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ENERGY AUDIT OF AITRC CAMPUS, VITA

Thorat Pramod R.[1], Mohite Ajay L.[2], Jadhav Dipalee V.[3], Paramane Siddhi S.[4], Pawar Suraj A.[5], Thorat Sumit B.[6]

[1]*Asst. Professor, Dept. of Civil Engineering, AITRC, Vita, Maharashtra, India.*
[2,3,4,5,6]*Students, Dept. of Civil Engineering, AITRC, Vita, Maharashtra, India.*

Abstract – *Energy is very important constraints in all sectors for any country's economy. Coals and gas are conventional sources of energy and available in limited forms. Both this sources are important for electricity generation. It is very necessary to optimize use of natural resources and it is necessary to avoid energy crisis. Energy demand has increased as its consumption is increased so proper energy conservation methodology to be adopted. Academic sector is one of the major energy consuming sectors. This paper has mainly focuses on identification of energy conservation in our college. During the energy audit, a complete survey of power consumption in the college was carried out. Audit was conducted for lighting, fans, computers, Air conditioners, single phase, three phase water pump and the laboratory equipment and their power consumption pattern was determined. Estimation of monthly energy consumption is studied through analysis of electric bill. Energy conservation areas are identified. The purpose of this paper is to carry out energy audit of the institute offering engineering program. It will help to implement the energy efficient project for improving energy efficient in institute building.*

Key Words: *Energy Audit, Energy Consumption, Energy Conservation.*

1. INTRODUCTION

An Energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. Increasingly in the last several decades, industrial energy audits have exploded as the demand to lower increasingly expensive energy costs and move towards a sustainable future have made energy audits greatly important.

Energy audit is one of the most important tools for energy conservation and for achieving energy efficiency. The domains of leakage, wastage of renewable energy can be identified by using energy audits. Energy audits also provide a means to reduce energy losses in the systems of current use. Therefore, energy audits provide as a means of providing-

- Energy saving
- Cost saving

1.1 Objectives

- To study and audit MSEB bill.
- To improve the energy preserving measures and methods.

2. LITERATURE REVIEW

2.1) Takshashila Bhandari, et.al (2016):

This paper has mainly focused on identification of energy conservation in academic sector consist of many schools, colleges of different field. This paper deals with the energy audit of an engineering college. Estimation of monthly energy consumption is studied through analysis of electric bills.

2.2) Manish Talwar (2016):

Energy is the requirement of the time. There are huge losses in the energy systems. In this paper author focused on the energy audit for conservation. It is the study of usage of energy and methods for saving of energy. A mix of new technologies and the existing ones can provide future references for saving energy. The process of energy management initiates with an energy audit.

3. METHODOLOGY

Energy audit is defined as "The verification, monitoring and analysis of use of energy including submission of technical report containing recommendation for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption". Energy audit is one of the important tools for energy conservation in order to achieve energy efficiency. It includes monitoring and analysis of different energy consuming equipment's and proper action plan to reduce extra energy consumption in the building. Energy auditing of any institute or building can be possible by collecting energy consuming data and analyze those data to find out unnecessary use of energy.

Following are the step by step procedure of Energy Audit of Institute Building

3.1 Data collection

In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, interviewing key persons, and measurements. For suggesting any corrective measures to reduce power consumption, it is first necessary to know the power consumption pattern in detail. For this, the exhaustive data collection exercise was performed at all the departments and other supporting entities such as library, office and management section.

3.2 Data Analysis

In data analysis, the data collected is processed to draw significant conclusions to pinpoint loopholes and identify the areas to focus upon. Analysis of the power consumption observations obtained was used to obtain the power consumption pattern and also to get the information about the points where electric power is wasted.

3.3 Recommendations

Energy as well as cost analysis of different appliances were performed and recommendations were made based on the capital cost recovery time.

4. SURVEY OF LOADS

The survey of electrical load is carried out to determine the connected load of institute. The number of quantities of connected load in the institute is measured and presented in table 1. Load is categorizing in different category like are as follows.

Table 1. Department wise Electrical Loads

Source of Loads	Office and Mang.	CSE	Work -shop	Mech	E&TC	Civil	Gen. Dept
PC	6277.5	11439	34.875	3504.94	2615	800.38	156.24
CCTV	1080	-	-	60	1080	1080	1890
Fan	1181.25	472.5	218.37	548.44	56.25	438.78	1501.87
Tube	720	423	-	454.5	481.5	472.5	1548
AC	2025	-	-	-	-	-	-
POP	1709.1	-	-	-	-	-	-
Router	261.9	52.38	43.65	87.3	130.95	130.95	130.95
Xerox	640	-	-	-	-	-	-
Printer	50.625	-	-	-	-	13.5	-
Cooler	55	-	-	-	-	-	-
LED	40.5	-	-	-	-	-	-
Laptop	-	10.125	-	6.15	3.375	-	-
Bell	0.36	-	-	-	-	-	-
Lab Equip.	-	-	6740.36	1027.395	76.251	30.2635	0.115
Total kWh	**13941.235**	**12397.005**	**7038.255**	**5689.325**	**4443.326**	**2966.373**	**5227.17**

Table 1 shows the department wise quantity of connected load of institute and their kW rating. From this table energy consumption usage is calculated. Now, for example, the lighting load consumes 472.5 kWh in civil department. It includes 105 tubes of 40 watt each. Maximum portion of institute get sufficient sunlight during day time so do not required continuous lighting. The complete lighting loads in terms of kWh calculated for 0.5 hr/day. Duration of use of light is total 225 working days of academic year 2018-19 is considered excluding all Sundays and academic holidays.

Sample Calculation

Duration= 0.5 hr x 225 =112.5 hrs

Total energy consumption

=Duration x No. of tube x Actualload

= 112.5 x 40 x 105

= 472.5 kWh

4.1 Energy Consumption Pattern

The above-mentioned methodologies have been appliedand similar kind work is carried out for preparing energy audit report of engineering institute. Figure 1 shows the pie chart of connected load.

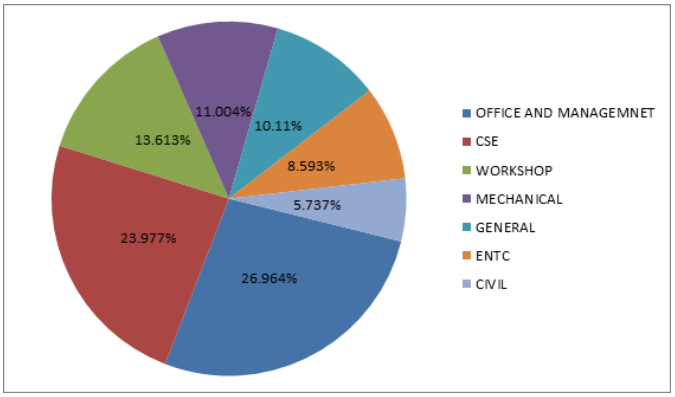

Figure 1. Department Wise Energy Consumption

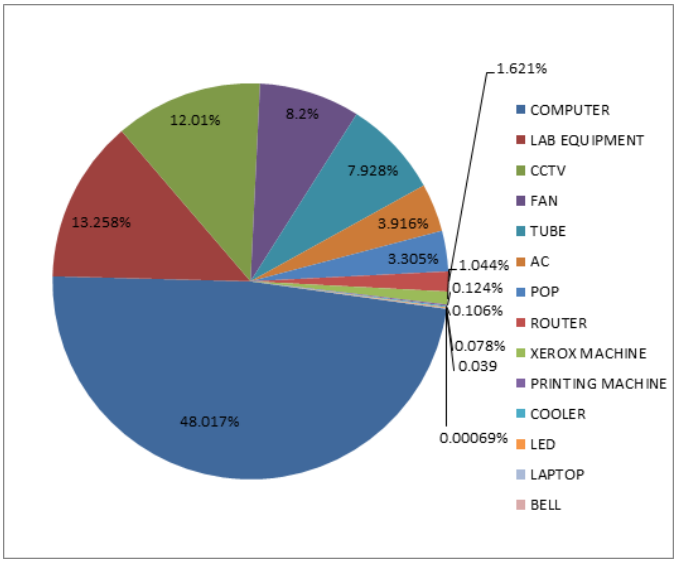

Figure 2. Appliances wise Energy Consumption

From above Figures 1 and 2, the connected load distribution pie chart shows, it is clearly observed that load which occupied maximum connected load is due to computer. Also, maximum energy consumption occupied in Office and Management section and also Computer Science Department. Out of this connected load, computer load can play major role in consumption of energy since electricity will be continuously in running condition through the day. So, analysis of each department is done to calculate the mitigation of computer load in order to reduce the wasteful energy consumption and also to reduce the electricity bills of colleges.

Table 2. Actual Billing History of MSEB

Month	Units	Bill Amount (Rs.)
Jul. 2018	3045	56394.54
Aug.2018	2422	46502.4
Sep.2018	2510	47439.39
Oct.2018	6797	132910.87
Nov. 2018	5464	93779.81
Dec. 2018	4332	78683.05
Jan. 2019	4454	73781.51
Feb. 2019	4935	87511.74
Mar. 2019	7187	125662.94
Apr. 2019	7134	150852.27
May2019	3533	74819.47

5. RECOMMENDATIONS

- Total connected load distribution consists of 48 % of computer load, 8.5% of fan load, and 8% of lightning load. So, the focus is mainly given to reduce computer energy, fan energy and lightning energy consumption so that ultimate result will be having less electricity bill.
- The computer load of college consists of 371 computers, 405 nos. of fans and 696 nos. of tubes. During the data collection and data analysis process it is found that there are some spaces of colleges which are having a greater number of extra tubes and fans than required. Also, there are so many computers which are under maintenance and going to replace by using such computer which consume less energy as compare to present.

6. CONCLUSIONS

Energy audit is an effective tool in identifying a comprehensive energy management program. A careful audit of any type will give the organization a plan with which it can effectively manage the organization energy system at minimum energy cost. In this project a detailed study has been made to reduce the electrical energy consumption in the campus of Adarsh Engineering College, Vita. It highlights the amount of energy saving, thereby reducing the energy crisis considerably.

7. SCOPE AND FURTHER STUDY

The work of energy audit has the objective of finding opportunities of energy conservation, saving and to recommend action plan with calculation of investment option and energy saving. The scope of energy audit is,

- Study of lighting system and its measurement.
- To study and audit MSEB bill.
- Identification of energy saving opportunity and energy saving conservation.
- Load study and submission of technical report.

7.1 Solar Energy

Solar energy is one of the best renewable energy sources. It produces greater amount of energy by using solar panels. Such type of solar plant was installed in college campus on Nov. 2019. This step helps to produce electricity by using solar energy since its installation. There are two plants were installed on the terrace of college building each of 50 kW and 30 kW capacity.

Table 3. Monthly Electricity Generated by Solar Plant

Month	50 kW plant	30 kW plant
Nov. 2019	6511 kWh	3864 kWh
Dec. 2019	5766 kWh	3398 kWh
Jan. 2020	5266 kWh	3109 kWh
Feb. 2020	5866 kWh	3464 kWh
Total	**23409 kWh**	**13835 kWh**
Avg. Electricity production	5852.25 kWh	3468.75 kWh

- Avg. monthly energy production = 9321 kWh.
- Total cost of installation of plant = Rs. 32,00,000 /-
- Months required to nil the total cost of installation of plant by energy production

= 3200000 / (9321 x 17.5)

= 19.617 months

= 20 months

Net profit of solar energy plant will get after 20 months from installation.

8. REFERENCES

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BIOGRAPHIES

Asst. Prof. P.R. Thorat
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH CENTRE, VITA.

Mr. Ajay Laxman Mohite
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH CENTRE, VITA.

Miss. Dipalee Vinayak Jadhav
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH CENTRE, VITA.

Miss. Siddhi Sunil Paramane
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH CENTRE, VITA.

Mr. Suraj Ananda Pawar
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH CENTRE, VITA.

Mr. Sumit Babanrao Thorat
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH CENTRE, VITA.