



ASHOKRAO MANE COLLEGE OF PHARMACY, PETH VADGAON
Tal – Tasgaon, Dist – Sangli

Energy Audit



Prepared by
Department of Environmental Science,
Shivaji University, Kolhapur- 416004
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Certificate

This is to certify that the Department of Environmental Science, Shivaji University, Kolhapur has conducted detailed "Energy Audit" of "Ashokrao Mane College of Pharmacy, Peth-Vadgaon" during the academic year 2024-2025. The Energy audit was conducted in accordance with the applicable standards prescribed by 'Bureau of Energy Efficiency, Government of India'. Their audit involves 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 equipment's 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.

Head



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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 Ashokrao Mane College of Pharmacy, Peth Vadgaon Energy Audit preparation:

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 Ashokrao Mane College of Pharmacy, Peth Vadgaon campus includes use of electricity. Major use of the energy is at office, Seminar Hall, Principal cabin, library, laboratories, classrooms, 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 Analysis

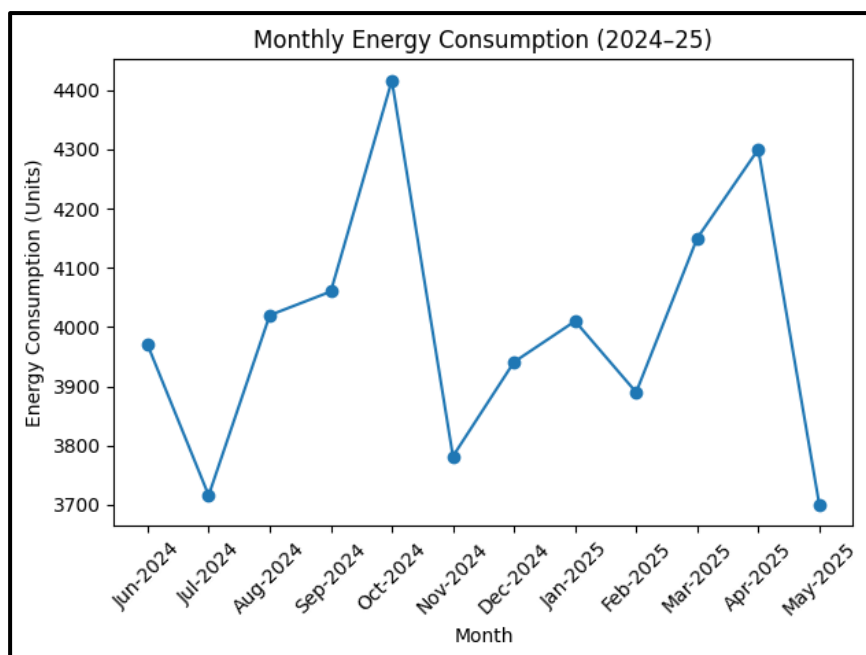
Electricity is the primary source of energy utilized in the campus of Ashokrao Mane College of Pharmacy, Peth Vadgaon. Energy is required for operating laboratory

instruments, classroom lighting, computers, administrative facilities, and water supply systems. Monitoring monthly electricity consumption helps the institute evaluate energy usage patterns and identify opportunities for improving energy efficiency across the campus.

During the academic year 2024–25, the monthly electricity consumption shows moderate variation depending on academic activities and laboratory operations. In June 2024, the institute recorded consumption of 3970 units, which represents the regular operational demand at the beginning of the academic year. In July 2024, the electricity consumption slightly decreased to 3716 units, possibly due to moderate weather conditions and controlled usage of electrical equipment.

The consumption increased during August and September 2024, where the combined electricity use indicates intensive academic and laboratory activities. These months generally involve practical sessions and research activities requiring the continuous operation of laboratory equipment and computers. In October 2024, the electricity consumption increased to 4416 units, which is the highest recorded value during the available data period. This increase can be associated with extensive laboratory experiments and institutional activities.

In November 2024, electricity usage decreased to 3782 units, likely due to academic holidays and reduced laboratory schedules. During December 2024, the energy consumption slightly increased to 3941 units, indicating the continuation of academic and administrative activities. The remaining months of the academic year, from January to May 2025, show relatively stable energy consumption with slight increases during the summer months due to increased use of electrical equipment and cooling systems.



3.3 Energy Consumption of Laboratory and Institutional Instruments

The college campus utilizes a wide range of electrical instruments and equipment across various departments including Pharmaceutics, Pharmacology, Pharmacognosy, Pharmaceutical Chemistry, and Pharmaceutical Quality Assurance laboratories. These instruments are essential for academic experiments, research activities, and practical training of pharmacy students.

In the Pharmaceutics laboratory, several instruments such as bulk density apparatus, tablet coating pan, centrifuge, electronic water bath, magnetic stirrer, deionizer, clarity test apparatus, hot air oven, and homogenizer are regularly used during practical sessions and research work. Among these instruments, equipment involved in heating, drying, and sample preparation contributes significantly to the overall energy consumption of the laboratory. Continuous operation of these instruments during experimental work results in moderate electricity demand within this section.

The Pharmacology laboratory includes instruments such as rota rod apparatus, actophotometer, analgesimeter, centrifuge machine, Sherrington rotating drum, and organ bath. These instruments are primarily used for pharmacological experiments and physiological studies. The energy consumption in this laboratory is comparatively lower than some other laboratories because many of these instruments operate intermittently during practical sessions rather than continuously.

In the Pharmacognosy laboratory, instruments such as heating mantle, flash evaporator, and digital microscope are used for extraction, purification, and microscopic analysis of plant materials. Equipment involved in heating and extraction processes requires consistent electrical supply, contributing to the energy demand within the laboratory.

The Pharmaceutical Chemistry laboratory uses analytical instruments such as UV spectroscopy, High Performance Liquid Chromatography (HPLC), and FTIR spectroscopy. These sophisticated analytical instruments play an important role in chemical analysis, drug identification, and quality evaluation of pharmaceutical compounds. Their operation during research and practical experiments contributes to the institute's electricity consumption.

Similarly, the Pharmaceutical Quality Assurance laboratory utilizes equipment such as vacuum pumps, heating mantles, muffle furnaces, analytical balances, and digital balances. These instruments are mainly used for quality testing, thermal analysis, and accurate measurement of pharmaceutical samples. Some of these devices operate for extended periods during laboratory sessions and therefore contribute to energy consumption within this section.

Apart from laboratory equipment, the administrative offices and examination sections also consume electricity through the use of computers, printers, xerox machines, and other office equipment. These facilities are essential for academic administration, record maintenance, and examination processes. Continuous use of these devices during working hours contributes significantly to the overall electricity demand of the campus.

Overall, the energy consumption within the institute is distributed among laboratory instruments, administrative equipment, and lighting systems. Proper maintenance of electrical equipment, efficient usage of laboratory instruments, and adoption of energy-saving practices can help reduce unnecessary electricity consumption and improve energy management within the campus.

Chapter IV

Summary and Conclusion

4.1 Summary

Energy auditing is an important tool used to evaluate the consumption and management of energy resources within an institution. It helps identify patterns of electricity usage, areas of energy loss, and opportunities for improving energy efficiency. The present Energy Audit for the academic year 2024–25 was conducted to assess electricity consumption and energy utilization practices at Ashokrao Mane College of Pharmacy, Peth Vadgaon.

The analysis of monthly electricity consumption indicates that the institute maintains a relatively stable pattern of energy use throughout the year, with slight variations depending on academic schedules, laboratory activities, and seasonal conditions. The major share of electricity consumption is associated with lighting systems, computers, laboratory instruments, and water supply facilities operating across different sections of the campus.

Various departments such as Pharmaceutics, Pharmacology, Pharmacognosy, Pharmaceutical Chemistry, and Pharmaceutical Quality Assurance utilize several instruments for practical training and research work. These instruments contribute to the overall energy consumption of the institute. Additionally, administrative offices and examination sections use computers, printers, and other electrical equipment which also require regular electricity supply.

The energy audit also highlights that lighting systems and administrative services contribute significantly to total energy consumption within the campus. Water supply services and pumping systems also require considerable electricity for their operation. Monitoring these components is essential for efficient energy management.

4.2 Conclusion

The Energy Audit conducted for the academic year 2024–25 indicates that electricity is the primary source of energy used for academic, laboratory, and administrative activities in the institute. The analysis of energy consumption data shows that lighting systems, laboratory instruments, and administrative equipment are the major contributors to electricity usage.

Although the institute maintains a relatively stable energy consumption pattern, there is still scope for improving energy efficiency through better management and monitoring of electrical equipment. Adoption of energy-efficient technologies and responsible energy usage practices can significantly reduce unnecessary electricity consumption.

The implementation of energy conservation measures such as LED lighting systems, sensor-based electrical controls, regular maintenance of electrical infrastructure, and increased use of renewable energy sources such as solar power can help the institute reduce its overall electricity demand.

Furthermore, awareness programs for students, faculty, and staff regarding energy conservation can encourage responsible use of electricity within the campus. Through proper planning and implementation of an effective Energy Management Plan (EMP), the institute can enhance its sustainability initiatives and contribute to environmental protection.

Chapter V

Recommendations

Based on the analysis of energy consumption for the academic year 2024–25, several measures can be implemented to improve energy efficiency and reduce unnecessary electricity usage within the campus of Ashokrao Mane College of Pharmacy, Peth Vadgaon. Energy conservation practices are essential for sustainable campus management and for reducing operational costs associated with electricity consumption.

1. The institute should encourage the use of energy-efficient lighting systems such as LED bulbs and tube lights in classrooms, laboratories, corridors, and offices. These systems consume less electricity and have a longer service life compared to conventional lighting.
2. Installation of sensor-based lighting and fan systems in frequently used areas such as corridors, laboratories, and classrooms can help prevent unnecessary electricity usage when these spaces are not occupied.
3. The college may also increase the use of renewable energy sources, particularly solar energy, by installing additional rooftop solar panels. This will reduce dependence on conventional electricity supply and promote sustainable energy practices within the campus.
4. Regular inspection and maintenance of electrical equipment, wiring, and meters should be carried out to prevent energy loss due to technical faults or inefficient electrical systems.

Chapter VI

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 Ashokrao Mane College of Pharmacy, Peth Vadgaon. 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.

Sector	Strengths	Weakness	Suggestions	Priority
<i>Electricity</i>	Laboratory instruments and lighting facilities available for academic activities	Unnecessary use of lights, fans and computers in some areas	Install sensor-based lighting and promote energy saving practices	Medium
<i>Lighting System</i>	Adequate lighting in classrooms, laboratories and offices	Conventional lighting consumes more electricity	Replace with LED lights and energy-efficient systems	High
<i>Renewable Energy</i>	Solar lamps installed in some parts of campus	Limited use of solar power for electricity generation	Increase installation of rooftop solar panels	Medium
<i>Water Supply System</i>	Proper water supply infrastructure available	Energy used for pumping and purification systems	Use energy-efficient pumps and regular maintenance	Medium
<i>Awareness & Monitoring</i>	Institute supports environmental activities	Limited monitoring of daily energy use	Conduct energy conservation awareness programs and periodic energy audits	Medium