

## A Review on Energy Auditing

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### Abstract: -

*Electrical energy plays a vital role in our day-to-day life. Anything cannot be imagined without electricity. As there is a limited number of resources that can be help us to generate electricity, so this is our keen duty to save these resources or save electricity for our further use. Our papers main vision is to give a review how we can save energy by conducting audits, also finding the best method for auditing of an Industrial plant, residential buildings and commercial housesand small offices whicheliminate the losses of energy and eliminating the leakages of energy. Also, what are different types of energy auditing techniques and methods that can be implemented and any new innovation in this field of work. We have studied different case studies and on different buildings, offices, houses, plants etc. and a possible conclusion to give a review of the best method suitable for energy auditing.*

### 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. We have found in our research that energy audit can be improved in many ways. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint. When the object of study is an occupied building then reducing energy consumption while maintaining or improving human comfort, health and safety are of primary concern. Beyond simply identifying the sources of

energy use, an energy audit seeks to prioritize the energy uses according to the greatest to least cost-effective opportunities for energy savings. A home energy audit is a service where the energy efficiency of a house is evaluated by a person using professional equipment (such as blower doors and infrared cameras), with the aim to suggest the best ways to improve energy efficiency in heating and cooling the house.

An energy audit of a home may involve recording various characteristics of the building envelope including the walls, ceilings, floors, doors, windows, and skylights. For each of these components the area and resistance to heat flow (R-value) is measured or estimated. The leakage rate or infiltration of air through the building envelope is of concern, both of which are strongly affected by window construction and quality of door seals such as weatherstripping. The goal of this exercise is to quantify the building's overall thermal performance. The audit may also assess the efficiency, physical condition, and programming of mechanical systems such as the heating, ventilation, air conditioning equipment, and thermostat.

A home energy audit may include a written report estimating energy use given local climate criteria, thermostat settings, roof overhang, and solar orientation. This could show energy use for a given time period, say a year, and the impact of any suggested improvements per year. The accuracy of energy estimates is greatly improved when the homeowner's billing history is available showing the quantities of electricity, natural gas, fuel oil, or other energy sources consumed over a one or two-year period.

Some of the greatest effects on energy use are user behavior, climate, and age of the home. An energy

audit may therefore include an interview of the homeowners to understand their patterns of use over time. The energy billing history from the local utility company can be calibrated using heating degree day and cooling degree day data obtained from recent, local weather data in combination with the thermal energy model of the building. Advances in computer-based thermal modeling can take into account many variables affecting energy use.

A home energy audit is often used to identify cost effective ways to improve the comfort and efficiency of buildings. In addition, homes may qualify for energy efficiency grants from central government.

Recently, the improvement of smartphone technology has enabled homeowners to perform relatively sophisticated energy audits of their own homes. This technique has been identified as a method to accelerate energy efficiency improvements.

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. Their importance is magnified since energy spending is a major expense to industrial companies (energy spending accounts for ~ 10% of the average manufacturer's expenses). This growing trend should only continue as energy costs continue to rise.

### **Literature Survey: -**

- A. In the paper “Energy audit for pyro processing unit of new generation cement plant and feasibility study for recovering waste heat: A case study” the author VahabGhalandari, MahdietMozaffariMajid and Amir Golestanian has done an audit on a cement plant which results in increase of thermal efficiency and also reducing the heat losses of the cement plant.
- B. in the paper “Integrated smart system for energy audit: methodology and application”. The author Lorenzo Belussi, Ludovico Danza, Francesco Salamone, Ital Merino, Stefano Galli and Sandra Dei Svaldi. They describe the design and application stage of smart audit system integrated within building which result optimization of building heat and software assessment of building behavior and the management of energy flow.
- C. In the paper “Application of the infrared thermography in the energy audit of buildings: A review” Author Elena Lucchi

has described. The critical review of the use of the infrared thermography (IRT) survey in building energy audit which result to minimize the source errors as well as future trends in the use of IRT for energy audit has been described.

- D. In the paper “Energy Audit and potential energy saving in an office building in Riyadh Saudi Arabia” The author Saleh A Al-jjan describe a case study of an office building on which auditing is conducted by increasing energy efficiency.
- E. In the paper “Energy audit of an industrial site: A case study”. Author Matteo Dongllini, CosimoMarinoci and Gian Luca Morini described a case study on an industrial site on which energy auditing is conducted which result the optimization of performance of the existing HVAC system can determine A reduction of gas consumption up to 15% per year.
- F. In the paper “Analysis of energy consumption, a case study of an Italian winery” The author Maria Malvoni, Paolo

- Maria Congedo and Domenico Laforgin describes the energy consumption assessment in residential and industrial sector in order to identify specific measures for getting energy savings.
- G. In the paper “Energy audit for an educational building which operates in middle East climate conditions” The author Salim R. K. And doctor Sudhir CV describes the energy auditing of educational building working from last 20 years is done which result in savings of energy and increasing the efficiency of building.
- H. In the paper “Energy audit in Vishvevarayya iron and steel plant” The author Nandini K.K. describes the replacement of old technology by new technology and using auto illumination for increasing efficiency of the plant.
- I. In the paper “Electrical energy audit in residential house” the author Avinash Kumar, Shashi Ranjan, M. Bharat Kumar Singh, Priyanka Kumari and L.Ramesh describe a case study of a residential house on which electric energy audit is performed which result in improving efficiency of system and minimizing losses.
- J. In the paper “Energy management strategies for a governmental building in Oman”. The authors Saleh N.J., Al-Saadi, MuthukumarRamaswami, Hamed Al-Rashadi, Malik Al-Mamari and Majed Al-Abri describes work the outcome of a study that has been performed to reduce the energy consumption of a library building in a hot climate of Oman. The result of this audit is increased the efficiency of the library and decreases the consumption of energy by 38.5%.
- K. In the paper “Energy audit method for industrial plant”. The authors Sandra Gusta and KarlisGrinbergs describes a case study of a how the auditing is been conducted in an industrial plant which results the increasing the efficiency of the industrial plant and minimizing losses inside the plant.
- L. In the paper “Energy audit and efficiency of a complex building comprehensive review”. The authors JamiluYa’u Muhammad, Abdullahi AuduAdamu, AbdulkarimMika’ll Alhaji and YerimaYusif Ali describes a case study of auditing of a complex building in the Nigeria. This helps to reduce the extra power consumption and optimizing the performance of the building. It can befound that the air conditioners consume more energy followed by office equipment’s and the lighting.
- M. In the paper “Energy audit of an industrial unit- a case study”. The authors S.U. Kulkarni and Kalpana Patil describes the auditing of an Industrial unit and analyzed to find the scope of energy conservation opportunities in the selected test case industrial unit. It results increasing the efficiency of the plant also finding out of some errors and giving some recommendations. By performing Energy Audit, the recommendations have been suggested due to which industry can save total amount of Rs. 8,98,700/- per year.
- N. In the paper “Energy Audit in the Meat Processing Industry—A Case Study in Hermosillo, Sonora Mexico”. The authors Nora Munguia, Luis Velazquez, Tania Poom Bustamante, Rafael Perez, Johannes

Winter, Markus Will, and Bernd Delakowitz describes the auditing of a case study of auditing of a meat processing plant which results the results obtained allow the identification of main processes with significant correlations in terms of energy consumption within the company. This data has the potential for energy savings. The data acquisition process prompts the development of practical and accessible energy efficiency measures. In addition, a benchmarking analysis with several tools is performed. Altogether, this work gives guidance on the implementation of energy auditing in industries within its geographical and industrial sector limitations.

- O. In the paper “Energy Audit of an Industry: A Case Study of Fabrication Company”. The authors Olatunde Ajani Oyelaran, Yau Yusuf Twada, Olawale Monsur Sanusi describes a case study of auditing of a fabrication company which results minimize energy costs and wastage without affecting production and quality. Energy Audit is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility.
- P. In the paper “Energy Audit: Case Study of a Wheel Manufacturing Industry”. The authors Manu Sharma and V Anish Koushik describes a case study of auditing of a wheel manufacturing industry which results Reduction in the energy consumption and its cost, Capacity of the grid increases without investment and Conservation of natural resources.
- Q. In the paper “The Effectiveness of Home Energy Audits: A Case Study”. The authors Timothy J. Considine and OnurSapci describes a case study of auditing of a house which results the decrease of 7% of electricity consumption per month.

### **Conclusion: -**

We have studied different papers and found that a many technique of how the auditing is been performed in different ways also new innovation for auditing in industrial plant, residential building and commercial home.

1. In this review the auditing of using the integrated smart systems is the best method for energy auditing of industrial plants. It uses the new developed auditing software’s for data assessment which saves the time consumed for auditing.
2. Then energy auditing using Effectiveness of Home Energy is best method suitable for commercial home audits to use to save electricity.
3. And energy auditing using infrared thermography (IRT) techniques is the best method suitable for auditing of a building or residential complex. By using infrared thermography, we can easily find out the losses of the building or complex.

### **Review: -**

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