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O&M BEST PRACTICES SERIES



FIFTEEN O&M
BEST **P**RACTICES(I)

For Energy-Efficient Buildings

에너지효율빌딩을 위해 만들어진 '운전 및 유지관리를 위한 15가지 최고의 실행법 시리즈'는 PECI(Portland Energy Conservation, INC.)사에서 미국 환경보호협회(EPA)와 에너지부(DOE)의 자금지원을 받아 제작·배포한 것이다. 국내 ESCO 업무 담당자에게 도움이 되길 바라며 3회에 걸쳐 연재한다.



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15 O&M BEST PRACTICES

The 15 Best Operation and Maintenance Practices for Energy-Efficient Buildings

INTRODUCTION

Building operation and maintenance programs specifically designed to enhance operating efficiency of HVAC and lighting systems can save 5 to 20 percent of the energy bills without significant capital investment. The U.S. EPA and U.S. DOE want to help commercial building owners capture these savings. The 15 Best Practices described in this booklet are strategies that facility managers, energy managers and property managers can use to integrate energy-efficient operation into their organizations' O&M programs and to obtain support from senior management.

This publication is part of the O&M Best Practices Series, which includes the following books:


- Fifteen O&M Best Practices for Energy-Efficient Buildings
- Operation and Maintenance Service Contracts: Guidelines for Obtaining Best-Practice Contracts for Commercial Buildings
- Portable Dataloggers - Diagnostic Monitoring Tools for Energy-Efficient Building Operation
- O&M Assessments: Enhancing Energy-Efficient Building Operation
- Energy Management Systems - A Practical Guide
- Putting the "O" Back in O&M: Best Practices in Preventive Operations, Tracking, and Scheduling

O&M Best Practices save energy while maintaining or enhancing indoor air quality and equipment reliability.



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In line with the series' focus on energy, best practices are defined as those O&M activities, methods, and approaches that contribute to, or are directly responsible for, producing energy savings while maintaining or enhancing indoor environmental quality and equipment reliability. These overarching O&M practices lead to the *efficient operation* of commercial buildings rather than emphasizing energy-efficient capital improvements, (such as energy-efficient lighting and HVAC retrofits), or equipment-specific maintenance procedures, (such as cleaning indoor and outdoor coils, tightening fan belts and changing filters). Each of the best practices fall into one of the following four major categories:

 These best practices focus on efficient operation — not capital improvements.

- **Management**—energy-efficient building operation and the “big picture.”
- **Teamwork**—energy-efficient building operation is everybody’s business.
- **Resources**—information saves time and money.
- **Energy-Efficient O&M**—expanding the preventive maintenance program.

Because there is very little information on building operation (the “O”) compared to the volumes written on building maintenance (the “M”), this series emphasizes activities that support energy-efficient building operation, (such as optimizing schedules, control strategies, sequences of operation, etc.). Maintenance is not ignored but this discussion is limited to the maintenance activities that support efficient operation of equipment and systems.



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MANAGEMENT

*Energy-Efficient Building Operation
and the “Big Picture”*

BEST PRACTICE 1: GOALS

INCORPORATE GOALS FOR ENERGY-EFFICIENT BUILDING OPERATION INTO THE STRATEGIC BUSINESS PLAN

Today’s business atmosphere of “downsizing” and reducing capital expenditures is fertile ground for energy-efficient building operation. Senior managers and building owners are focused on maximizing the return on investment (including assets such as facilities and O&M staff). This focus increases opportunities for energy managers, facility managers and property managers to demonstrate the relevance of energy-efficient building operation. Optimizing O&M strategies for keeping expensive building equipment and systems operating efficiently reduces the risk of early equipment failure, unscheduled down time, high utility costs, and tenant losses. Also, efficient building operation can increase a facility’s net operating income (NOI), which in turn increases its value. Clearly defining O&M goals and objectives, and communicating to senior management how O&M fits into the “big picture,” increases management’s awareness and support for the O&M department’s efforts.

Efficient building operation can increase capital value.

PURPOSE

- Gain the attention of senior management by increasing their understanding of efficient operation as part of asset management. Efficient building operation reduces operating costs and maintains comfort. This



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translates into increased capital value. In addition, an income building with excellent comfort and low operating costs increases the owner's ability to attract and retain tenants.

- Obtain senior management support for the O&M department in general and for energy-efficient building operation in particular.
- Establish energy-efficient operation as a specific goal for the facilities department.

ACTION TIPS

- Thoroughly understand the organization's mission and strategic business plan.
- Clearly define and communicate to senior management how the O&M department fits into the overall organization by developing clear, written goals and objectives that are in harmony with the larger mission and strategic plan. Include an objective to achieve a level of measurable operating efficiency for the building or buildings.
- Keep senior management informed about the current level of operating efficiency, additional savings potential, and the resources needed to achieve it.



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BEST PRACTICE 2: PLANNING

REQUIRE AN ENERGY MANAGEMENT PLAN WITH ENERGY-EFFICIENT OPERATION AS A PRIMARY COMPONENT

Energy-efficient operation means operating an energy-consuming device so that it uses only as much energy as necessary to fulfill its intended function. The primary objective of an effective energy management plan is to eliminate or minimize energy waste while maintaining a comfortable and safe environment. Effective energy management planning generally consists of three basic elements:

- Purchasing clean and reliable energy at the lowest cost
- Replacing old equipment and systems with new, efficient technologies
- Operating energy consuming equipment efficiently

The energy management plan should include and equally emphasize all three of these elements. Operating energy consuming equipment efficiently is the most under-rated and least understood element, yet it has high potential for savings with little or no capital outlay (Herzog 1997).

PURPOSE

- Create a written energy management plan that not only includes fuel purchasing and equipment replacement but equally emphasizes strategies for efficient building operation.
- Optimize energy cost savings by efficiently operating existing equipment and reducing inappropriate or premature capital outlay.



*An energy management
plan minimizes waste.*



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ACTION TIPS

- Include in the energy management plan a component clearly defining energy-efficient operation of energy consuming equipment. An example of a definition is: Operate energy consuming equipment to constantly maintain a match between the energy used and the energy required for the equipment or system to fulfill its intended function (Herzog 1997).
- As part of the plan, state the goals for energy-efficient operation, outline the steps to achieve the goals, and define methods of measuring and reporting whether goals have been met.
- When communicating with management, use language and terms they understand and emphasize benefits they value, which may differ from your own.



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BEST PRACTICE 3: ENERGY ACCOUNTING


USE AN ENERGY ACCOUNTING SYSTEM TO LOCATE SAVINGS OPPORTUNITIES AND TO TRACK AND MEASURE THE SUCCESS OF ENERGY-EFFICIENT STRATEGIES

An energy accounting system is a critical part of the energy management plan. For an energy management plan to be successful it must include information on past and current energy use, demand (in the case of electricity) and cost. Without this information it is impossible to understand or communicate in any measurable way the progress of the overall energy management plan as well as the various energy-saving components. An energy accounting system can be used to better understand major drivers of a facility's energy use, such as weather, increased occupancy, additional equipment, operational deficiencies, etc. Tracking whole-building energy performance provides insight into overall energy and O&M fitness of the building.

Often those individuals that are most involved with operating and maintaining the building receive the least information on energy use. Sharing the energy accounting information with the building's O&M staff helps them to track the increases in demand and energy use that may indicate problems. It also may help them track the success of energy-efficient O&M strategies.

PURPOSE


- Provide a basic foundation for a successful energy management plan.
- Record and track the progress of energy saving strategies.
- Provide a basis for setting realistic energy savings goals.
- Indicate possible areas for improved O&M.

 *O&M staff need energy use information in order to implement energy-efficiency strategies.*



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- Motivate O&M staff by continually giving them feedback through monthly reports.
- Provide owners and managers of multiple buildings the ability to benchmark and compare energy use among similar buildings. A building with a unusually high annual energy use intensity or energy use index (EUI, or energy consumption per square foot per year) compared to buildings of the same type and use, often indicates energy waste and opportunities for savings.

 *Energy accounting reports should be useful to both senior management and O&M staff.*

ACTION TIPS

- Choose an energy accounting system or method that suits the size and complexity of the building or buildings involved. The accounting system may be manual or computerized.
- Fully understand various utility bills for each building, including rate schedules, consumption data and demand (electrical).
- Develop a reporting system for the data that is clear, concise and useful to both senior management and building O&M staff. This may include information in the form of charts and graphs that informs and educates the audience about energy use, demand, costs, savings and progress.
- Remember to normalize data for weather, changes in occupancy or use, and other relevant factors when developing the report.
- Distribute the report to both senior management and building O&M staff. Consider giving senior management a summary report and the building staff a more detailed report.



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TEAMWORK

*Energy-Efficient Building Operation is
Everybody's Business*

BEST PRACTICE 4: STAFFING

HIRE OR APPOINT AN ENERGY MANAGER

Assigning or hiring someone to take on the role of energy manager sends a message to the facility staff that the energy management process is important. A good energy manager engages the facility staff in the energy management process and supports and motivates staff efforts in energy-efficient operation. Often the cost savings generated by an experienced energy manager can easily cover his or her salary.

As part of the facility staff, an energy manager has the primary responsibility for managing energy and promoting energy-efficient building operation. The energy manager must have the technical background such as an engineering degree, professional engineer's (PE) license, or certification as an energy manager (CEM). He or she should have the skill and the desire to develop and carry out all aspects of the energy management plan and should have a clear understanding of how indoor environmental quality (IEQ) issues relate to energy efficiency. A good energy manager also has good communication skills, the ability to make a business presentation to the organization's financial officers, and should act as a champion for the energy management plan.

Often, the cost savings generated by an experienced energy manager can easily cover his or her salary.



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PURPOSE

- Employ a skilled staff member whose primary focus is developing and implementing the organization's energy management plan with an equal emphasis on efficient building operation.

ACTION TIPS

- Depending on the building size, use, complexity of technologies, and potential energy savings, either hire a professional energy manager or assign the energy management function to a technically qualified staff person. Using an in-house staff person, (such as facility manager, property manager or building operator) is usually only appropriate for smaller (less than 300,000 sf) facilities.
- Provide adequate, up-to-date energy management training for the staff member assigned the energy management position. Training might include conferences, seminars, and university classes on the subject.
- Consider obtaining memberships in organizations that specifically support energy management such as the Association of Energy Engineers (AEE) and the Association of Professional Energy Managers (APEM).
- Clearly define the energy management job function along with reporting and authority guidelines. The energy manager should know who they report to and how much authority they have to carry out their goals.
- Assign a contracting representative "buddy" to work with the energy manager when he or she investigates the financing options of energy efficiency and O&M projects.

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