Chapter 11

Sequence of Events

A properly applied EMS has the potential to reduce energy consumption in almost any building. Following is a general overall approach to installing an EMS.

INITIAL CONCEPT

- How large is your facility and what type of operation is it? Maybe a smaller EMS would be more suitable.
- How much energy can you save? Some EMS suppliers say that energy savings will be 25-35%. In general, real savings are in the range of 10-14%.
- Understand your electric utility rate structure as it relates to ON PEAK, OFF PEAK, and DEMAND.
- Call other EMS users to find out the pros and cons of their EMS.
- Who will use your EMS?

INFORMATION RETRIEVAL

This step in the process should include floor plans, HVAC system diagrams, temperature control schematics, wiring diagrams, lighting levels, and utility bills for the previous year (preferably previous three years). As you examine the electric bills, and especially the demand charges, you may see that the demand portion is as much as 40% of the bill charges. The question then is, how much can this demand be reduced?

CANDIDATE BUILDINGS AND SYSTEM SELECTION

The physical size of a building is not so important. Rather, it's what is going on in that building and how can changes in operating strategies be incorporated. Operating and maintenance personnel should be questioned about operating procedures of the various utility systems under their control. Interviews should be conducted with these personnel:

1. What is the general condition of HVAC equipment components?

2. What are the operating problems?

3. What are the maintenance problems? Operation of temperature controls? Filters? Belt and other drive? Lubrication? Pumps? Heating systems? Chillers?

4. When and why does the system waste energy- electricity, steam or chilled water?

5. Identify and review the operating schedule of chillers, the method of starting and stopping the unit (manual or automatic).

6. Reviewing lighting levels and maintaining minimum levels required for specific area requirements (offices, lobbies, hallways, laboratories, etc.).

FIELD SURVEY

Locate all related equipment on reduced size floor plans noting measured capacity of each system (power and CFM or GPM). Do not rely on so-called "as built" diagrams. You may find your HVAC equipment operating at 60-70% of design specifications.

Obtain the actual operating schedules of each building and of all HVAC units.

Analyze the temperature control sequence of operation for each system to determine if it is "energy obsolete." Control redesign changes should be recommended where necessary.

SYSTEM DESIGN CONSIDERATIONS

Numerous factors must be considered in designing and specifying a system that will meet a facility's requirements.

a. Cost-effectiveness is the basic criterion to be used in determining which type of system will yield maximum return on investment.

b. Adaptability—that is, how well a system can be adapted to an existing facility—involves many important concerns, such as the following: Will the system fit into the existing space? If the space is not readily available, can it be made available? Will new construction be necessary? Can the EMS system be interfaced with existing local controls, or will the controls have to be replaced?

c. Building system utilities energy savings functions should be automatic, not manual.

d. An EMS should be able to monitor energy used hour by hour, day by day, and produce permanent records when required.

e. System control loops should be upgraded where possible, to save energy (for example, fan system economizer cycles could be added to systems not operating on minimum outdoor air only).

f. An ongoing energy audit on a monthly basis should be initiated when the system becomes operable.

g. The system design shall be such that monitoring the environment shall be both for comfort and safety of occupants.

h. The system should incorporate fire and security functions where these functions can be improved via an EMS central operator station.

i. The system control console would be easy to operate by non-technical personnel.

CONTRACT DOCUMENT PREPARATION

Drawings and specifications—the contract documents—must be prepared for the system that is selected. Drawings must be reviewed carefully for completeness and accuracy; they should clearly and precisely indicate the designer's intent; and they should be carefully coordinated with the specifications in showing the components' functional relationships.

Specifications should address major concerns such as degree of accuracy, level of access, use of existing controls, use of electric power, factory debugging, acceptance testing, and training.

Do not use documents written around one supplier.

CONTRACT

Consider utilizing a two-step procurement procedure that prequalifies suppliers before pricing.

Do not award contracts simply to the lowest bid unless you have prequalified the bidders.

INSTALLATION

Manage the construction and installation of an EMS thoroughly … supervise closely, ask questions, and learn by "looking over his shoulder."

A "bargain" on the initial cost can result in thousands or hundreds

of thousands of dollars being wasted in the long term. The facility should ask each contractor to provide references from other facilities in which its equipment has been installed and should check with responsible personnel at those facilities to assess their experiences and satisfaction with the equipment and the contractor.

A major concern is the project manager to whom the contractor assign the project. In fact, the capabilities of the project manager can make or break the project. Ideally, the project manager should be experienced in HVAC systems and their controls as well as in electronics applications. The facility should check his background and should determine how much time he will be spending on the project, who his assistants will be, and who the backup personnel will be.

After the system has been installed, but before acceptance tests are begun, the contractor should debug the system by operating and calibrating each point in the entire system. Personnel should be located at both central and remote locations so that, when each function is performed, readings are taken at the central station, and the actual function is observed and the readings are verified at the remote station.

ACCEPTANCE

Once again, human verification of the readings must be obtained for all points in all locations. After each point in the EMS system is calibrated and it has been ascertained that all points are in operating order, the system must be operated as a complete entity for acceptance testing.

It is beneficial to have the outside or in-house maintenance staff members actively engaged in the debugging procedure. They can participate with the operators in the initial training that is provided by the contractor, and they can gain experience with the system so there will be relatively few surprises later if problems arise.

OPERATION AND MAINTENANCE

The facility's personnel must be trained so that they understand the concepts involved in the system, how to perform their functions in relation to the systems, and how their functions interrelate. They should

be provided with manuals from the contractor and some type of on-call troubleshooting arrangement with the contractor should be established so that the personnel at least can have their questions answered.

Maintainability of a system depends on the manufacturer's or supplier's ability to support the facility's in-house maintenance efforts through training programs and manuals and, equally important, if not even more so, to make available professionally trained maintenance personnel. Whenever possible, the facility should check the manufacturer's references to determine whether other users of the proposed system are satisfied with the maintenance services provided by the manufacturer.

VERIFY PAYBACK (ONE YEAR LATER)