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ENERGY AUDIT OF AN ELECTRICAL INDUSTRY

[1]Dr.P. V. Narendra Kumar,[2] K. Abdulsalam,[3]R.Bheemesh,[4] T.Himabindu,[5]J.Pradeep,[6]P.Srinivas

[1]Associate Professor,[2,3,4,5,6]UG Scholars

Department of Electrical & Electronics Engineering

Chalapathi Institute of Engineering & Technology, Lam, Guntur, Andhra Pradesh
EMAIL :cieteeehod@chalapathiengg.ac.in

Abstract*----To present information on the calculation of loads for the electrical system of a building so that one can prepare an electrical load balancing and energy audit for the Electrical Department As part of the construction plans, one is able to understand and take the electrical load for Department permit applications. With a full understanding of the electrical load the students can better estimate the cost of a construction project. Energy audit is a process of checking the way energy is used and identify areas where wastage can be minimize if not totally eradicate. Energy audit consists of several tasks which can be carried out depending on the type of audit and the function of audited facility. It started with review the historical data of energy consumption which can be compiled from the electricity bills. The energy utilization such as running hours of efficiencies of equipment's and machine and the areas of high energy consumption and the possibility to reduce consumption should be record for further analysis. The energy audit will only focused in the sir Visvesvaraya Institute of Technology ,Nashik It is carried out in aim of analysing and identifying possible energy saving measures and load balancing which can later be implemented for saving energy conservation program in our collage. The energy audit discussed in this paper also focused in the Electrical department. It is carried out in aim of analysing and identifying possible energy saving measures in the such department, which can later be implemented for energy efficiency program in college.

Keywords-: *Energy Audit, Energy Consumption, Energy Management, Estimation, Energy Conservation*

1.INTRODUCTION

An energy audit is a study of a plant or facility to determine how and where energy is used and to identify methods for energy savings. There is now a universal recognition of the fact that new technologies and much greater use of some that already exist provide the most hopeful prospects for the future. The opportunities lie in the use of existing renewable energy technologies, greater efforts at energy efficiency and the dissemination of these technologies and options. This energy audit of the Nandi Institute of Technology and Management Sciences (NIT&MS) has been carried out and reported in this paper. We have compiled a list of possible actions to conserve and efficiently utilize our scarce resources and identified their savingspotential. The next step would be to prioritize their implementation. I look forward with optimism that the institute authorities, staff and students shall ensure the maximum execution of the recommendations and the success of this work. Nandi Institute of Technology & Management Sciences (NIT&MS) one of the pioneer private Engineering College in Karnataka was established in the year 2007 initially with three AICTE approved Degree Engineering course and one AICTE approved Management course. At present the college is running Five UG Courses and one Management course. Before planning this paper the various papers related to the Energy Audit available in the IEEE archives were studied. Most of the papers [1, 2] related to such studies made in different industries like, mechanical and heavy engineering. To the best of our knowledge no paper could be located on the energy auditing of educational institutions. However, the

following paper was identified. Dr. K. Umesha [3] has mentioned that the Energy auditing has been conducted at the Technical Institute Campus. In this paper the Energy Auditing has been dealt as the index of the consumption which normalizes the situation of Energy crisis by providing the conservation schemes. This has been done to minimize the unwanted power shutdown either incidentally or by load shedding. Here author has defined Energy auditing is one of the tools through which balancing of demand and supply is determined. The recommendations reduce around 15-20% of the energy and 25-30% of cost reduction. In the paper [6] Equipment wise analysis has been performed in order to identify the electrical equipment's, within same application area, which consume more power as compared to others. During equipment wise analysis of the overall campus, the equipment's with power consumption less than 1% of total power consumption of the campus were ignored so as to make the analysis results simple and easy to observe.

1.1TYPES OF ENERGY AUDITING

a) Preliminary energy audit
b) Detailed energy audit.

1. Walk through energy audit: The preliminary audit alternatively called a simple audit, screening audit or walk-through audit, is the simplest and quickest type of audit. It involves minimal interviews with site operating personnel,a brief review of facility utility bills and other operating data, and a walk-through of the facility to become familiar with the building operation and identify areas of energy waste or in effi-ciency. Typically, only major problem areas will be uncovered during this type of audit.

2. Detailed energy audit: Detailed energy is also called comprehensive audit or investment grader audit. It expands on the general energy audit. It covers estimation of energy input for different processes, collection of past data on production levels and specific energy consumption.It is a comprehensive energy audit action plan to be followed effectively by the industry. In detail audit we define energy use and losses through a more detailed review and analysisofequipment, systems, operational characteristics, and on-
site measurements and testing

.1.2APPLIANCES

- to identify the end use of energy in building and its Energy Conservation opportunities
- Using electricity to power electronic devices such as smartphones, computers, and kitchen appliances.

1.3ADVANTAGES

- To easy find out of load of building such as lighting, fan and power circuit.
- To find out of cost for load of building.
- Improve building energy efficiency.

2. LITERATURE SURVEY

A case study has been done [1] which says that audit was conducted and suitable strategies of adjusting and optimizing energy were suggested so as to reduce energy requirements and hence, the total cost spent towards energy consumption.[2] a case study of energy audit Electrical Department was presented which discusses the common aspects of electrical energy management in Electrical Labs. It contains the findings and the analysis of the results obtained from the electrical energy audit program employed in an Electrical Department, Sir Visvesvaraya Institutes of Technology, Tal. Sinnar, Dist. Nashik. The electrical energy audit was carried out under three major heads: (i) lighting audit, (ii) power load audit (motors, meters, etc.), and (iii) Computer. [3] standard design practice to assist engineers in evaluating electrical options from an energy standpoint has been presented. It establishes engineering techniques and procedures to allow efficiency optimization in the design and operation of an electrical system considering all aspects. Identification of areas of energy wastage and

estimation of energy saving potential in Departments and Institute Central Facilities. Suggesting cost-effective measures to improve the efficiency of energy use. Estimation of implementation costs and payback periods foreach recommended action. Documenting results & vital information generated through these activities.Identification of possible usages of co-generation, renewable sources of energy (say Solar Energy) and recommendations for implementation, wherever possible, with cost benefit analysis.

3. PROBLEM FORMATION

How many units of electricity is consumed for various electrical appliances is calculated without auditing?

4.SOLLUTION FORENERGY AUDIT CALCULATIONS

With energy auditing, number of units consumed by various electrical appliances are calculated .

As acase study, various electrical appliances used in a house considered.

The calculations are as follows.

1. Data Collection – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, interviewing key persons, and measurements.

2. Data Analysis - Detailed analysis of data collected was done by manually. The database generated by manually was used for producing graphical representations.

4.1Table for enrgy audit

Appliancs	No.s	Monthly Saving in Kwh	Monthly Saving Rs.	Annual Saving Rs.
Ceiling fans	36	92.16	921.6	11059.2
Tubes	32	50.12	501.2	6014.4
Computers	53	572.4	5724	68688
Motors	40	700.252	70005.2	84062.4

1.DailyKWh:-Nos. of Appliances*Wattage of Appliances*Active Hours
1000
2.Monthly KWh:- Daily KWh*Nos. of Days in Month(24 days)
3.Electricity Bill in Rs.:- Monthly KWh*Cost of Unit(10 Rs.)

i) Monthly Saving in KWh*Cost of Unit(10Rs.)= Monthly Saving (Rs.)
II)Monthly Saving in (Rs.)*No of Months(12)= Annual Saving (Rs.)

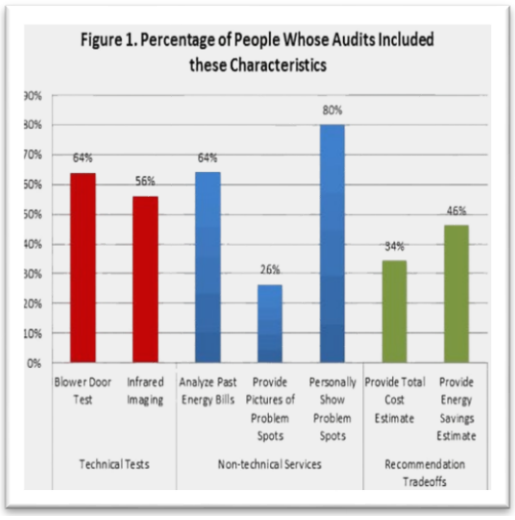
Ceiling Fan:-
i)Monthly Saving in Rs.is
92.16*10=921.6Rs.
ii)Annual Saving in Rs. is
921.6*12=11059.2Rs.

Tubelights:-
i)Monthly Saving in Rs.is
50.12 *10=501.2Rs.
ii)Annual Saving in Rs.is
501.2*12=6014.4Rs.

Computers:-
i)Monthly Saving in Rs.is
572.4 *10=5724Rs.
ii)Annual Saving in Rs.is
5724*12=68688Rs.

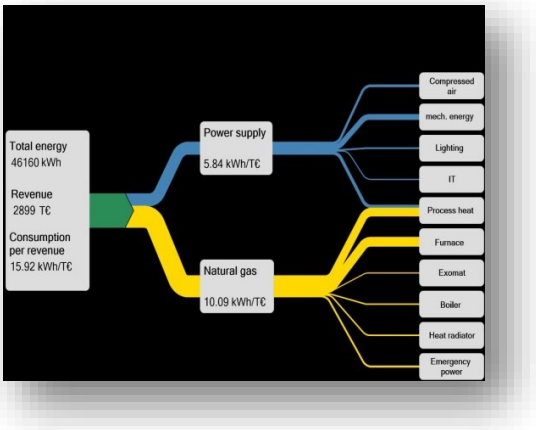
Motors:-
i)Monthly Saving in Rs.is
700.52 *10=7005.2Rs.
ii)Annual Saving in Rs.is
7005.2*12=84062.4Rs

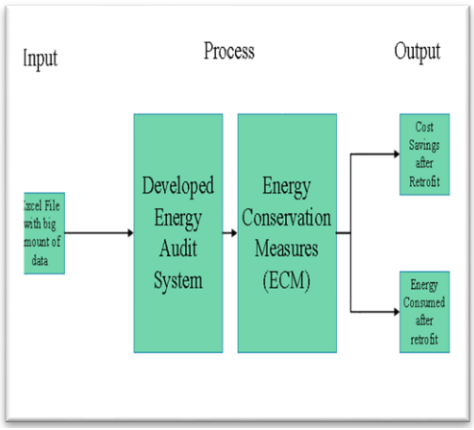
4.2.Graph for monthly electricity bill



Graph Percentage for energy audit.

4.3. BLOCK DIAGRAM :- STAGES OF ENERGY AUDIT.





4.4.ENERGY SAVING OF TUBE LIGHT:

- Used natural day light more energy saving is below
- Monthly electricity bill saved tube up to 921.6 RS.
- Annual saving of tube is 11052 RS.
- Monthly energy saving in tube is 92.16kwh

4.5. ENERGY SAVING OF FAN :

- Monthly kwh energy saving of fan up to 80.64 kwh
- Monthly electricity bill saving up to 1935.3 RS
- Annual electricity bill saving up to 9682.8 RS
- Capital investment up to 3200 RS
- Bajaj 80 watt fan more energy saving than 120 watt fan and more saving electricity bill.

4.6. ENERGY SAVING OF PC :

- Monthly energy saving of pc up to 572.4kwh
- Monthly electricity bill saving up to 5724RS
- Annual electricity bill saving up to 68688RS
- Daily energy saving up to 23.85 kwh ¬ Lenovo c20 pc is used to more energy saving from pc.

4.7. PIE CHART FOR ELECTRICITY BILL

Energy consumption Distribution in electrical department

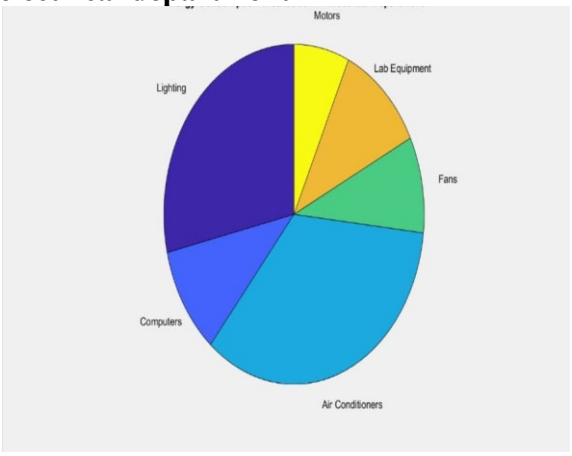


Figure 1

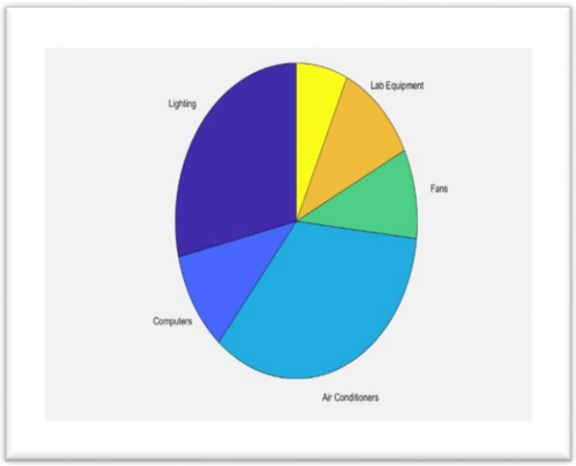


Figure 2

4.8.FUTURE SCOPE &DEVELEPMENT

- With the use of harmonic analyzer, harmonic study can be carried out. Study different losses, harmonic distortion factor etc can be carried out.
- Using photo sensors if the atomization in the lighting system is implemented, then considerable energy saving can be achieved. With the use of Master Switch in computer lab to more energy saving.

4.9. MAINTENANCE:

- It is observed that the solar panels installed at the roof of new Building are not being cleaned regularly. The surface panel needs to be cleaned in regular intervals so that efficiency can be increased to the maximum extent.
- It is observed several joints / nodes in wiring. It is recommended that such conductors are to be replaced.
- Replacing conventional electrical regulators in Electrical Department to electronic type regulators for controlling the speed of ceiling fans.

5.CONCLUSION

In conclusion, an energy audit is a crucial process for identifying areas of energy inefficiency within a building or facility. By evaluating energy usage and identifying potential improvements, an audit helps reduce energy consumption, lower operational costs, and improve sustainability. The findings from an energy audit can guide the implementation of energy-saving measures, such as upgrading equipment, optimizing systems, or introducing renewable energy solutions. Ultimately, conducting regular energy audits leads to more efficient energy management, contributing to both cost savings and a reduction in environmental impact.

- In this project we have studied that, it provide information for cost estimates and permitting needs.
- Energy auditing improves energy conservation and efficiency of building devices.
- Energy auditing provides better recommendation of motor computer fan and tube. More energy saving.
- Total electricity of bill of electrical department 23,211RS.

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