Chapter 14

Training/Operation/ Maintenance

TRAINING

The success of an energy management system is contingent upon a careful balancing between the EMS itself, the mechanical system of the building complex, and the users of the EMS. The importance of the user must not be overlooked as the integral link between the EMS and the building complex. Even an operator whose only job with the system is to monitor system outputs needs training in order to understand and properly react to messages. The training may serve simply to remove fear of the computer from the mind of the operator.

The type and amount of training required depends on the complexity of the tasks an individual will be asked to perform, and as the operator's responsibilities with the system increase, so will the amount of required training. A user who will be performing very complex functions such as specifying or developing computations, interlocks, or conservation strategies must have a sound knowledge of the capabilities of the system as well as of how the various features interact.

The types of EMS training approaches vary widely. They should teach theory and include hands-on experience. They should also be formal, done at the user's site, or done at a remote location.

For a simple EMS or for an operator who will have limited use of

an EMS, the use of system documentation with some informal on-the-job training may be satisfactory. Responding to routine system messages and performing routine building functions is probably easy, so it is reasonable to practice right on the system which is controlling and monitoring the building functions.

As the complexity of the EMS increases, or as an operator becomes responsible for more complex processes in the system, the effectiveness of on-the-job training as a single source of training soon becomes unsatisfactory. In these cases, formal off-site training has several advantages.

Formal off-site classroom training has the advantage of removing the student from the distractions inherent to on-the-job training. Also, when extensive formal training is done off-site, the student is immersed in using the system, requiring the individual to rely only on the EMS to solve building problems, again minimizing distraction. This experience results in more efficient and creative use of the system.

When available, formal courses offered by the EMS vendor at the vendor site teach the proper use and range of capabilities of the system along with how features interact. The instructor is likely to be a full-time professional who learns firsthand from the system designer how the system works. This type of training is important for most medium-to-large systems which may include a few hundred to several thousands points.

Extensive formal training is not complete without hands-on use of the EMS. Whereas classroom training is important to teach concepts and system structure, it is the hands-on experience which makes the training most effective. This hands-on experience may be on the user's own EMS or on the same type of system in a laboratory situation.

Many users initially feel that hands-on training at their site is most beneficial since students are learning precisely how their system is applied to their building complex. This experience is definitely important, but might better come after the laboratory situation.

During the training period, experimentation and errors are bound to occur and are an important aspect of the learning process. However, errors and experimentation made on a system which is actually monitoring and controlling a building could be life threatening (if fire management is involved) and costly (in terms of energy or property). In a lab situation, it is safe to experiment with new ideas and gain expertise. Then the knowledge can be applied to a real system. Also, in a lab situation, it is easy to simulate building functions and problems such as

temperature change or equipment failures in order to prepare the student to better react in a real situation.

Even if extensive formal off-site training is done, training is not complete. Time is necessary to allow the operators to become familiar with details of how their EMS works and to implement newly gained ideas. Also, time is required to become "fluent" with the system, and it is natural to expect the operator to rely on the system documentation, perhaps indefinitely. However, answers to all application questions often are not in the documentation. Therefore, armed with extensive training that has given the user a clear and accurate understanding of how the system features work and interact, the operator can put the features to use so that they best apply to the building in which the EMS is operating.

The timing of training is also important. An EMS user should not plan on a formal training period (only) after the system is installed. A certain amount of knowledge can be gained during the installation phase. Advance copies of equipment data sheets and other vendor information will be beneficial during this phase of the project. Ideally, it is best to have some training both before and after installation is complete.

If the user is a first-time EMS owner, additional follow-up training periods will be required at six and twelve month periods after installation to be certain the EMS is operating as originally intended and to answer questions that are bound to come up.

The success of any EMS comes only through its use. It will be used only if the building personnel understand its capabilities and see them as valuable to their jobs. This can happen only if they are trained to apply the EMS. Energy management systems applied to medium and large buildings are of an implementation and functional complexity that training from either experienced users or a formal instructional organization is required for a successful application of the system. Smaller or less sophisticated systems may be adequately applied through documentation and on-the-job training.

OPERATION

Lack of sufficient training is the major problem facing EMS owners. Because of this number one problem, the next most often mentioned problem is the inability to properly program or reprogram the system.

Following are some common problem-related statements made with regard to the EMSs:

"We're unable to shed loads during peaks due to customer discomfort."

"We need an outside person to reprogram."

"The system fails to respond in a timely manner, resulting in the need to override it."

"Most of the people responsible for operating the system know very little about HVAC operation and, since that's what it controls, we're limited in what we can accomplish."

To avoid being a presenter of such statements, EMS owners must realize that someone is going to have to operate the system so select, in advance, the person(s) who will be responsible for its use. Also, realize that it will take time (as much as six to twelve months) for operating personnel to become "experts" at the operator terminal keyboard. EMS operators must know the building mechanical and electrical systems and therefore an office secretary, although an excellent typist, will not necessarily be qualified to operate the EMS in the most efficient manner. Monthly utility bill with energy consumption data should be routed to the EMS operator as soon as possible so that data stored in the EMS can be checked and verified.

MAINTENANCE

Maintenance falls into two categories; physical maintenance on the EMS itself, and software maintenance programs that modern EMSs are capable of storing and implementing. This section will be directed at maintenance on the systems.

There are generally two classifications of maintenance.

1. Vendor supplied on a one-year basis.

2. Time and material.

Early systems, prior to the early 1980's were designed around a mini computer. It was the fear of many owners that "if the computer went down, it would cost tens of thousands of dollars to repair or replace it." This, coupled with the magnitude of electronics in the field panels forced many customers into annual vendor supplied service/maintenance agreements. It was not unusual for such an agreement to average 15-25% of the installed system cost. Furthermore, it amounted to the purchase of an "insurance policy."

Present day EMS-DDC systems no longer require the large central computer and, coupled with the more reliable microprocessor circuitry, expensive maintenance contracts should be a thing of the past. Actual practice has shown that if the vendor is contracted to check the entire EMS twice a year and replace defective parts, the cost will quite possible be 3-5% of the installed system cost.