# Energy Management & Audit

# Lesson Objectives

After completing this lesson, you will be able to describe the followings.

- Definition of Energy Management and Audit
- Need of Energy management and Audit
- > Types of Energy Audit
- Energy Management Approach
- > Energy Cost
- Bench Marking
- Energy Performance
- > Energy Audit Instruments and Metering

# Definition of Energy Management

- Energy Management is defined as "The strategy of adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems".
- The use of energy resources is required to be reduced by managing the utilization of electricity which is termed as energy management.
- It is all about reducing the cost of energy used by an organization.

# The Energy Management System

### **MANAGERIAL**

### PLAN:

- Policy/goals/targets
- Resources

### DO:

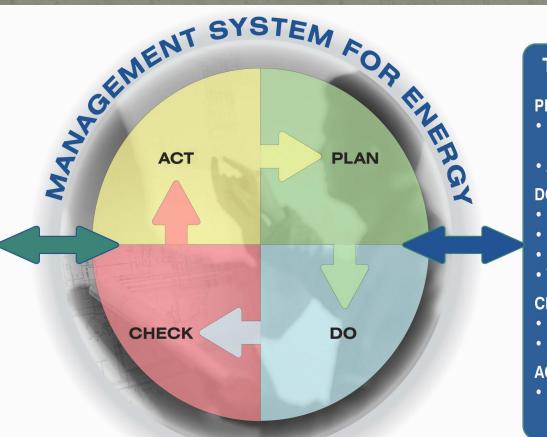
- Training
- Communication
- Control equipment systems & processes

### **CHECK:**

- Corrective/ preventive action
- Internal audits

### ACT:

 Management review



### **TECHNICAL**

### PLAN:

- Energy data management
- Assessments

### DO:

- Energy purchasing
- Design
- Projects
- Verification

### **CHECK:**

- Monitoring
- Measurement

### ACT:

 System performance

# The Objectives of Energy Management

- 1. To achieve and maintain optimum energy procurement and utilization, throughout the organization.
- 2. To minimize energy costs / waste without affecting production & quality.
- 3. To minimize environmental effects.

# Energy Management Objectives Clarified

- ➤ The basic objective of any Energy Management System is to answer five simple questions:
- How much energy is consumed
- How is the energy consumed
- Where is the energy consumed
- When is the energy consumed
- What is the quality of the energy consumed
- ► In order to address these queries Energy Audits are conducted. Lets understand audits.

# Definition of Energy Audit

As per Indian 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."

# Need for Energy Audit

- The three top operating expenses are energy (both electrical and thermal), labour and materials.
- Energy would emerge as a top ranker for cost reduction.
- primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs.
- Energy Audit provides a "bench-mark" (Reference point) for managing energy in the organization.

# Types of Energy Audits

- 1. Preliminary Energy Audit
- 2. Targeted Energy Audit
- 3. Detailed Energy Audit

# Preliminary Energy Audit

- Preliminary energy audit uses existing or easily obtained data.
- Establishes the energy consumption in the organization.
- Estimates the scope for saving.
- Identifies the most likely areas for attention.
- Identifies immediate(no cost or low cost) improvements.
- Sets a 'reference point'.
- Identifies areas for more detailed study/measurement.

# Targeted Energy Audits

- > Targeted energy audits are mostly based upon the outcome of the preliminary audit results.
- They provide data and detailed analysis on specified target projects.
- As an example, an organization may target its lighting system or boiler system or compressed air system with a view to bring about energy savings.
- Targeted audits therefore involve detailed surveys of the target subjects/areas with analysis of the energy flows and costs associated with those targets.

# Detailed Energy Audit

- Detailed Energy Audit evaluates all systems and equipment which consume energy and the audit comprises a detailed study on energy savings and costs.
- Detailed Energy Audit is carried out in 3 phases.
  - The Pre-audit Phase
  - The Audit Phase
  - The Post-Audit Phase

## The Ten Steps for Detailed Audit

| Step<br>No | PLAN OF ACTION   | PURPOSE / RESULTS  |
|------------|--|--|
| Step 1     | <ul> <li>Phase I – Pre Audit Phase</li> <li>Plan and organise</li> <li>Walk through Audit</li> <li>Informal Interview with<br/>Energy Manager, Production<br/>/ Plant Manager</li> </ul> | <ul> <li>Resource planning, Establish/organize a Energy audit team</li> <li>Organize Instruments &amp; time frame</li> <li>Macro Data collection (suitable to type of industry.)</li> <li>Familiarization of process/plant activities</li> <li>First hand observation &amp; Assessment of current level operation and practices</li> </ul> |
| Step 2     | • Conduct of brief meeting / awareness programme with all divisional heads and persons concerned (2-3 hrs.)  | <ul> <li>Building up cooperation</li> <li>Issue questionnaire for each department</li> <li>Orientation, awareness creation</li> </ul>  |

| THE PERSON OF TH | Step 3 | Phase II —Audit Phase  • Primary data gathering, Process Flow Diagram, & Energy Utility Diagram | <ul> <li>Historic data analysis, Baseline data collection</li> <li>Prepare process flow charts</li> <li>All service utilities system diagram (Example: Single line power distribution diagram, water, compressed air &amp; steam distribution.</li> <li>Design, operating data and schedule of operation</li> <li>Annual Energy Bill and energy consumption pattern (Refer manual, log sheet, name plate, interview)</li> </ul> |
|--|--------|---|---|
| STATE OF THE PARTY | Step 4 | • Conduct survey and monitoring   | <ul> <li>Measurements:         Motor survey, Insulation, and Lighting survey with portable instruments for collection of more and accurate data. Confirm and compare operating data with design data.     </li> </ul>   |

| Step 5 | Conduct of detailed trials /experiments for selected energy guzzlers                 | <ul> <li>Trials/Experiments:         <ul> <li>24 hours power monitoring (MD, PF, kWh etc.).</li> <li>Load variations trends in pumps, fan compressors etc.</li> <li>Boiler/Efficiency trials for (4 – 8 hours)</li> <li>Furnace Efficiency trials Equipments Performance experiments etc</li> </ul> </li> </ul>   |
|--------|--|---|
| Step6  | Analysis of energy use   | Energy and Material balance & energy loss/waste analysis  |
| Step 7 | Identification and<br>development of Energy<br>Conservation (ENCON)<br>opportunities | <ul> <li>Identification &amp; Consolidation ENCON measures</li> <li>Conceive, develop, and refine ideas</li> <li>Review the previous ideas suggested by unit personal</li> <li>Review the previous ideas suggested by energy audit if any</li> <li>Use brainstorming and value analysis techniques</li> <li>Contact vendors for new/efficient technology</li> </ul> |
| Step 8 | • Cost benefit analysis  | <ul> <li>Assess technical feasibility, economic viability and prioritization of ENCON options for implementation</li> <li>Select the most promising projects</li> <li>Prioritise by low, medium, long term measures</li> </ul>  |
| Step9  | • Reporting & Presentation to the Top Management                                     | Documentation, Report Presentation to the top Management.   |

# Step10 Phase III –Post Audit phase Implementation and Followup Assist and Implement ENCON recommendation measures and Monitor the performance Action plan, Schedule for implementation Follow-up and periodic review

# Questions which an Energy Auditor should ask

- What function does this system serve?
- How does this system serve its function?
- What is the energy consumption of this system?
- What are the indications that this system is working properly?
- If this system is not working, how can it be restored to good working conditions/
- How can the energy cost of this system be reduced?





Working to save America's energy and environmental future.

Third by more .



**THANK YOU**