UNIT 2 : ENERGY AUDIT

1. OVERVIEW

Energy shortage and the cost of environmental quality control have made the use of energy very costly to many industrial establishments. As a result, many factories have opted for establishing energy management programmes to cope with severe energy shortages and for improving the profitability of their operations.

Fig.: Save Energy*

Energy management involves the following basis approaches:

(i) Reducing avoidable losses,
(ii) Improving the effectiveness of energy use, and
(iii) Increasing energy use efficiency.

No matter what approach is taken, the steps to be followed are general in nature, e.g., conduct energy audits, implement the energy conservation measures, carry out post installation monitoring and set targets, etc.

Meaning of Energy Audit:

As per the Energy Conservation Act, 2001, Energy Audit is defined as “the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption”.

Thus, energy auditing is an activity that serves the purposes of assessing energy use pattern of a factory or energy consuming equipment and identifying energy saving opportunities. It is the first step of any energy management programmes.

2. FUNCTIONS OF ENERGY AUDITOR

The function of an energy auditor could be compared with that of a financial auditor. At the moment, while energy auditor is not yet a mandatory requirement on an all-India basis, the financial auditor

* Source : Alpha Techno Solution
is a pre-requisite for any organisation. Another key distinction is that the energy auditor is normally expected to give recommendations on efficiency improvements leading to monetary benefits and also advise on energy management issues. Generally, energy auditor for the industry is an external party.

The following are some of the key functions of the energy auditor:

(i) Quantify energy costs and quantities.
(ii) Correlate trends of production or activity to energy costs.
(iii) Devise energy database formats to ensure they depict the correct picture – by product, department, consumer, etc.
(iv) Advise and check the compliance of the organisation for policy and regulation aspects.
(v) Highlight areas that need attention for detailed investigations.
(vi) Conduct preliminary and detailed energy audits which should include the following:
   (a) Data collection and analysis.
   (b) Measurements, mass and energy balances.
   (c) Reviewing energy procurement practices.
   (d) Identification of energy efficiency projects and techno-economic evaluation.
   (e) Establishing action plan including energy saving targets, staffing requirements, implementation time requirements, procurement issues, details and cost estimates.
   (f) Recommendations on goal setting for energy saving, record keeping, reporting and energy accounting, organisation requirements, communications and public relations.

Energy efficiency is achieved through company-wide activities involving administration, purchase, design, engineering, production and maintenance management functions. Since it is an interdisciplinary activity, energy efficiency must be supported not only by technical division but all other divisions as well. Therefore, in industries where energy cost is substantial or widely dispersed across the plant campus, it has been the experience of some large companies to set up internal energy audit teams. One of the effective ways of setting up an internal energy audit team is to have representation from the various sections with rotating membership and with at least one team member from the area being audited. The eyes of a stranger very often see things which familiarity has made common place and invisible to the user of the area. To be truly effective, these audits must be made not only during normal working hours but also during night shifts, weekends and holidays.
3. PRELIMINARY ENERGY AUDIT

It is a relatively quick exercise to:

- Establish energy consumption in the organization
- Estimate the scope for saving
- Identify the most likely (and the easiest areas for attention)
- Identify immediate (especially no-/low-cost) improvements/savings
- Set a ‘reference point’
- Identify areas for more detailed study/measurement

Preliminary energy audit uses existing, or easily obtained data

4. DETAILED ENERGY AUDIT

Detailed energy audit provides a detailed energy project implementation plan for a facility, since it evaluates all major energy using systems. It offers the most accurate estimate of energy savings and cost.

Detailed energy audit considers the interactive effects of all projects, accounts for the energy use of all major equipment, and includes detailed energy cost saving calculations and project cost.

Arrives energy balance based on an inventory of energy using systems, assumptions of current operating conditions and calculations of energy use. This estimated use is then compared to utility bill charges.

4.1 List Steps Involved in ‘Detailed Energy Audit’ (EA)

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<td>Plan and organise</td>
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<td>Walk through audit</td>
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<td>Informal interview with plant personnel</td>
<td>Conduct detailed trials and experiments</td>
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<td>Analysis of energy use</td>
<td>Identification and development of energy conservation opportunities</td>
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<td>Cost benefit analysis</td>
<td>Report preparation and presentation to the plant personnel and management</td>
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4.2 Base Line Data

The audit team should collect base line data while conducting detailed energy audit, that include:

- Technology, processes used & equipment details
- Capacity utilisation
- Amount & type of input materials used
- Water consumption
- Other inputs like compressed air, cooling water etc
- Steam consumption
- Electrical energy consumption
- Fuel Consumption
- Quantity & type of wastes generated
- Percentage rejection / reprocessing
- Efficiencies / yield

5. ENERGY AUDIT REPORT

After successfully carried out energy audit energy manager/energy auditor should report to the top management for effective communication and implementation. A typical energy audit reporting contents and format are given below. The following format is applicable for most of the industries. However, the format can be suitably modified for specific requirement applicable for a particular type of industry.

- Acknowledgement
- Executive summary - Energy audit options at a glance and recommendations
- Introduction about the plant
- Production process description
- Energy and utility system description
  - List of utilities
  - Brief description of each utility
- Detailed process flow diagram and energy and material balance
- Energy efficiency in utility and process systems
- Energy conservation options and recommendations
  - List of options in terms of no cost / low cost, medium cost, and high investment cost, annual energy and cost savings, and pay back
  - Implementation plan for energy saving measures / projects
- Annexures