Energy Management for Motor Driven Systems

Course Number: EE-02-305

PDH: 9

Approved for: AK, AL, AR, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, VT, WI, WV, and WY

State Board Approvals

Florida Provider # 0009553 License #868
Indiana Continuing Education Provider #CE21800088
Maryland Approved Provider of Continuing Professional Competency
New Jersey Professional Competency Approval #24GP00025600
North Carolina Approved Sponsor #S-0695
NYSED Sponsor #274

How Our Written Courses Work

This document is the course text. You may review this material at your leisure before or after you purchase the course.
After the course has been purchased, review the technical material and then complete the quiz at your convenience.
A Certificate of Completion is available once you pass the exam (70% or greater). If a passing grade is not obtained, you may take the quiz as many times as necessary until a passing grade is obtained).
If you have any questions or technical difficulties, please call (508) 298-4787 or email us at admin@PDH Pro.com.

Module 1: Energy Management for Motor-Driven Systems

Learning Objectives

By the end of this section, you will be able to:

- **Identify** the ten key elements necessary for establishing a successful facility energy management program.
- **Evaluate** motor-driven systems to target high-priority candidates for energy conservation audits.
- **Develop** an organization-wide energy management plan that integrates technical analysis with corporate culture.

Executive Summary: Effective energy management is an ongoing, team-structured effort that moves beyond simply turning off equipment to optimizing production efficiency. By integrating energy awareness into the "corporate culture," industrial facilities can achieve significant gains in the "bottom line," potentially increasing profits by 5% through a one-third reduction in net energy costs.

Industrial plant staff should prioritize energy management to counteract ever-increasing utility costs that erode profits and competitiveness. A successful program challenges staff to provide services with absolute minimum energy consumption through production efficiency gains.

Elements of a Successful Energy Management Program

Energy management consists of a structured team effort to create awareness, organize data, and implement conservation opportunities without overburdening staff.

Secure Top Management Commitment

Top management’s attitude determines the success of the energy plan. Management must display an active awareness of the program's importance and be willing to provide both **personnel** and **financial resources**.

Appoint an Energy Coordinator

An energy coordinator acts as a "coach," responsible for mobilizing resources and motivating others.

- **Primary Duty:** Energy management should be a primary responsibility for this individual.
- **Key Tasks:** Analyzing trends, suggesting ways to remove roadblocks, and preparing monthly facility efficiency reports.

💡 **Design Tip:** A general rule-of-thumb for staffing is to allocate **one person-year** for every **$1 million** of annual energy expenditures. As the program matures, this can be reduced to one person-year per $2–$5 million spent.

Obtain Employee Cooperation

The effectiveness of an improvement program is proportional to the time staff are allowed to spend on it.

- **Idea Champions:** Recognize and support "prime movers" who have the persistence to see projects through to completion.
- **Energy Committee:** Establish a cross-departmental committee to foster a sense of "ownership".

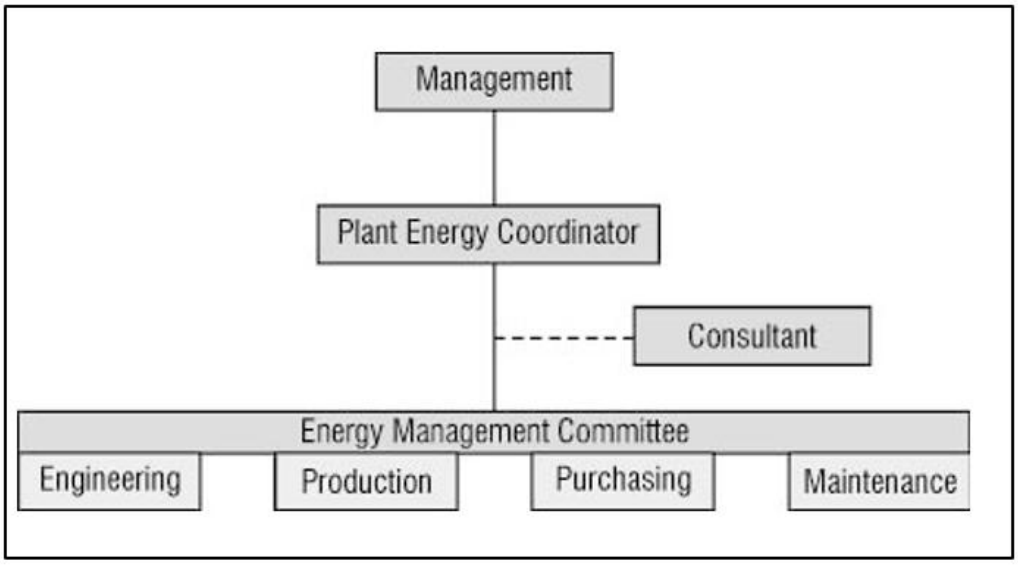

Figure 1-1: Typical Energy Management Team Organization Chart

Conduct Energy Surveys

Initial surveys show where energy is used or wasted. An inventory of equipment should document nameplate data, running times, and operating profiles.

Auditors should concentrate on motor-driven systems where:

- Running time exceeds **1,000 hours per year**.
- Motors are larger than **20 hp** (these represent 20% of population but 60% of energy use).
- Loads are nearly constant and operate at or near **full-load**.
- **Utility rebate** or demand management incentives exist.

Calculation Note: In-plant metering is typically economically justified when the annual cost of energy exceeds **five times** the cost of the meter.

Organize Energy Data

Begin gathering information with utility bills for at least a **one-year period** to establish a baseline. Graphing use and costs helps identify patterns and seasonal trends.

Analyze Survey Results

Construct **energy balances** for each process to quantify total energy output against total energy supplied.

- **Engineering Review:** Analysts must examine capital costs, energy savings, and potential disruptions to operations.
- **Risk Assessment:** Address technological risks, maintenance requirements, and vendor reliability.

Set Conservation Goals

Yearly goals for reductions in baseline energy intensity or cost are absolutely necessary. Performance cannot be measured without established targets.

Develop Organization-Wide Energy Management Plan

The plan must include policies, assignments, implementation timelines, and feedback mechanisms. It serves as the roadmap for decision-makers.

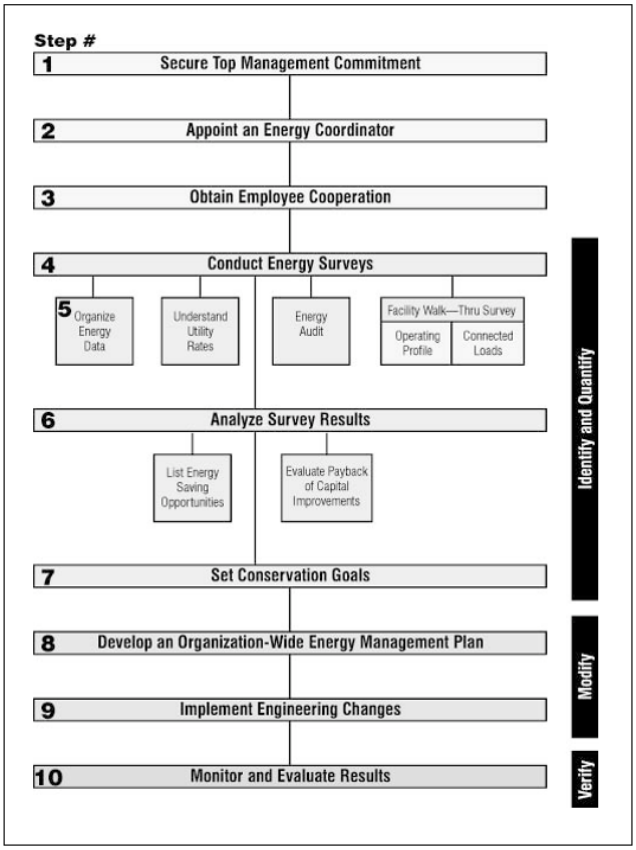

Figure 1-2: Steps in an Energy Management Program

Implement Engineering Changes

Identify and implement the most cost-effective measures first.

- **Build Momentum:** Starting with small, low-investment projects from the routine maintenance budget builds confidence and trust within the organization.
- **Documentation:** Thoroughly document performance and savings for initial projects to prove abilities to plant management.

Monitor and Evaluate Results

Periodic reports (monthly or quarterly) make the program visible to both management and department staff.

- **Evaluation:** Share successes to build support and provide recognition for teamwork or exceeding reduction goals.

Conclusion

Historically viewed as fixed costs, energy expenses are increasingly recognized as controllable through modern technologies. Energy management is particularly beneficial for energy-intensive industries that have not previously implemented aggressive efficiency programs.

Checkpoint Quiz

---

1. **Which of the following is a primary criterion for prioritizing a motor for an energy audit?**
   a) Motors that operate less than 500 hours per year.
   b) Motors with highly fluctuating or random loads.
   c) Motors above 20 hp that operate more than 1,000 hours per year.
   d) Motors with the newest nameplates and high existing efficiency.

Answer: (c). Systems with running times exceeding 1,000 hours and motors above 20 hp represent the greatest potential for conservation savings.

2. **What is the recommended strategy for a newly appointed energy coordinator to build momentum for the program?**
   a. Implement the largest, most expensive process overhaul immediately.
   b. Start with a small, low-investment project that can be funded via the maintenance budget.
   c. Focus solely on administrative changes before touching any engineering systems.
   d. Wait until a major motor failure occurs before taking any action.

Answer: (b). Choosing a small, successful project builds confidence and momentum, which is necessary to overcome barriers and change organizational culture.