



**Senapati Prataprao Gujar Shikshan
Sanstha Kandewadi's
Mhaisal Mahavidyalaya, Mhaisal
Energy Audit**



**Prepared by
Department of Environmental Science,
Shivaji University, Kolhapur-416004
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Principal Message

Today, the universe is facing problems like global warming and deforestation. There are several aspects responsible for climate change. Safe drinking water scarcity, drought, and flood are nowadays. All these environmental issues are only discussed at the global level, but the fact is that regional and local activities are responsible for making such cases global.



In the dire need to protect our planet from environmental pollution, it is the responsibility of everyone not to contribute to activities that may harm the environment. College is where students, faculty and staff gather daily to run the teaching and learning process. This process requires infrastructure, energy, water, chemical and support facilities. The college has to look after these things' optimum and economical use. It is necessary to conserve energy from non-traditional sources. Also, it is essential to avoid the entry of monoxide and other gaseous pollutants into the environment. The scarcity of water and its pollution are the hot topics. We must save the available water and keep it free from pollution. The campus must be clean and green to have a pleasant atmosphere for the teaching-learning process. We must make maximum efforts towards carbon neutrality. In this direction, along with plantation, the origination of other nature-related activities and the creation of awareness among the people is necessary.

To be environmentally conscious, every college must undertake a green audit of the premises and facilities. I am pleased to state that the Department of Environmental Science, Shivaji University Kolhapur, is under the guidance of the green audit team, and they have conducted the green audit of our college very keenly. Their suggestions are undoubtedly helpful for us for the improvement.



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Certificate

This is to certify that the Department of Environmental Science, Shivaji University, Kolhapur has conducted detailed "Energy Audit" of "Senapati Pratao Rao Gujar Shikshan Sanstha Kandewadi's Mhaisal Mahavidyalaya, Mhaisal Tal. Miraj Dist. Sangli." during the academic year 2022-2023. The Energy audit was conducted in accordance with the applicable standards prescribed by 'Bureau of Energy Efficiency, Government of India'. Their audit involve code compliance, operations, maintenance, occupancy, and building systems etc and gives an 'Energy Management Plan', which the institute can follow to minimize impact on the institutional working framework. The analysis was based on a review of the rules governing energy efficiency and conservation, on data analysis, and on the findings of survey with key personnel in the campus's administrative management. The performance of college was found to have good quality even though some important aspects like increasing the use of solar energy and energy efficient equipments are to be considered seriously. In an opinion and to the best of our information and according to the information given to us, said Energy audit gives a true and fair view in conformity with energy auditing principles accepted in India.



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Chapter I

Introduction

1.1 Energy Audit, a Tool for Environmental Protection and Conservation

An energy audit is a survey that looks at how an organization uses its energy and looks for ways to conserve it. It refers to a method or system designed to lower the organization's energy consumption without lowering output. The audit offers recommendations for additional strategies and techniques for maximizing energy savings. Traditionally, fossil fuels, water, and wind have been used to produce electrical energy. The abundance of fossil fuels and their rates of depletion reinforce the need for alternative energy sources and electric energy conservation. Offering goods or services at the lowest cost and with the least degree of environmental damage is often the main goal of an energy audit and the control of energy consumption (Backlund and Thollander, 2015). Energy audits are required to identify areas for improvement, cost-saving opportunities, understand how fuel is used, where waste occurs, and identify potential savings.

The Energy Conservation Building Code (ECBC), introduced in 2017, establishes minimal standards for the design and construction of energy-efficient buildings throughout India. Additionally, it offers two extra sets of incremental specifications that buildings must meet in order to reach higher than necessary levels of energy efficiency (Gnanamangai *et al.*, 2021). In an effort to adopt energy-saving procedures in an organisation, the Bureau of Energy Efficiency (BEE) was established in 2002. Affixed to manufactured goods, energy-efficiency labels provide information on the products' energy efficiency (Ingle, 2014). In order to speed up energy efficiency efforts, BEE has created a system for labelling buildings' energy efficiency that corresponds with their star ratings. The BEE Star Rating Scheme is based on the real performance of the building and equipment in terms of specific energy usage, or "Energy Performance Indicator," by using star ratings to designate products that will be helpful for energy savings in a sustainable manner (Mishra and Patel, 2016).

Chapter II Methodology

2.1 Background of Mhaisal Mahavidyalaya, Mhaisal Tal. Miraj Dist. Sangli Energy Audit preparation:



Satellite image of Mhaisal Mahavidyalaya, Mhaisal Tal. Miraj Dist. Sangli (Source: Google Earth)

Considering all this situation and adding national holidays in the total days, the audit process was carried out in three phases. For preparation of audit, the earlier data was compared with the present. At first, all the secondary data required for the study was collected from various sources, like concerned departments. A broad reference work was carried out to clear the idea of Energy Auditing. Different case studies and methodologies were studied and the following methodology was adopted for present audit. The methodology of present study is based on onsite visits, the personal observations and questionnaires survey tool. Initially, based on data requirement, sets of questionnaires were prepared. The surveyors then visited all the departments of the college and the questionnaires were filled. The generated data is subsequently gathered through various sections of college and used for further analysis. From the outcome of the overall study, a final report is prepared.

- Energy Auditing Process
- Planning
- Choosing audit team
- Inspecting site/ Collection of data

- Analyzing results of audit
- Evaluating audit

2.2 Survey by Questionnaire:

Baseline data for Energy Audit report preparation was collected by questionnaire survey method. Questionnaires prepared to conduct the Energy Audit in the college campus is based on the guidelines, rules, acts and formats prepared by Ministry of Environment, Forest and Climate Change, New Delhi, Central Pollution Control Board and other statutory organizations. Most of the guidelines and formats are based on broad aspects and some of the issues or formats were not applicable for college campus. Therefore, using these guidelines and formats, combinations, modifications and restructuring was done and sets of questionnaires were prepared for energy audit. All the questionnaires comprise of group of modules. The first module is related to the general information of the concerned department, which broadly includes name of the department, month and year, total number of students and employees, visitors of the department, average working days and office timings etc. The next module is related to the present consumption of resources energy. There are possibilities of loss of resources like water, energy due to improper maintenances and assessment of this kind of probability is necessary in Energy Audit. One separate module is based on the questions related to this aspect. Another module is related to maintaining records, like records energy bill, equipment warranty specification, etc. For better convenience of the surveyor, some statistics like, basic energy consumption characteristics for electrical equipment etc. was provided with the questionnaires itself.

Chapter III

Observation and Result

3.1 Electricity and energy audit:

Energy auditing is a tool for identifying energy efficiency potential and measures. Proper management of energy efficient systems can lead to significant cost savings and energy savings as well as increased comfort, lower repair costs, and extended machine life. An effective energy management program begins with a thorough energy audit. Energy audit evaluates the efficiency of all building and process systems that use energy. The auditor of the power starts at the meter used, finding all the energy sources that go into space. The auditor then identifies the streams of energy in each fuel, balances the distribution of energy into different functions, evaluates the efficiency of each of those functions, and identifies energy efficiency and cost-effectiveness.

- ❖ Audit activities, in general order, include:
 - Identify all energy systems
 - Check system status
 - Analyze the impact of improvements to those systems
 - Write up an energy audit report

The report documents the use and occupancy of the building and building systems equipment. The report also recommends ways to improve efficiency through improvements in operation and maintenance items, and through installation of energy conservation measures.

An energy source utilized by all the departments, of Mhaisal Mahavidyalaya, Mhaisal Tal. Miraj Dist. Sangli campus includes use of electricity. Major use of the energy is at office, Seminar hall, Principal cabin, library and various departments for lighting. Electricity is supplied to the college campus by Maharashtra State Electricity Board. The college has only one building with one ground floor.

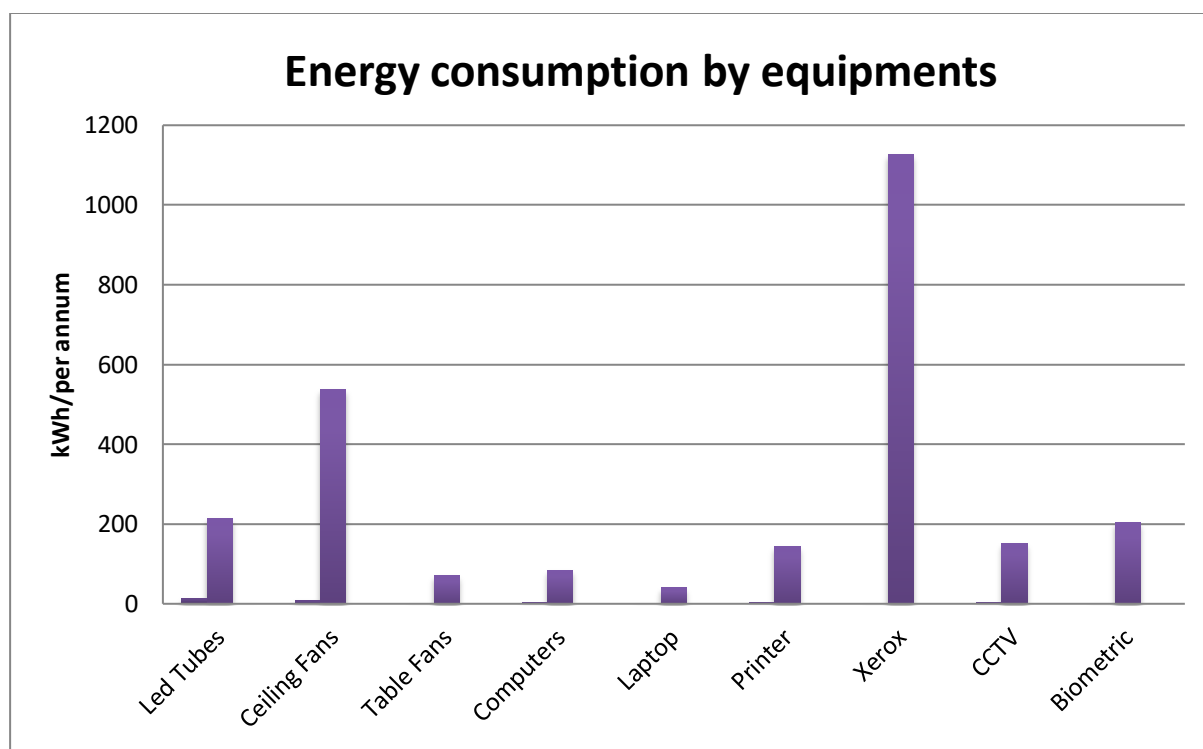
3.2 Energy consumption at building:

The college building includes Principal cabin, office, Seminar hall, library, classrooms and support services. The calculations are based on the data provided by the college and actual observations taken at the site.

The collected data of the college shows the energy consumption is about 2573.27 kWh/ Annum. The consumption of energy of each equipment is shown in the table in detail.

Table No.3.1: Energy consumed per annum by equipments in Building

Sr. No.	Equipments	Number	kWh/Per Annum
1	LED Tubes	14	215.02
2	Ceiling Fans	8	537.6
3	Table Fans	1	70
4	Computers	3	84
5	Laptop	1	40.25
6	Printer	2	144
7	Xerox	1	1126.4
8	CCTV	3	151.2
9	Biometric	1	204.8
	Total	34	2573.27



Graph No.3.1: Energy consumed per annum by equipments in Building

The energy-consuming equipment throughout the building uses 2573.27 kWh/Annum of power annually. Since there was maximum use of energy 1126.4 kWh/Annum for Xerox machine. Also 2 printers consume 144 kWh/Annum energy Moreover, in the assessments it was found that there are 14LED Tubes, which consumes energy i.e.215.02kWh/Annum. 8

Ceiling Fans use 537.6 kWh/ Annum and also 1 Table Fans uses 70kWh/Annum, 3 CCTV cameras use 151.2kWh/Annum, 3 computer and 1 laptop use 84kWh/Annum and 40.25kWh/Annum energy respectively. Also there is 1 biometric machine which uses energy of 204.8 kWh/Annum. (Graph No. 3.1)

3.3 Key Observations:

- The total energy consumption of college is 2573.27kWh/Annum
- Highest consumption of energy is by Xerox machine i.e. 1126.4 kWh/Annum.
- Installation of sensor based electrification items like fans, lights, etc. can save electricity.
- Installation of solar panels on building will be useful in conserving the natural resources.
- Unnecessary use of lights, fans and computers at some places when no one is using.

Chapter IV

Summary and Conclusion

Summary:

Energy Audit is one of the important tools to check the balance of natural resources and its judicious use. Energy auditing is the process of identifying and determining whether institutional practices which are eco-friendly and sustainable. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area.

The Department of Environmental Science, Shivaji University, Kolhapur has conducted an “Energy Audit” of Mhaisal Mahavidyalaya, Mhaisal Tal. Miraj Dist. Sangli in the academic year 2022-23. The main objective to carry out energy audit is to check the Energy Audit practices followed by college and to conduct a well defined audit report to understand whether the college is on the track of sustainable development.

After completing the audit procedure of college for Energy Audit practices, there are following conclusions, recommendations and Energy Management Plan (EMP) which can be followed by college in future for keeping campus environment friendly.

Conclusion:

From the Energy Audit, following are some of the conclusions which can be taken for improvement in the campus.

1. Installation of solar panels provides ample amount of electricity. Such solar modules should be installed wherever possible in the campus.
2. Use of LED lamps and Tube Lights is minimum and is to be encouraged.

Recommendations:

Following are some of the key recommendation for improving campus environment:

1. An environmental policy document has to be prepared with all the recommendations and current practice carried by college.
2. The college should develop internal procedures to ensure its compliances with environmental legislation and responsibility should be fixed to carry out it in practice.
3. Electrification of lights by solar power should be encouraged.
4. Installation of sensor based electrification items like fans, lights, etc. can save electricity.
5. Installation of solar panels and rain water harvesting system to building will be useful in conserving the natural resources.
6. Regular check-ups and maintenance of wire, and Electricity meter system should be done by engineering section to reduce over use, short circuit.
7. Science laboratories and support services using large amount of energy consumption; the system should develop energy conservation practices.

Chapter V

Energy Management Plan (EMP):

By understanding the dynamics of present situation of resource utilization and current Energy Audit practices, the Department of Environmental Science has prepared an "Energy Management Plan" for the Mhaisal Mahavidyalaya, Mhaisal Tal. Miraj Dist. Sangli. This plan will reveal the strengths and weaknesses and suggests remedies to develop Energy Audit campus. The EMP also gives suggestion for the priority of work to carry out.

Energy Management Plan

Energy Management Plan Sector	Strengths	Weakness	Suggestions	Priority
1. Electricity	Different types of the instrument is available	Insufficient use of solar energy for electricity generation. Unnecessary use of lights, fans and computers at some places when no one is using.	Electrification of street lights by solar power. Installation of sensor based electrification for fans, lights, etc. Use of solar pumps for water tanks.	Medium