# Energy Audit: A Case Study of an Engineering Building

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*Abstract*— In this project work, the importance of energy auditing and process of energy auditing are presented in detail. A sincere attempt has been made to conduct the Energy Audit at SPVP, SBPCOE, INDAPUR PUNE to estimate the Energy consumed in a day, and month. Identification of areas of energy wastage and estimation of energy saving potential in the all Departments and Institute Admin Office has been made by walk-through energy Audit. Also, detailed analysis of data collected is done by suggesting cost-effective measures to improve the efficiency of energy use. Estimation of implementation costs and payback periods for each recommended action has been made. The results & vital information generated through these activities are documented. The Energy Auditing for a day is the index of the consumption which normalizes the situation of Energy crisis by providing the conservation schemes.

***Key words:*** Energy Audit, Energy Consumption, Energy Management, Estimation, Energy Conservation

## I. 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.
- Today, the energy consumption is increased very sharply
- we discuss about possible actions firstly i.e. How to conserve and efficiently utilize our scarce resources and identified their savings potential
- We have compiled a list of possible actions to conserve and efficiently utilize our scarce resources and identified their savings potential.
- Energy Scenario and energy sources:
- Energy can be classified into various types based on following criteria..
- Primary energy sources are those that are either found or stored in nature. Common primary energy sources are coal, oil, natural gas, and biomass (such as wood). Other primary energy sources available include nuclear energy from radioactive substances, thermal energy stored in earth's interior, and potential energy due to earth's gravity
- Secondary energy sources like steam, electricity are derived from primary energy sources like coal, oil & gases & are suitable for transportation, distribution and control.
- Commercial Energy sources that are available in the market for a definite price are known as commercial sources that are available in the market for a definite price are known as commercial energy. Commercial energy forms the basis of industrial, agricultural, transport and commercial development in the modern world.

Non-commercial energy sources that are not available in the commercial market for a price are classified as Non-commercial energy. Example: Firewood, agro waste in rural areas; solar energy, animal power, wind energy.

- Renewable energy sources are those that are essentially inexhaustible, like wind power, solar power, geothermal energy, tidal power and hydroelectric power

Non-renewable energy is the conventional fossil fuels such as coal, oil and gas, which are likely to deplete with time

- WORKING LED (Lighting Emitted Diode) is an alternative to traditional light sources and considered to be the latest cutting edge lighting technology. Now a days LED has already exceeded the values of halogen and incandescent lamps.
- Replacing The CRT Monitors With LCD Monitors

Computers with CRT and LCD monitors are nearly equal in number. In total,

- RECOMMENDATION FOR ENERGY SAVING OF TUBE
  1) Used natural day light more energy saving
  2) Philips 20watt tube should connected in remaining room to more power saving and electricity bill.
- RECOMMENDATION FOR ENERGY SAVING OF FAN
  1) Bajaj 80 watt fan more energy saving than 120 watt fan and more saving electricity bill.

### A. *Advantages*

- 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.
- Reduce energy consumption of electrical building up to 10 to 15%
- Sun light produces less heat per lighting area hence it can be very much useful for reducing cooling loads
- Reduces the cost of raditor.

### B. *Disadvantages*

- More time are required.
- Installation cost is high.
- High Skill person required
- High calculation
- More data collection is required

## II. ENERGY CONSERVATION & EFFICIENCY

### A. *Energy conservation:*

Energy is defined as the ability to do a work and work is transformation of energy from one form to another and also the energy can neither be created nor destroyed. It includes any behavior that results in the use of less energy.

 

Examples Shut lights off , Don't leave water running, Recycle (bottles, can, papers, glass, etc.) ,Walk or ride a bike ,Open a window in the summer instead of turning on the air conditioning ,use public transportation.

*B. Energy efficiency:*

It involves the use of technology that requires less energy to perform the same function. A compact fluorescent light bulb that uses less energy to produce the same amount of light as an incandescent light bulb is an example of energy efficiency. The decision to replace an incandescent light bulb with a compact fluorescent is an example of energy conservation. Driving the same amount with a higher mileage vehicle is an example of energy efficiency.

*C. Need of Energy Conservation:*

Fossil fuels like coal, oil that has taken years to form is on the verge of depleting soon. In last 200 years we have consumed 60% of all resources. For sustainable development we need to adopt energy efficiency measures. Today 85% of primary energy sources come from non-renewable and fossil sources. These reserves increasing consumption and will exist for future generations.

## III. Problem Statement

- Energy is very important constraints in all sectors for any country's economy. The economic development of any country is closely linked with consumption of energy. Coal 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 conservation avoids wasteful use of energy. Energy saving achieved through energy efficiency

Conservation also avoids capital investment in fuel, mining, transport, water and land required for power plant, thereby mitigating environmental pollution

## IV. Objective

The work eligible for Energy Audit Study should be directed towards:

- 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 for each 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.

## V. Energy Audit Methodology

The methodology adopted for this audit was a two-step process comprising of:

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.

## VI. Literature Review

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.

## VII. Methodology

We will be using car Radiator and will be using Al2O3 Nano-fluid as a coolant. The Nano -fluid will be prepared by two step method or one step method. Nano-fluid is prepared by mixing Nano particles in water in different compositions. Later performances of the Radiator are tested with water, ethylene glycol and Al2O3as coolant. Comparison will be made between coolant flow rates and temperature difference, coolant flow rates and average heat transfer, coolant flow rates and effectiveness, time and temperature difference, time and average heat transfer.

## VIII. Scope of Work

In recent years, with the advancement in nanotechnology, it has been become possible to produce suspension of nano particles based suspensions, called nano-fluids. Nano-fluid term was first introduced by Choi in 1995 at the Argonne National Laboratory. The ultrafine nano particles are normally smaller than 100 nm and have remarkably higher thermal conductivity than base liquids. Various Researchers expect that these fluids may offer higher thermal conductivity compared to that of conventional coolants. Major properties of nano-fluids make it suitable to be used in Radiator coolant one already seen is high thermal conductivity, low viscosity, high convective heat transfer coefficient, high area per unit volume.

## IX. Conclusion

These audits are very important for the society. The buildings, offices, rooms etc. are designed without taking

 

into consideration of the use of energy efficient lighting system. These buildings consume more energy as the energy required by energy efficient structure design for In this we have considered the academic sector for evaluation of energy audit and energy conservation of s.b.patil college of engineering Vangali ,Indapur. Key issues pertaining to the implementation of Energy Conservation proposal and methodology have been discussed in detail. Based on the exhaustive literature survey were presented for energy conservation and energy audit in keeping mind the present Energy scenario and future condition

## REFERENCE

[1] Renewable energy sources & conservation technology-N.K.Bansal
[2] Energy conservation in electrical system national conference on recent trends in engineering & technology organised by agnel polytechnic, vashi in association with iie zenith – 2009
[3] Financial and economic aspects of energy saving within the framework of the csrc approach" workshop: "transnational energy saving networks"14 december 2005 vilnius, Lithuania
[4] Energy Saving Opportunities for Transformers Hans De Keulenaer Outokumpu Tara Mines Energy Efficient Motors & Transformers Workshop
[5] http://www.productivity.in/knowle debased/Energy
[6] www.energy.com
[7] www.energyconservation.net
[8] www.behaviourofenergyefficiency.com
[9] www.NEED.org
[10] www.inspectionservicesinc.com
[11] www.EnergyBooks.com

 