

## **Determining the ‘right’ program for your chiller maintenance needs — in-house, outsourced or a combination.**

When engineering and maintenance managers are asked to take steps to improve a facility’s energy efficiency, most are quick to turn to a range of projects that involve expensive construction and renovation.

New high-efficiency lighting systems, thermal storage systems, high-tech window glass are all projects that frequently are implemented to reduce facility energy use. But while they may be cost effective, they also are expensive and disruptive to both the building occupants and the facility operations.

Conserving energy does not have to be either expensive or disruptive. In many cases. In fact, it can involve nothing more than properly maintaining a facility’s existing plant equipment, such as chillers.

A well-designed and implemented chiller maintenance program has numerous potential benefits. It is not expensive to implement, provides a rapid rate of return, extends the life of the chiller plant and improves the reliability of the chiller system.

### **Cost considerations**

#### **How cost-effective can a chiller maintenance program be?**

A centrifugal chiller that has been in operation for 10 years without a comprehensive maintenance program probably has a full-load operating efficiency in the range of 1.0 kW per ton. If that chiller’s maintenance program had included inspection and cleaning of the tubes every other year, ongoing refrigerant leak monitoring, and a water treatment program, that same chiller would have a full-load operating efficiency close to what it was when the chiller was new - about 0.70 kW per ton.

This difference translates to annual energy savings of 20-25 percent. The cost of the maintenance program would be recovered in weeks, not years, as is the case with most energy conservation projects.

The specific activities that are required to maintain a chiller in peak operating condition depend on a number of factors, including the type and age of the chiller and how the chiller is operated.

All maintenance programs, however, have three common elements — operational logs, scheduled inspections and scheduled maintenance activities.

### **Operational logs**

**The chiller log is one of the most effective tools at a manager’s disposal for ensuring the long-term health and efficiency of an organization’s chillers. By recording data on a regular basis, engineering and maintenance personnel can establish a baseline for the operation of the chiller.**

Regular reviews of the data will show trends in chiller operation, such as slow declines in operating efficiency, slow refrigerant leaks or air entering the chiller system. Chiller logs can also be used as diagnostic tools during chiller operation troubleshooting.

### **Scheduled inspections**

**Regular inspections of chiller components — whether on a daily, weekly, monthly or seasonal basis — allow maintenance managers to identify any relatively minor problems in the chiller’s operation before these problems develop into more extensive and costly items.**

Some procedures, such as inspecting the unit for water or oil leaks, can be performed without having to shut down the chiller. Other inspections, such as checking the chiller's tubes for scale, will require a planned outage of the chiller.

In both of these cases, the two keys to an effective chiller inspection program are performing the inspections on a regular basis and keeping accurate records.

### **Scheduled maintenance**

**Depending on the size and type of chiller, as well as the type of maintenance activity, inspection activities can be performed on a daily, weekly, monthly, annual, or semi-annual basis. Working with the chiller manufacturer, a manager should develop a list of maintenance activities and their recommended frequencies for each chiller. Some activities will be routine, while others will require specialized skills. What is most important, however, is that the programs outline those maintenance activities and that technicians perform the activities when they are scheduled.**

When establishing a maintenance program for chillers, maintenance managers have three options:

- implement the program fully in-house
- outsource the entire program
- use a combination of in-house and outsourced functions.

Each of these options offers several advantages and disadvantages that a manager must consider carefully before committing time, energy and other resources to a maintenance program.

#### **Option 1: In-house**

**One of the most important benefits of a program that uses in-house personnel is the institutional knowledge of those systems. Maintenance personnel have been working with those chiller systems for years, and they most likely know what many of the existing maintenance problems are.**

By developing a program based on in-house personnel, maintenance managers can readily make use of their institutional knowledge in both program development and operation.

Another benefit of using in-house personnel is long-term quality. Maintenance managers and in-house personnel are better able to focus their attention and efforts on both short- and long-term requirements, up to the expected life of the equipment. Outsourced programs tend to have a much shorter focus — the length of the maintenance contract.

In-house programs do have several disadvantages. The most serious of these is commitment. If the maintenance organization has the staffing and resources available to dedicate to a chiller maintenance program, why was chiller maintenance neglected in the past?

And if those resources are in fact dedicated to the task of a chiller maintenance program, how likely is it that they will be reassigned should an “emergency” arise? If this situation occurs, chiller maintenance once again would be deferred.

Another disadvantage of running chiller maintenance programs in-house is the cost of establishing the program. Managers will have to arrange for the training of maintenance personnel on the specifics of maintaining the different chillers installed in the facility, and they will have to purchase specialized test equipment for many of the inspection and maintenance activities that must be performed during the program.

## **Option 2: Outsource**

**Outsourcing a chiller maintenance program offers maintenance and engineering managers the advantage of efficiency. The level of expertise required to perform several the maintenance tasks carries a high price tag.**

With in-house programs, that cost must be carried as overhead for the entire year. With outsource programs, the organization pays for the expertise only when they need it.

Another advantage of outsourced programs is ease of management. Under an outsourcing arrangement, the difficulties of scheduling and coordinating maintenance tasks and personnel is the responsibility of contractor. In-house emergencies with other equipment do not impact the availability of personnel for completing chiller maintenance tasks as scheduled.

Outsourced programs do have several drawbacks. One of the most serious of these is the loss of institutional knowledge of the chiller systems. As the contractor takes over many of the maintenance tasks, in-house personnel no longer are involved. The resulting lack of involvement decreases the feedback available to maintenance managers on the operation of those systems.

Equally important, the outsourcing of chiller maintenance activities can create resentment on the part of in-house maintenance personnel, not to mention fostering the fear of layoffs. If the resentment and fear are sufficient, some workers may choose to leave the organization, further decreasing institutional knowledge of the chiller systems.

## **Option 3: Hybrid program**

**A chiller maintenance program that makes use of both in-house personnel and outside contractors can overcome many of the disadvantages of each program, and it can take advantage of the benefits of both in-house and outsource programs.**

Hybrid programs typically retain many of the routine and preventive maintenance tasks for in-house personnel, while contracting out specialized activities that require a higher level of expertise than is available in-house.

The result is that in-house personnel are actively involved in the maintenance of the facility's chillers while outside experts assist them by performing tasks that otherwise would go uncompleted. This arrangement can help preserve the institutional knowledge while improving chiller maintenance.

Hybrid programs also make the most efficient use of the organization's available maintenance personnel. The decision to retain in-house or outsource a activity is based on the availability of in-house maintenance personnel and their skill levels.

As the maintenance program evolves and the organization adds chillers, managers modify the balance of in-house and outsourced activities to meet the new work requirements.

## **Implementation**

**If chiller maintenance has been largely ignored for several years, it will be a costly and time consuming effort to bring all of the chillers in a particular facility back up to like-new condition, particularly if there are a large number of chillers.**

All chillers can benefit from the maintenance program, but limited resources may require phased implementation. Start by classifying chillers into three different priorities — high, medium and low.

High-priority chillers are those that serve critical functions, those chillers that have a high number of operating hours per year or those chillers whose operation has become unreliable as a result of neglected maintenance. All other chillers should be classified as medium or low priority based on similar factors.

Implement the maintenance program for the highest priority chillers first, starting with a detailed inspection and testing of chiller components. Keep accurate records of the conditions found and corrective action taken. Do not try to include a greater number of chillers by bypassing certain maintenance activities.

Each chiller must be thoroughly inspected, tested and repaired before moving to the next one. Skipping maintenance activities will only result in more problems later and will defeat the chiller maintenance program's overall goals.

*This article appeared previously in the December 1999 issue of Maintenance Solutions. James Piper is a consultant and writer with 25 years of experience in the facilities field.*