Energy Audit: Need for Process Industry

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Abstract— This India is the Fifth largest producer of Electrical energy in the world. Despite such achievements the gap between demand and supply of electrical energy is increasing every year and power sector is highly capital – intensive. Thus the deficit in installed capacity was nearly 10000MWper year. So the gap between demand and supply is continuously increasing day by day. Growing concerns arise about energy consumption and its adverse environmental impact in recent years in India, which cause manufactures to establish energy management groups. 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. The energy auditing is the key to successful running of an industry with saving energy & contributing toward preserving resources of energy. Managing energy is not a just technical Challenge but one of how to best implement those technical Challenges within economic limits, and with a minimum of disruptions. The opportunities lie in the use of existing energy more precisely, greater efforts at savings and the implementation of new technologies.

Key words: Energy Audit, Energy Conservation, Data Collection

I. INTRODUCTION

Energy is one of the major inputs for the economic development of any country. Power capacity has risen at the rate of 5.87% per annum over the last 25 years. In 2011-12, India was the fourth largest consumer in the world of Crude Oil and Natural Gas, after the United States, China, and Russia. The total installed capacity for electricity generation in the country has increased from 16,271 MW as on 31.03.1971 to 2,36,387 MW as on 31.03.2012, registering a compound annual growth rate (CAGR) of 6.58% [1]. So some steps are required to conserve the energy globally using systematic approach. However a more comprehensive method in checking energy usage and wastage is the "Energy Audit". Energy audits do not provide the final answer to the problem. This identifies where the potential for improvement lies, and therefore, where energy management efforts must be directed. An energy audit is first step towards understanding how energy is being used in comprehensive methods in checking the energy usage and wastage in buildings. The process of energy audit includes, historical energy data collection, formulation of energy audit program to the actual implementation. There is now a universal recognition of the fact that new technologies and much greater use of some that already exist provide the most hopeful prospects for the future. The energy process is an organized approach to identify energy waste in a facility, determining how this waste can be eliminated at a reasonable cost with a suitable time frame. Energy audit is widely used and many have different meaning depending on energy service companies. Energy auditing of a building can range from a short a walkthrough of the facility to a detailed analysis. However, there is an occasion where coexisting of the saving of energy.

II. ENERGY AUDIT METHODOLOGY

Effective Energy audit is a process that consists of four steps:

- Step 1: Identify all the Opportunities
- Step 2: Prioritize the activities rationally
- Step 3:.Accomplish the activities successfully
- Step 4: Maintain the activities throughout the life of the facility

By using these simple steps the scopes of works and the available resources for conducting the energy audit should be determined. This part of energy audit specifies the scope and potential of energy saving through energy audit. The main steps to follow are as follows-

- Define Scope of Energy Audit
- Forming Energy Audit Plan
- Estimating Time Frame and Budget
- Collecting Building information
- Conducting Site Inspection and Measurement
- Analyzing Data Collection
- Finding Opportunities for energy conservation
- Finding Appropriate Measures
- Implementation and follow ups.

Depending on time span invested auditing can be classified in as:

1) Walk Through Audit
2) Intermediate Audit
3) Detailed / Comprehensive Audit

A. Walk Through Audit:

This is simple kind of energy, it carries rapid survey of plant. During rapid walk survey main focus is on the energy input, spots of energy wastages and ECO's. Data about plant is collected in such a way that, data should be utilized for next detailed audits. Usually audit is carried out at two periods viz. During off period & during working shifts. Generally this kind of audit is carried out for three days to one week. As the time span required is short cost involve in auditing is also less.

B. Intermediate Audit:

This kind of audit is conducted for detailed survey and measurement of systems compare with walk through audit. Major focus is made on energy loses measure and quantification to analyze energy efficiency of system. Generally low tech recommendations are preferred with first preference is given for -Switching off lights and fans when not required. -Placing of automatic thermostat to control temperature of water heaters etc -Spotting out golden ECO's which involves higher energy wastage cost. This type of audit is carried out for one week to one week; time span required is more so the cost associated with audit is also more compare with walk through audit.

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C. Detailed / Comprehensive Audit:

This is exhaustive audit than the previous types of audit. Detailed survey of systems as well as subsystems of an industry is done. Energy consumption of all subsystems and systems is compared with targeted energy consumption. This kind of audit also identifies the consumption of secondary energy like electricity, steam, gases etc. Modernization and changes in major retrofitting as suggested if required.

III. BASIC COMPONENTS OF ENERGY AUDITING

The Energy Audit Process starts by collecting information about facilities Operation and its past record of utility bills. This data is then analyzed to get Picture of how the Facility uses and possibly wastes energy, as well as to help the auditor learn that areas to examine to reduce energy cost. Specific changes called Energy Conversion Opportunities (ECO) are identified and evaluated to determine their benefits and their cost effectiveness. These ECOs are accessed in terms of their costs & benefits and economic comparison is made to rank various ECOs. Finally an action plan is created whether certain ECOs are selected for implementation and the actual process of energy saving & saving money begins.

1) Auditor's tool box: To obtain the best information from a successful energy cost control program the auditor must make some measurement during audit visit.
2) Preparation for audit visit: Some preliminary work must be done before the auditor makes actual energy audit. To a facility some parameters that should be needed are: energy use data, energy rate schedule, physical & operational data for facility that will consist of geographical location, whether data, facility layout, operation house, equipment list. One more important part of energy audit is safety of energy auditor & audit team. The audit person & audit team must be thoroughly briefed on safety equipment's & processes.
3) Conducting the audit: Once the information on energy bills, faculty equipment and facility operations has been obtained, the audit equipment can be gathered up and actual visit is to be started. Following are some important steps in audit.
4) Introductory meeting audit team should meet facility manager & maintenance manager to brief about purpose of audit.
5) Audit interview getting correct information on facility equipment and operation is important, if the audit is going to most successful in identifying ways to save money on energy bills. Auditor must interview with floor supervisor and equipment operator to understand building and process problems.
6) Walk through audit a walk through tour of facility or plant should be arranged by facility/ plant manager and should be arranged to the auditor or audit team can see major operational and equipment features of facility. During walk through audit data regarding ECOs should be gathered by looking at lighting, HVAC system, electrical motors, water heaters, waste heat sources, peak equipment loads and other energy consuming equipment's .
7) Post audit analysis after visit data collected should be examined , organized and reviewed for completeness ant thing missing data items should be obtained form facility of re-visit.
8) The energy audit report: Next step in energy auditing process is to prepare a report which details the final result and recommendation. An industrial audit report is more likely to have a detailed explanation of ECOs and benefit cost analysis. The report should begin with an executive summary that provide owners/ manager of facility with brief synopsis of total saving available and the highlights of each ECOs.
9) Energy action Plan: The last step in audit process is to recommend an action plan for facility. The energy action plan list the ECOs which should implement first and suggest an over all implementation schedule , often one or more of the recommended ECOs should provide an immediate or very short period pay back, so saving from that Eco or those ECOs can be used to generate capital to pay for implementing other ECO.

IV. BENEFITS OF ENERGY AUDIT

1) Financial benefits which contribute to reduction in operating costs or an increase in the profits of organization. These must be assessed against cost of implementation of energy efficiency measures.
2) Operational benefits that assist the management of industrial site improve the comfort, safety and productivity.
3) Environmental benefits like reduction in CO2 concentrations or other greenhouse gases and emissions.
4) It was also found that correct decision-making depended on accurate energy audit data. In order to improve the quality and efficiency of the energy audit, the government should establish an energy-information-sharing platform among the enterprises.

V. CONCLUSION

Energy audit is an effective tool in identifying and perusing a comprehensive energy management program. A care full audit of any type will give the industry a plan with which it can effectively manage the industrial energy system at minimum energy cost. This approach could be useful for an industry in combating essential energy cost and also raps several other benefits like improved production, better quality, higher profit and most important satisfaction of heading towards contributing in world energy saving.

REFERENCES

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