



PRESENTATION ON ENERGY MANAGEMENT AND AUDIT

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ENERGY MANAGEMENT

- Energy Management encompasses a wide range of activities and expertise in the optimal use of energy. This includes the areas of:
- development of management strategies programmes and plans,
- implementation of techniques, technology and tools
- measurement, verification and control.





OBJECTIVES OF ENERGY MANAGEMENT

- Eliminating unnecessary energy use
- Improving the efficiency of needed energy use
- Buying energy at lower net prices
- Adjusting operations to allow purchasing energy at lower prices



WHAT IS ENERGY AUDIT

- In the Indian Energy Conservation Act of 2001 (BEE 2008), an energy audit is defined as:

"The verification, monitoring and analysis of the use of energy and submission of technical report containing recommendations for improving energy efficiency with cost-benefit analysis and an action plan to reduce energy consumption."



ENERGY AUDIT-DESCRIPTION

- The energy audit is one of the first tasks to be performed in accomplishing an effective energy management program.
- It is designed to improve the energy efficiency and reduce the energy operating costs of a facility.
- The energy audit is sometimes called an energy surveyor or an energy analysis, so that it is not confused with a financial audit.
- The term “audit” should be avoided if it clearly produces a negative image in the mind of a particular business, organization, or individual.
- The audit process starts by collecting information about a facility’s operation and about its past record of utility bills.
- This data is then analyzed to get a picture of how the facility uses – and possibly wastes – energy, as well as to help the auditor learn what areas to examine to reduce energy costs.



CONTD....

- Specific changes – called Energy Conservation Measures (ECM's) – are identified and evaluated to determine their benefits and their cost effectiveness.
- These ECM's are assessed in terms of their costs and benefits, and an economic comparison is made to rank the various ECM's.
- Finally, an Energy Action Plan is created where certain ECM's are selected for implementation, and the actual process of saving energy and money begins.



OBJECTIVES OF ENERGY AUDIT

- an energy audit is usually conducted to understand how energy is used within the plant and to find opportunities for improvement and energy saving.
- Sometimes, energy audits are conducted to evaluate the effectiveness of an energy efficiency project or program



TYPES OF ENERGY AUDIT

Preliminary audit (Walk-through audit)

- In a preliminary energy audit, readily-available data are mostly used for a simple analysis of energy use and performance of the plant.
- This type of audit does not require a lot of measurement and data collection. These audits take a relatively short time and the results are more general, providing common opportunities for energy efficiency.
- The economic analysis is typically limited to calculation of the simple payback period, or the time required paying back the initial capital investment through realized energy savings



B) DETAILED AUDIT (DIAGNOSTIC AUDIT)

- For detailed (or diagnostic) energy audits, more detailed data and information are required. Measurements and a data inventory are usually conducted and different energy systems (pump, fan, compressed air, steam, process heating, etc.) are assessed in detail. Hence, the time required for this type of audit is longer than that of preliminary audits.
- The results of these audits are more comprehensive and useful since they give a more accurate picture of the energy performance of the plant and more specific recommendation for improvements.
- The economic analysis conducted for the efficiency measures recommended typically go beyond the simple payback period and usually include the calculation of an internal rate of return (IRR), net present value (NPV), and often also life cycle cost (LCC).



TARGETED ENERGY AUDIT

- 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.



TEN STEPS FOR AUDIT

The Ten Steps for Detailed Audit

Step No	PLAN OF ACTION	PURPOSE / RESULTS
Step 1	<p>Phase I –Pre Audit Phase</p> <ul style="list-style-type: none"> • Plan and organise • Walk through Audit • Informal Interview with Energy Manager, Production / Plant Manager 	<ul style="list-style-type: none"> • Resource planning, Establish/organize a Energy audit team • Organize Instruments & time frame • Macro Data collection (suitable to type of industry.) • Familiarization of process/plant activities • First hand observation & Assessment of current level operation and practices
	Step 2	<ul style="list-style-type: none"> • Conduct of brief meeting / awareness programme with all divisional heads and persons concerned (2-3 hrs.)

Phase II –Audit Phase

Step 3

- Primary data gathering, Process Flow Diagram, & Energy Utility Diagram
- Historic data analysis, Baseline data collection
- Prepare process flow charts
- All service utilities system diagram (Example: Single line power distribution diagram, water, compressed air & steam distribution.
- Design, operating data and schedule of operation
- Annual Energy Bill and energy consumption pattern (Refer manual, log sheet, name plate, interview)

Step 4

- Conduct survey and monitoring
- 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.



Step 5	<ul style="list-style-type: none"> • Conduct of detailed trials /experiments for selected energy guzzlers 	<ul style="list-style-type: none"> • Trials/Experiments: <ul style="list-style-type: none"> - 24 hours power monitoring (MD, PF, kWh etc.). - Load variations trends in pumps, fan compressors etc. - Boiler/Efficiency trials for (4 – 8 hours) - Furnace Efficiency trials Equipments Performance experiments etc
Step6	<ul style="list-style-type: none"> • Analysis of energy use 	<ul style="list-style-type: none"> • Energy and Material balance & energy loss/waste analysis
Step 7	<ul style="list-style-type: none"> • Identification and development of Energy Conservation (ENCON) opportunities 	<ul style="list-style-type: none"> • Identification & Consolidation ENCON measures <ul style="list-style-type: none"> ▪ Conceive, develop, and refine ideas ▪ Review the previous ideas suggested by unit personal ▪ Review the previous ideas suggested by energy audit if any ▪ Use brainstorming and value analysis techniques ▪ Contact vendors for new/efficient technology
Step 8	<ul style="list-style-type: none"> • Cost benefit analysis 	<ul style="list-style-type: none"> • Assess technical feasibility, economic viability and prioritization of ENCON options for implementation • Select the most promising projects • Prioritise by low, medium, long term measures
Step9	<ul style="list-style-type: none"> • Reporting & Presentation to the Top Management 	<p>Documentation, Report Presentation to the top Management.</p>



Step No	PLAN OF ACTION	PURPOSE / RESULTS
Step10	<p data-bbox="202 406 759 442"><u>Please III – Post Audit plan</u></p> <ul data-bbox="202 492 759 564" style="list-style-type: none"><li data-bbox="202 492 759 564">• Implementation and Follow-up	<p data-bbox="797 535 1620 606">Assist and implement ENCON recommendations measures and Monitor the performance</p> <ul data-bbox="859 621 1620 735" style="list-style-type: none"><li data-bbox="859 621 1620 692">• Action plan. Schedule for implementation<li data-bbox="859 699 1620 735">• Follow-up and periodic review



Good Collaboration with energy manager is important



ENERGY AUDIT INSTRUMENTS

Energy Audit

Energy Audit Instruments

1. *Electrical parameters*
2. *Combustion analyzer*
3. *Fuel efficiency monitor*
4. *Fyrites- gas analyzer*
5. *Temperature measurements*
6. *Pressure measurements*
7. *Velocity measurements*
8. *Speed measurements*
9. *Leak detectors*
10. *Measurement of light*
11. *Measurement of water flow*
12. *Humidity measurement*

FLUE GAS ANALYSERS



Combustion analyzer:

This instrument has in-built chemical cells which measure various gases such as CO_2 , CO , NO_x , SO_2 etc. :



Fuel Efficiency Monitor:

This measures Oxygen and temperature of the flue gas. Calorific values of common fuels are fed into the microprocessor which calculates the combustion efficiency.



Fyrite:

A hand bellows pump draws the flue gas sample into the solution inside the fyrite. A chemical reaction changes the liquid volume revealing the amount of gas. Percentage Oxygen or CO_2 can be read from the scale.

TEMPERATURE MEASUREMENTS



Contact thermometer:

These are thermocouples which measure the average fluid gas, hot air, hot water temperatures by insertion of probe into the stream.

For surface temperature a lead type probe is used with the same instrument.



Infrared Pyrometer:

This is a non-contact type measurement which when directed at a heat source directly gives the temperature reading. Can be useful for measuring hot jobs in furnaces, surface temperatures etc.



FLOW MEASUREMENTS – AIR , WATER



Pitot Tube and manometer:

Air velocity in ducts can be measured using a pitot tube and inclined manometer for further calculation of flows.



Ultrasonic flow meter:

This a non contact flow measuring device using Doppler effect principle. There is a transmitter and receiver which are positioned on opposite sides of the pipe. The meter directly gives the flow. Water and other fluid flows can be easily measured with this meter.



A top-down view of a white card with the words "Thank you" written in purple cursive. The card is placed on a light-colored marble surface. To the left of the card is a bouquet of purple flowers with green leaves. To the right of the card is a black pen with a white polka-dot grip. In the bottom right corner, there is a small gift wrapped in white paper with a black polka-dot pattern, tied with a red and white striped string. A spool of this same string is visible in the top right corner.

Thank
you