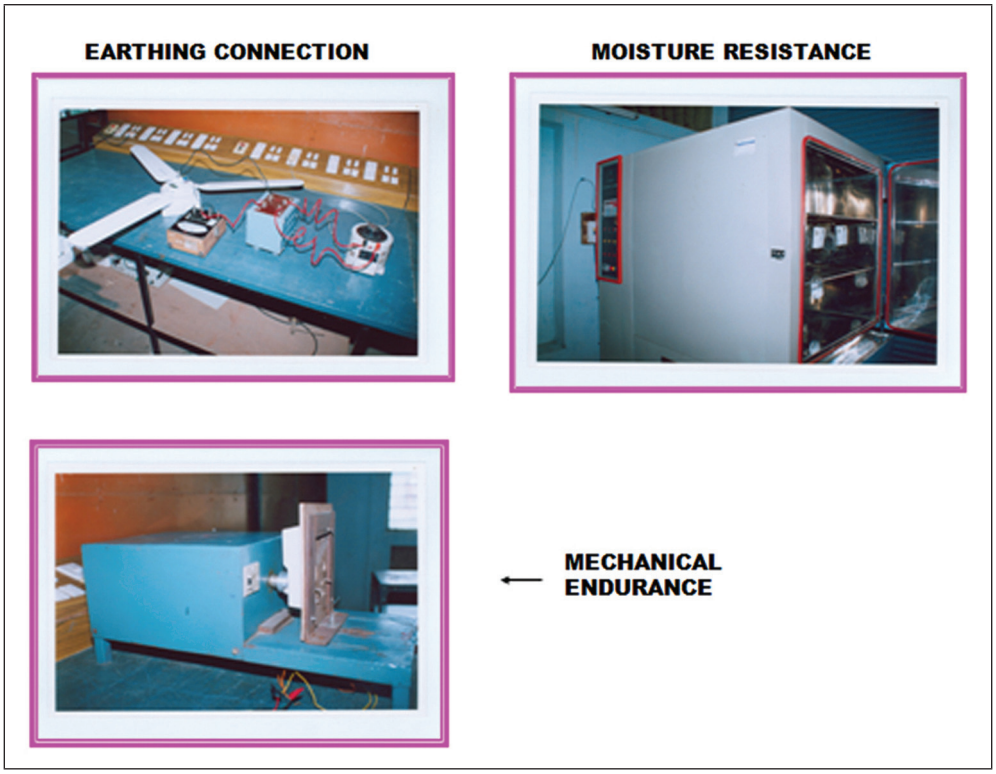
(d) Test Bench for geysers

(e) LCR Bridge

(f) Sound Level Meter

(g) Noise Generator

(h) Anemometer



During the year 1992–1993, one more test facility viz. Flame Proof Test facility was added to Distribution Division. The facility provided was suitable for flame proof testing of electrical equipment enclosures for use in hazardous atmospheres categorized for Group I, Group IIA, IIB & IIC.

4.0 ELECTRICAL APPLIANCES TECHNOLOGY DIVISION (1995 TO TILL DATE)

In the year 1995, The Distribution Division was reconstituted as Electrical Appliances Testing Division and the testing facilities included under this were:

(a) Domestic Electrical Appliances Laboratory

(b) Relay Testing Laboratory

(c) Ingress Protection Laboratory

(d) Battery Testing Laboratory

(e) Illumination Laboratory

(f) Fan Testing Laboratory

The important activities of this division were to investigate R&D problems on distribution systems/equipment and to conduct performance testing and certification on low voltage equipment.

This Division was first in the Institute to conduct Customer meet to impart knowledge of testing to its customers and to understand their needs.

4.1 Energy Conservation Act

Owing to the increasing demand and limited availability of fossil fuels, the importance of efficient use of energy has been realized all over the world. The measures of energy efficiency are useful in multiple ways. Reduced use of fossil fuels is essential in lowering the emission of greenhouse gases contributing to global warming. The policies for energy efficiency aim is to minimize the use of fossil fuels; thereby prevent the occurrence of adverse climatic change resulting from it. The strategies for energy efficiency supports the clean energy policies initiated by different organizations committed towards protection of environment. In view of

the above the Government of India has enacted *Energy Conservation Act – 2001*.

Bureau of Energy Efficiency (BEE) was established in March 2002 to address the issues related to energy efficiency and implement the Standards and Labeling Program in India.

BEE along with Bureau of Indian Standards (BIS) and National testing body like *Central Power Research Institute* is working to implement the Standards & Labeling Program. BIS has the responsibility of formulating the relevant Standards for Energy Efficiency of equipment like Refrigerators, Air Conditioners, Ceiling fans, Tube Lights and distribution transformers, etc.

In order to verify the correctness of the energy star labels, BEE has introduced the check testing of the notified energy efficient products available in the market. To reef the immediate benefit, BEE has launched its Standards and Labeling program for energy intensive electrical appliances viz. Refrigerators and Air Conditioners

CPRI had established the State of Art test facility for Testing of Refrigerators and Air conditioners for implementation of BEE's Mission – "Standards and Labeling (S&L) Program

The Refrigerator Test facility was created in the year 2006 while the Air conditioner test facility was established in the year 2009.

As of now the Electrical Appliances Technology Division is functioning with the following test facilities:

(a) Ingress Protection Test facility

(b) Illumination Test facility

(c) Fan testing facility

(d) Refrigerator Test Facility

(e) Air conditioner test facility

(f) Battery Test facility

WALK IN CHAMBER FOR REFRIGERATOR TESTING

The above facilities have been accredited according to the ISO/IEC17025:2005 standards. The ingress protection test facility is also recognized for ASTA certification.

5.0 RESEARCH ACTIVITIES

In the course of its journey from 1978 to till date the division had under taken several research activities.

(a) Development of a HV contactor with SF_6 as the arc quenching medium

(b) Development of permanent power fuse (PPF) using sodium as the current limiting element

(c) Development of software for interactive graphic for rationalization of Distribution System.

(d) Setting up of Fan test facility

(e) Endurance testing of domestic electrical appliances

(f) Performance analysis of domestic equipment

(g) Measurement of response of power supply equipment to tubular fluorescent lamps with electronic and normal chokes.

(h) Evaluation of field performance of static energy meter, Trivector meter, etc. Phase–1.

(i) Evaluation of energy efficient lamps.

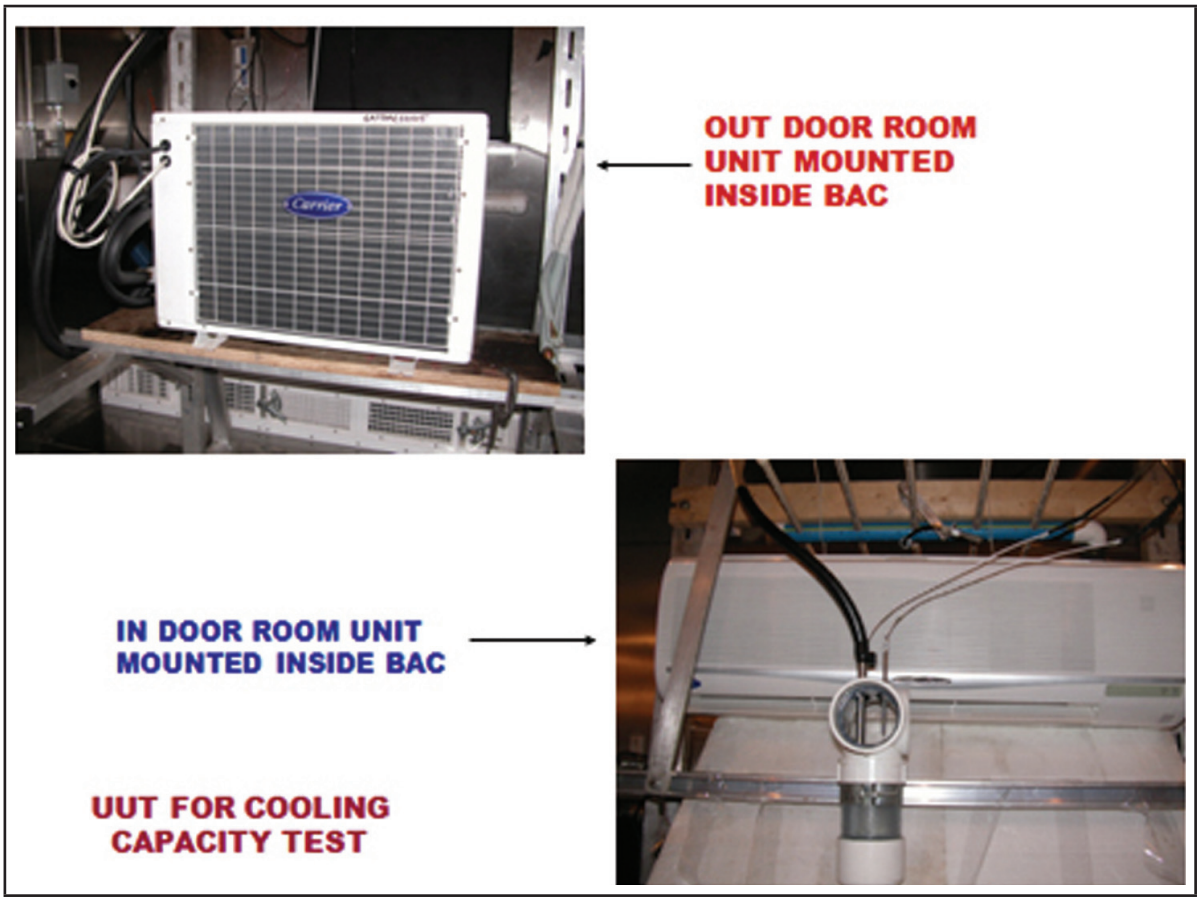
(j) Ripple control of street lighting system.

(k) Study of performance of LT electrical equipment in normal working condition solid and fluid ingress.

(l) Study, modeling and verification by tests and creation of facility for response of LT electrical equipment enclosures to impulse energy release caused by gaseous explosions (CBIP).

(m) Under the capital project "Comprehensive Energy Efficiency Testing Facilities for Refrigerators up to 600 Lts and Air conditioners up to 3 TR", test facilities has been set up to test both Direct cool and Frost Free refrigerators up to 600 Lts and Room air conditioners (window and split type) up to 3 TR as per National and International Standards.

(n) "Diagnostic studies and evaluation of frictional incendivity and surface temperature rise of flame proof electrical equipment enclosures" – study conducted during 2000.



(o) "Performance study of single phase small AC and Universal Motors" – study conducted during 2000.

(p) Design and development of line commutated converter to pump back power into grid in RMTL during motor testing" – study conducted during 2000.

(q) "Marketing research for customer satisfaction index for CPRI" by Gujjala B. Balaraju *et al.* conducted in 2004.

6.0 FIELD ASSIGNMENTS AND THIRD PARTY INSPECTIONS

- Vibration studies of Motors in power plants as a part of R&M Studies
- Harmonic measurements of electrical systems at thermal power plants and steel industries.
- Third party inspection for testing of motors, alternators at Manufacturers premises.
- Harmonic measurement at site on a project "Custom Power Device" for M/s P. K. Steels, Calicut and M/s ER&DCI, Trivandrum

7.0 TESTING AND CERTIFICATION

The EATD has facilities for testing and evaluation of energy efficient devices viz. Refrigerator (both direct cool and frost free) up to 600 L-cap; Room air conditioners (both unitary and split type) up to 3 TR-cap; ceiling fan, table fan, tubular fluorescent lamps, Compact Fluorescent Lamps and Batteries. Check testing of these samples under S&L Program as per BEE Schedule and relevant National and International Standards.

Ingress protection test of Panels, Switchgears, Distribution boards, motors, luminaries, energy meters, etc. as per IS and IEC standard specification.

8.0 KNOWLEDGE DISSEMINATION AND TRAINING

Periodic Workshops and Conferences were being conducted to bring out new advances in technology and best practices on topics of current interest for professionals. Following conferences/ Seminars/Workshops/Training programs have been conducted by the Division:

1. Application of ingress protection and flameproof testing and R&D for enhancing equipment reliability – seminar during 11–12 September 1997.
2. Standards and Labeling Program for consumer applications" International Workshop, 13–14 October 2004 at Le Meridian Hotel, Bengaluru Organized by CPRI in Association with Ministry of Power Govt. of India, and International Energy Agency, France
3. Customized hands on Training Program on Environmental Protection tests for electricity meters – conducted during 30 May to 02 June 2005 and 29 August to 02 September 2005 for Engineers from Bhutan Electricity Board
4. Workshop on "Power Quality Measurement" conducted on 22–23 December 2005.
5. National Workshop on "Refrigerator and Air Conditioner Testing – Latest Trends and Standards and Labeling" during 20–21 December 2010 at CPRI, Bengaluru.
6. Tutorial program on "Refrigerator and Air conditioners Testing and Testing requirements for S&L Purpose" during 25–26 August 2011 at CPRI, Bengaluru.

9.0 PLANNING FOR THE FUTURE

9.1 Research and development

One of the important area of Research in the present day environment being "Performance evaluation of New Refrigerants for use in Air Conditioners" with main objective are:

- Obtain thermodynamic property data and thermal design data for air conditioning systems operating with the refrigerants HFO1234yf and carbon dioxide and also for R134a to serve as base line case.
- Design and fabricate air-conditioners working with the above refrigerants

working with the above refrigerants, with conventional and enhanced tubes for the condensers and evaporators. (Enhanced tubes are tubes on the inside of which longitudinal fins or grooves are provided or any other enhancement mechanisms are deployed).

- Testing and evaluation of the efficiency improvement resulting from the use of enhanced tubes in air-conditioners.

9.2 Test facilities

Augmentation of Test facilities envisaged are as follows:

1. Up gradation of Battery test facility to enhance the bench capacity and also to include testing of individual cells of 2 V and also metal ion batteries, automotive, UPS, Maintenance free batteries, etc.
2. Up gradation of test capacity for Ceiling fan, table fan, wall mounted fans, pedestal fans and ac ventilating fans.
3. Up gradation of test capacity for Refrigerator to accommodate Refrigerators of height up to 2.5 m.
4. Addition of new test facility for illumination testing of luminaries such as T5 Lamps, Metal Halide lamps, etc.
5. Addition of new test facility for check testing of Motors (both routine and type test) up to 300 kW.

10.0 CONCLUDING REMARKS

Electrical Appliances Technology Division an offshoot of the original Insulating Laboratory and group generated out of earlier Distribution Division was catering to the needs of small scale industry sector in the country who are largely associated with manufacturing of domestic electrical appliances and electrical panels. The Division was very actively associated with testing and certification of appliances as per Indian and International standards.

With the enactment of Energy Conservation Act 2001 and formation of BEE and implementation of Standards and Labeling program by BEE, ETAD had established several state of art test facility for providing value added service to the industries under standards and labeling program by carrying out check testing of appliances such as Refrigerators, Air Conditioners, Ceiling Fans, Tubular Fluorescent Lamps, Compact Fluorescent Lamps, Batteries, etc.

The activities of the Division and the volume of samples being tested has increased many fold (nearly five times) over the past five years.

The Division is further contemplating to add new test facilities to cover other products including Motors, all types of batteries and other luminaries.

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