



Energy Audit

Conducting an Energy Audit

Energy Audit Goals

- ▶ Clearly identify types and costs of energy use
 - Electricity
 - Natural Gas
 - Propane
 - Motor Fuel
 - Fuel Oil
 - Coal
- ▶ Understand how energy is being used and where possibly wasted
 - Utility Costs can cover a wide range
 - Sewer – Refuse – Storm Water, etc are energy cost

Energy Audit Steps

1. Identify layout and operating schedule for facility



Make a plan or sketch of the building(s) which depicts building size, room sizes, window areas, wall and roof composition, and insulation factor

2. Compile an inventory list

List all equipment, with hours of use per year, with energy rating of efficiencies





3. Determine the pattern of project use to show annual needs for heating, cooling, and lighting

4. Conduct a room by room lighting inventory
- Light fixtures
 - Lamp types, size and numbers
 - Levels of illumination
 - Uses of task lighting



Geographical location and weather data.

- Obtain heating degree and cooling degree days for location
 - Local weather station
 - Local utility
 - State energy office

Degree-day data (HDD/CDD) is useful in analyzing energy needed to heat or cool facility

HDD or CDD

Heating Degree Days (HDD) and Cooling Degree Days (CDD) are separate values and are specific to a geographic location.

- Average building desired indoor temperature of 70° F.
- 5° of this temperature is supplied by internal heat sources such as lights, appliances, equipment and people.
- The basis for computing degree-days is 65° F.

HDD Example

Assuming a period of 3 days when the outside temperature average is 50° F.

The number of HDD for this period would be:

$$\begin{aligned} \text{HDD} &= (65^{\circ} - 50^{\circ}) \times 3 \text{ days} \\ &= 45 \text{ Heating Degree Days} \end{aligned}$$

CDD Example

Assuming a period of 3 days when the outside temperature average is 80° F.

The number of CDD for this period would be:

$$\begin{aligned} \text{CDD} &= (80^\circ - 65^\circ) \times 3 \text{ days} \\ &= 45 \text{ Cooling Degree Days} \end{aligned}$$

1

Facility Layout

- ▶ Obtain the facility layout or plan and review it to determine:
 - Facility size
 - Floor plan
 - Construction features
 - (Wall and roof material, insulation levels, door and window sizes and construction material.)

2

Equipment List

- ▣ Get equipment list for facility for review of loads
- ▣ Identify all large pieces of energy-consuming equipment.
 - ▣ Heaters, air conditioners, water heaters, process systems, and lighting

(Equipment list and operational data of equipment provide understanding of major energy-consuming tasks or equipment at a facility)

Nine Major Systems to Consider

1. Building Envelope
2. HVAC System
3. Electrical Supply System
4. Lighting Design
5. Boiler and Steam Systems
6. Hot Water Systems
7. Compressed Air System
8. Motors
9. Special Purpose Process Equipment

As you examine each system, you should ask:

1. What function(s) does this system serve?
2. How does this system serve its function(s)?
3. What is the energy consumption of the system?
4. What are the indications that this system is probably working?

5. If the system is not working, how can it be restored to good working condition?
6. How can the energy cost of this system be reduced?
7. How should this system be maintained?
8. Who has direct responsibility for maintaining and improving the operating and energy efficiency of this system?

3

Operating Hours

- ▶ Obtain operating hours for facility or project
 - How many shifts of operations for the facility

(Knowing the operating hours in advance gives some indication as to whether any loads could be shifted to off-peak times.)


4

Lighting Inventory

- ▶ List all lighting fixtures by type, lamp number and size in watts, number of ballasts

(Count, type, and size will allow for a lighting design analysis.)

Major Impact of today

- ▶ Motor fuel use
 - ▶ Type of fuel used
 - ▶ Green Fuel – Green Vehicle
 - ▶ Benefits
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Preliminary Identification of Energy Management Opportunities

- ▶ During on-site audit, take notes on potential EMOs
- ▶ Devote effort to analyzing and implementing the EMOs show the greatest saving with the least effort

Identifying EMOs requires a good knowledge of energy efficient technologies available.

The Energy Audit Report

- ▶ The Energy Audit Report details the final results of the energy analysis.
- ▶ Provides energy cost savings recommendations.
- ▶ Length and detail of report will vary by facility and project.

Energy Audit Report Format

- ▶ Executive Summary

- Brief summary of recommendations and cost savings

- ▶ Table of Contents

- ▶ Introduction

- Purpose of audit
- Need for continuing energy cost control program

▶ Facility Description

- Products or services provided and materials flow
- Size, construction, facility layout
- Hours of operation
- Equipment list with specifications

▶ Energy Bill Analysis

- Utility rate structures
- Table/graphs of energy consumptions and cost
- Discussion of energy costs and energy bills

▶ Energy Management Opportunities

- Listing potential EMOs
- Cost and savings analysis
- Economic evaluation

▶ Energy Action Plan

- Recommended EMOs and an implementation schedule.
- Designation of an energy monitor and on-going program

▶ Conclusion

- Additional comments not otherwise covered.

