

Electrical Energy Audit and Conservation

Mithilesh Ramrao Katole

M. Tech Student

*Department of Integrated Power System
DMIETR, Wardha, Maharashtra*

Abstract

Power crisis are the big brain twister of India, Over 10 million people in India still have no access to electricity. In such circumstance there is only a way to meet our energy demand that is Energy conservation which is done by energy audit and better energy management. Energy Audit will assist to grasp more about the ways energy and fuel are used in any industry, day to day life, and help in to know the areas where waste can occur and where chance for progress exists. The primary motto of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. The energy audit results in better energy management which results in energy conservation. [2]

Keywords: Conservation, Consumer, Energy audit, Energy management, Energy scenario

I. INTRODUCTION

To institute the correct energy efficiency programs, we have to know first which areas in our installation unnecessarily consume too much energy, which is the most cost-effective load. An energy audit to recognize where energy is being consumed and assesses energy saving opportunities so you get to save money where it counts the most.[2]

A. Energy audit commonly covers the following questions:

- 1) How much energy are we consuming?
- 2) Where is the energy consumed?
- 3) How efficiently is energy consumed?

B. Can there be improvement in energy use?

Energy management is a structured approach designed to arrange energy usage and reduce energy costs, raising productivity and make a better work environment. The goal of an Energy Manager is to produce a building that uses the least possible energy while sustaining optimal levels of comfort, safety and productivity. [1]

The relation between energy audit and the management of energy is as given in the fig.(1)

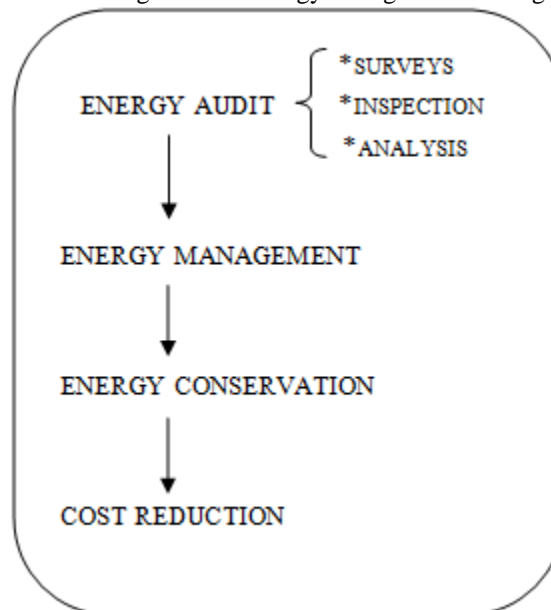


Fig. 1: The relation between energy audit and the management of energy

II. IMPORTANCE OF ENERGY AUDIT AND MANAGEMENT

An energy audit becomes the best first step towards saving money in the production plant. Wide-scale resource conservation and emissions reduction projects need a system of guerdon and swinge but there is no way to implement this kind of system unless energy audits are conducted more fairly and become more effective overall. For example, green architecture is an eventful opportunity for energy conservation, yet even when real estate companies try to invest in energy conservation, the companies still look for the greatest benefit and do not always meet existing building conservation standards. Thus, strict implementation of energy audit is compulsory for industries as they develop towards energy and sources conservation. Here importance of energy audit in home and industry is given:-

A. Home Energy Audit

A residential energy audit is frequently the first step in making your home more efficient. An audit can help you assess how much energy your home consumes and calculate what measures you can take to improve efficiency. But remember, audits alone don't save energy it only provides energy status. You can perform a simple energy audit yourself, or have a professional energy auditor perform a more thorough audit. Lower energy bills and increased energy savings: a detailed report will compute cost effective measures that you can take to ensure your home runs more efficiently.[1]

B. Industrial Energy Audit

Energy Audit is the beginning of Energy Saving in a plant and is recommended for almost all the Industries - irrespective of size and type. Industrial customers seeking to improve energy efficiency and cut operating costs should gravely consider having an industrial energy audit performed. Industrial audits can encompass the entire facility, or may be customized to meet your needs. Industrial energy audit gives us following benefits:-

- Improved comfort levels
- Improve illumination levels
- Low cost of maintenance
- Decreased A/C Load
- Ability to track energy savings

C. Other Importance of Energy Audit

- 1) Compliance with Government regulations
- 2) Lower energy costs.
- 3) Enable faster recovery of investments.
- 4) Achieve better performance and lower downtime.
- 5) Enhanced power quality and productivity.
- 6) Reduced loss levels.
- 7) Improved Age of Equipment and complete system

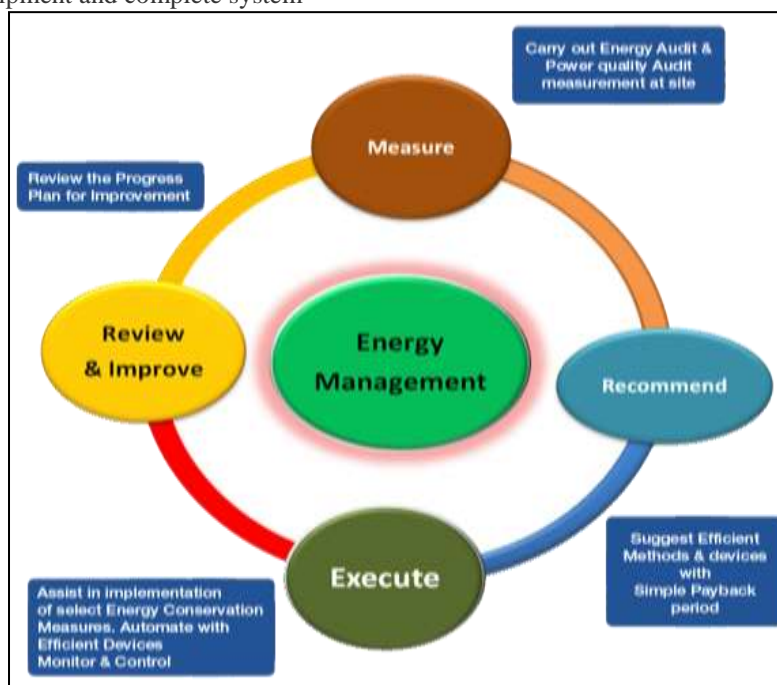


Fig. 2: Steps of Energy audit and the management [2]

III. INDIAN ENERGY SCENARIO

India is one of the countries where the present level of energy consumption, by world standards, is very low. The estimate of annual energy Consumption in India is about 330 Million Tones Oil Equivalent (MTOE) for the year 2004. Accordingly, the per capita consumption of energy is about 305 Kilogram Oil Equivalent (KGOE).

On the supply side, the miss-match between demand and supply is so large that India can ill-afford to choose one option in preference to the other. For several years, in fact may be for next few decades, India would need to exploit all possible options to create reasonably large capacity base on the energy side.

Sector wise consumption of electricity during 2012-2013[4]

- Total consumption	=	852902GWH
- Agriculture	=	17.95%
- Domestic	=	21.79%
- Commercial	=	8.33%
- Industry	=	44.87%
- Traction and railways	=	1.81%
- Other	=	05%

From this table it is clear that if we concentrate on energy consumption of domestic, commercial, industry where energy audit and management can be don easily then more energy conservation can be done in this sector. The important thing to remember is to focus on major energy users and areas to conserve energy. [4]

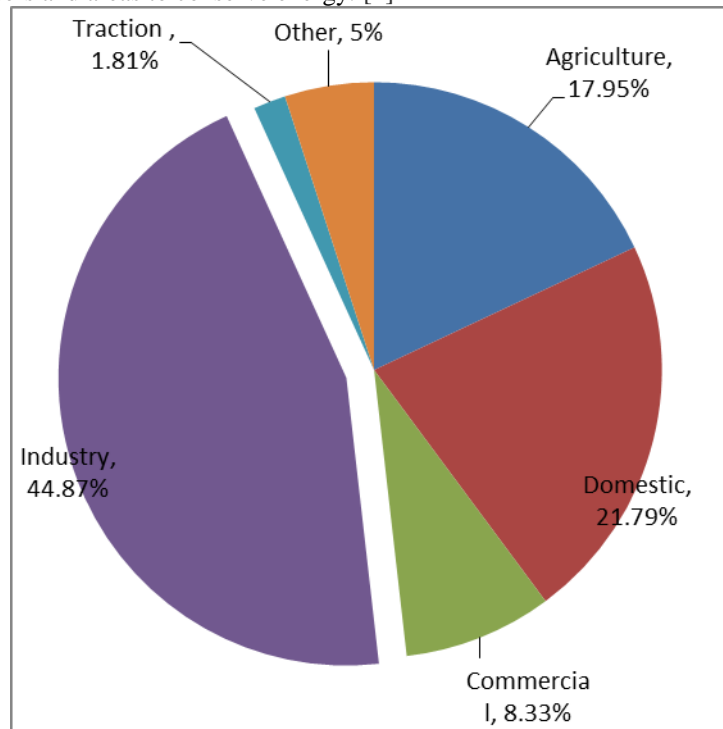


Fig. 3: Consumption of energy at various sectors

IV. MANAGEMENT AND CONSERVATION OF ENERGY

There are some basic approaches to enable energy efficiency, which are as follows:

A. Improvement of Power Factor

Power factor improvement is very necessary to conserve the power. There are some ways which are used for Improvement of Power Factor:-

- 1) Using the correct sized motor for a particular job
- 2) Shutting off unused motors
- 3) Installing a capacitor.

B. Use high energy star rated loads

Energy star international standard for energy efficient consumer products originated. Devices carrying the Energy Star service mark, such as computer products and peripherals, kitchen appliances, buildings and other products, generally use 20%–30% less energy than required by federal standards.

C. Technical and Economic feasibility

The technical feasibility should address the following issues

- Technology availability, space, skilled manpower, reliability, service etc.
- The impact of energy efficiency measure on safety, quality, production or process.
- The maintenance requirements and spares availability.

The Economic viability often becomes the key parameter for the management acceptance. The economic analysis can be conducted by using a variety of methods.

D. Create financial and or tax incentives for energy efficiency

Financial incentives for energy efficiency come in the form of tax incentives, grants and rebates, and loan programs. These incentives are among the most common ways that states promote energy efficiency. Currently in India 22 states have a tax incentive to promote energy efficiency?

E. Make early decisions about your efficiency effort

We should make early decisions for energy audit of, it will help to save power from initializing any industry. The National Council on Electricity Policy has also created tools and resources that can help, including guides to financing energy efficiency programs and to state programs that support energy efficiency, such as the 2006 State and Regional Policies That Promote Energy Efficiency Programs Carried out by Electric and Gas Utilities.

F. Awareness of energy issues among workers

In the factory, doing an energy audit increases awareness of energy issues among plant personnel, making them more knowledgeable about proper practices that will make them more productive. An energy audit in effect gauges the energy efficiency of your plant against “best practices”. When used as a “baseline” for tracking yearly progress against targets, an energy audit becomes the best first step towards saving money in the production plant.[2]

V. ADVANTAGES OF ENERGY AUDIT AND MANAGEMENT

A. Comfort

Energy efficiency and comfort go hand in hand. Improving your building envelope by air sealing and increasing insulation; installing window films and shades and radiant barriers, and high efficiency heating and cooling systems means a more comfortable home for a lower operating cost.

B. Financial benefits

Reduced expenditure on energy; e.g., by reducing consumption or changing tariff or fuel type. Reduced maintenance cost; e.g., following improved utilization of plant and optimization in operation. Saving in other costs; e.g., water charges, where demand is reduced saving in other costs; e.g., water charges, where demand is reduce.

C. Operational benefits

Addition to direct cost benefits, further benefits can be achieved by optimizing the operation of a building, process or plant. Ultimately, these may well have financial implications. The information made available to management on energy costs and use could in itself be found invaluable in asset planning and decision making. Measures can also lead to improved working practices or conditions.

D. Environmental benefits

Environmental benefits that arise from using energy more efficiently may include reduction of CO₂ and other emissions both from the site itself and upstream of energy suppliers that can be harmful to the environment. Reduction of environmental impacts related to transmission, delivery or transport of energy. Reduction of regional and national energy demand. Conservation of natural resources particularly fossil fuels and other non-renewable fuels. [4]

VI. CONCLUSION

Energy audits provide a unique pathway for customers to save money. Energy conservation and cutting utility costs are extremely important as energy prices rise. Energy auditing is not an exact science, but a number of opportunities are available for improving the accuracy of the recommendations. Techniques which may be appropriate for small-scale energy audits can introduce significant errors into the analyses for large complex facilities. We began by discussing how to perform energy and demand balance for a company. This balance is an important step in doing an energy use analysis because it provides a check on the accuracy of some of the assumptions necessary to calculate savings potential. We also addressed several problem areas which can result in over-optimistic savings projections, and suggested ways to prevent mistakes. Finally, several areas where additional research,

analysis, and data collection are needed were identified. Once this additional information is obtained, we can all produce better and more accurate energy audit results. [3]

“Audits are great investments for the future, often resulting in immediate returns and a quick payback”

REFERENCES

- [1] Energy Conservation, Efficiency & Energy Audit by R.A. Sharma (Electrical India Vol.46 & No.09).
- [2] Generation of electrical energy by (B. R. Gupta).
- [3] Report on Growth of electricity sector in India from 1947-2013 (Central India Authority, Ministry of Power India).
- [4] Energy Auditing of Induction Motor (ISSN: 2248-9622, Vol.4, Issue 1 (Version 1), January 2014, pp.238-242).