HVAC/R Repair and Maintenance In The Current Economy. How To Minimize Costs

By Ron Prager

It does not matter if you use the "R Word," or not, the effects of the current state of the economy are being felt in almost every household. Rising costs for food and fuel are pushing the cost of almost every product higher as pay rates remain stagnant and unemployment rates increase. People are worried about holding onto their homes and they are cutting expenses by cutting things they consider non-essential such as entertainment. Unfortunately, this includes dining out. It is no secret that restaurants are among the businesses hit first and hardest when times get rough. For the facility manager, cost cutting is no longer a road to increased profitability, it is necessary to insure survival. However, simply cutting down on expenditures in the facilities maintenance business can actually lead to increased costs and lost business or product over the long term. In this article, I will attempt to identify cost saving measures that deliver the greatest value and the greatest overall savings with a minimum of negative impact over a one year period. We are looking for ways to reduce the total cost of ownership for HVAC/R systems. I believe that the restaurateurs who cut costs most efficiently, will be those that are best managed and consequently those who survive the present economic downturn.

The question we seek to answer is, what measures will actually reduce the costs of maintaining and operating the HVAC/R Systems in your restaurants?

Run Time:

The best advice I can give you that will have both immediate and maximum impact on your bottom line is **"Turn it off!"** Every piece of mechanical and electrical equipment that exists in a restaurant has a cost of operation that includes utility cost and maintenance cost. Some equipment has the added effect of increasing the operating costs of other mechanical equipment. An example of this would be the self contained refrigerator under the bar that increases your air conditioning load by rejecting 1.25 times the cooling capacity of the refrigerator to the air in the bar area.

Every time you reduce the run time of a mechanical system you save three ways. Less run time means reduced cost of energy, reduced cost of preventive maintenance, and reduced repair costs. While it may seem to be an extremely simple concept, you really

need to look at your entire operation to see what equipment and lighting **must** operate during which hours. Energy management systems are nothing more than extremely sophisticated switches that turn loads off when they are not required to be operating. The most sophisticated systems will rotate the loads that must remain operating so that a small percentage of these loads is turned off at any one time. This serves to limit the demand charges levied by utilities.

Keep in mind that everything from lamps to compressors have increased maintenance costs associated with increased run time. Now, I am not recommending that you set your thermostats for 78°F in summer, or that you shut down your walk in freezer, but I am suggesting that you think about the ways that you can reduce limiting the operating hours on each piece of equipment you own. This can be the result of anything from replacing a leaky gasket on the door of the walk-in cooler to making certain that your freezers are not going into defrost mode more often than is necessary, to making certain toilet exhaust fans are shut down until the restaurant is open to the public. Let's look at some areas where cost savings are possible.

Preventive Maintenance:

A well designed preventive maintenance program saves money. A program that is too robust wastes money as does a program that does not fully address the needs of the equipment and the owner. Assuming that you presently have an HVAC/R preventive maintenance program in place, there may be some cost reductions possible by making changes to the program that allow you to purchase the minimum service required.

If you don't presently have a preventive maintenance program in place, you will probably reduce your overall costs by instituting a minimum maintenance program rather than responding only to breakdowns. It is well documented that poorly maintained equipment consumes more power, suffers more catastrophic failures, and operates for a longer time period to produce the same effect as well maintained equipment.

With respect to HVAC in a typical restaurant that is open to the public twelve hours daily, the minimum frequency for air filter replacement is quarterly. Drive belts must be replaced annually or you are looking at the high cost of replacing them on an emergency basis when they fail. In addition, equipment should undergo a complete operational check and bearings should be lubricated at the beginning of each heating and cooling season. A minimum program must include all of the above. Basically this requires four visits annually. Two visits where filters will be replaced and two visits that include a complete operational check as well as a filter change.

We have seen managers cutting back to 2 or 3 visits annually. This is a mistake, and will lead to increased cost of ownership. The result of reducing the frequency of air filter replacements is:

1. Increased number of condensate leaks
2. Increased number of compressor failures
3. Increased number of heat exchanger failures
4. Increased utility costs

5. Reduced equipment reliability

With the exception of replacing air filters and heating operation, your refrigeration systems require the same preventive maintenance as your air conditioning systems. The work scope listed above is the absolute minimum that your equipment requires. It is far more effective to pre-purchase this work as part of a PM program than it is to purchase this work on a time and material basis as equipment breaks down.

So where are savings possible?

Air Filters:
One discretionary item is the efficiency of the air filters you are installing in your equipment. If you are presently using 30% efficient pleated filters, and your costs must be reduced, you should consider switching to flat air filters. The actual cost of pleated air filter is approximately double the cost of flat filters. Theoretically, higher efficiency filters reduce the cost of cleaning building interiors and reduce the required frequency of indoor coil cleanings. However, in my experience, and in practical applications, the increased cost of pleated filters may not be justified. When forced to cut costs, this is a good place to cut as it will not necessarily lead to increased cost elsewhere. We have seen preventive maintenance costs reduced by as much as 20% by using flat filters in lieu of pleated filters.

Coil Cleaning:
The next possible area of savings is coil cleaning. Some facility managers include annual condenser coil cleaning in their preventive maintenance agreements. Some of you even include annual cleaning of indoor coils as part of preventive maintenance. Condenser coils need to be washed when they get dirty. It's as simple as that. The factors that influence the required frequency of condenser coil cleaning are:

1. The construction of the coils, including the type of fins, the number of fins per inch, and whether the coil is stacked
2. The number of hours of compressor operation each year
3. The geographic location of the store
4. The site conditions such as pollen, proximity of major roads and fields, elevations of equipment, and the direction of prevailing winds
5. Are refrigeration condensers located in the kitchen or on the roof?
6. Are the coils getting coated with grease due to their location?

While there is no doubt that a clean condenser allows for most efficient operation, and lowers equipment run time, the question becomes, when is the coil efficiency reduced to the point that it should be cleaned? A good technician can determine the efficiency of a condenser coil by taking temperature, pressure, and electrical current readings, as well as by checking the amount of sub-cooling occurring in the condenser. We see sites where air conditioning condenser coils must be cleaned every six months, and sites where condenser coils must be cleaned every six years. Rather than cleaning all coils at the same frequency, the greatest bang for the buck is obtained by cleaning condenser coils

when a technician determines that the coils require cleaning and only when a technician makes this determination. Depending on the capabilities of your in-house maintenance staff, you may also be able to lower costs by having employees perform some of the required condenser coil cleaning. No, I am not recommending that you arm the fellow who washes the floor with a 5000 PSI pressure washer and set him loose on the roof. I am suggesting that rinsing rooftop condenser coils with water (preferably hot) from a garden hose will decrease the frequency of professional cleanings required. If condenser coils on refrigerators located within the kitchen require frequent cleaning, you may want to experiment with fitting the intakes on these units with disposable or washable filter media and replacing the media weekly. The cost of the media is negligible, you already own the labor, and you may be able to decrease the frequency of professional cleaning. If you choose to go this route, you have to make certain that the media you used does not significantly decrease the air flow to the condenser, and you must make certain to replace the media as soon as it show signs that it is becoming coated.

The required frequency of indoor (evaporator and chilled water,) coils is determined by most of the factors mentioned with respect to condenser coils. We are speaking about refrigeration evaporator coils here as well In addition, the cleanliness of indoor coils can be affected by:

1. The efficiency of filtration
2. The percentage of outdoor air entering the coil.
3. How often the door to a refrigerator is opened.
4. The quantity of air passing over the coil
5. The number of hours of fan operation.
6. The type of product stored.
7. If people smoke in the area the coil serves.

As with condenser coils, evaporator coils and chilled water coils should be cleaned when their performance drops below an acceptable level. This performance level can be determined by a technician measuring, temperatures, pressures, electrical current, and coil superheat. On average, we see the need for indoor coil cleaning every 3 to 5 years. There are of course exceptions.

Drive Belts:

One item that should be addressed annually is drive belt replacement. Drive belts seldom last more than a year, and the cost of replacing a belt on a 10 ton RTU during a PM visit is less than $30. If the belt must be replaced on a service call the cost is more like $180.00. If that service call is performed on overtime, the cost is more like $280.00. It is definitely most cost effective to include belt replacements in your preventive program. Replacement of drive belts on exhaust fans is also mandatory at least once each year. I recommend that you require the use of cogged belts where possible. I also recommend that you ask your maintenance provider to leave a spare set of drive belts in one of the units on the roof as emergency replacements. If a belt fails on a fan that serves a hood

and you have a spare, a mechanic can get you operational in minutes. If no spare is available, you could be down overnight or over a weekend.

Condensate Drainage Components:
Inspection and cleaning of condensate drain pans and components should also be included as part of your PM program. Condensate leaks are a major cause of emergency and after-hours service calls. In addition, leaks can cause heavy financial and material losses as they cause damage to fixtures, ceilings, and cause you to loose customers. It is most cost effective to keep the number of condensate leaks to a minimum.

Perform Preventive Maintenance Only Where and When Required:
Make sure you're performing the minimum required service at each restaurant based upon the type of system installed. When a chain consists of hundreds of locations, it is possible that the owner is paying for service at locations, or on equipment where service is not required. When sites are slated to be closed or relocated, make certain to advise your service contractor of this situation with enough advance notice to cancel preventive maintenance visits three months prior to vacating the space. Are you certain that every piece of refrigeration equipment at every site is required? Many times a particular type of system was installed so that a certain type of food could be prepared or stored. That dish may not even exist on your menu, and perhaps the unit can be turned off completely.

Warranty Work:
There are four types of HVAC/R warrantees that restaurant facility managers deal with. The first type of warranty covers the labor and materials required to repair new equipment for the first year after installation. New sites are easy. Everything is under warranty for one year.

It gets more difficult when you replace a single piece of equipment and need to track the fact that all repairs for that unit are covered for a year. There are also extended warrantees that are furnished by manufacturers for components in new units. In air conditioners, typically compressors are covered by four year extended warrantees, control boards have two year extensions, and heat exchangers can be war anteed for an additional 4 years or 9 years.

Finally, we have the warranty provided by your HVAC/R service provider for every service call. Normally, all materials and labor furnished are guaranteed for a period of 90 days, and compressor (component only,) is guaranteed for one year. It is imperative to track warrantees by unit serial number and to track work that may be considered a call back. In tough times, the last thing you want to do is to pay for work that should have been free.

Proposed Work:
It is typical for contractors to submit proposals for the cost of repairs above a certain limit as a fixed price proposal. The facility manager should insist that these proposals are broken down as to the costs of the individual replacement parts and the cost of labor. I recommend that the proposal should be submitted and accepted on a time-and-material

basis not to exceed the proposed cost. When a contractor estimates the cost of a proposed job, he adds the cost of all materials he believes will be required to the cost of the maximum number of hours of labor he feels will be required to complete the work. The proposed price is based upon this maximum estimate of materials and labor. If the proposed work is quoted at a flat price, and the quantity of labor or materials is less than estimated, the contractor has increased his profit on the proposed job. If the proposal has been submitted and accepted as "Time and material not to exceed the proposed cost," the decrease in labor or materials yields savings to the restaurant owner. This simple provision should save between five and ten percent on proposed work.

Equipment Replacement:

It may very well be more cost effective to replace old inefficient equipment than it is to make repairs. Due to increases in utility costs, and the difference in efficiency between existing equipment and new high efficiency equipment, the cost of equipment replacement may be paid back in an extremely short period of time. Based upon return on investment, where extensive repairs are required, a payback period of three years or less is not uncommon. You may even want to consider leasing replacement units and actually obtain positive cash flow based upon the difference between operating cost savings and the monthly lease payments.

Economizers:

Operating costs and repair costs in most areas of the United States are reduced by the use of outside air economizers. These devices allow outdoor air to be used to cool a space in lieu of operating compressors during periods of reduced outdoor temperatures. It is essential that facility managers make certain that their HVAC contractors are checking economizer operation during PM visits. Contractors should also be instructed to set economizer changeover controls at aggressive set points to maximize the hours of economizer operation. It is also essential that the screens on outdoor air conditioners be kept clean for proper economizer operation. Note that restaurants gain greatly from economizer operation because periods of cooler outdoor temperatures occur at the same time as periods of maximum occupancy, which happens to be at night.

Outdoor Air and Make-up Air:

Outdoor air is required to provide code required ventilation in the occupied areas of a restaurant. Outdoor air is also required to make up the quantity of air that is being exhausted to the outdoors from your kitchen hoods. The cost of bringing this outdoor air into your restaurant consists of two components. The first is the cost of blowing the air through the equipment and the ductwork. The second is the cost of heating or cooling the air to temperature and humidity levels that are acceptable in the dining area and in the kitchen. To give you an idea of how costly it can be to condition outdoor air, think about the fact that a dedicated make-up-air unit typically requires double the cooling and heating capacity of a packaged HVAC unit moving the same volume of air.

While it is evident that there is a considerable opportunity for ventilation based savings, these savings may be extremely difficult to obtain in a restaurant, due to the large amounts of air exhausted through kitchen hoods. Basically, outdoor air for make-up of

kitchen exhaust is delivered via two methods. The first method involves the use of a dedicated make-up-air unit that tempers the air and delivers it adjacent to the exhaust hoods. The second method involves allowing outdoor air to be conditioned by the HVAC systems that serve the dining area and then directing that air into the kitchen so that it can make-up the air exhausted through the hoods. Often, both of the methods described above will be used in the same restaurant. Where dedicated make-up air units are utilized, you may be able to reduce the quantities of outdoor air being introduced through the HVAC systems that serve the dining area based on the carbon dioxide levels in the dining area. If you have multiple exhaust fans serving multiple hoods, you may be able to shut down some fans during certain hours and reduce the quantity of make-up air being introduced accordingly. You will really need to sit down with your HVAC vendor, or your Engineer and evaluate your current systems from the standpoint of a desire to reduce the cost of heating and cooling outdoor air, as the issue is complex and solutions will vary based upon the individual restaurant.

Thermostats and EMS Systems

Programmable thermostats and energy management systems are utilized to minimize the number of hours that your HVAC equipment operates. Both limit the degree to which an employee can adjust temperature set points and time-of-day settings. At a minimum, every HVAC system serving a restaurant should be served by a digital programmable thermostat. Considering the technology available today, this should really be a thermostat that can be accessed and programmed via the internet, giving the facility manager control of set points, set point limits, and the ability to observe discharge air temperature. There is no greater waste of capital than heating and cooling equipment that runs at exaggerated set points or that runs when the space it serves is unoccupied.

If you utilize a system with internet access, you can also set up parameters that will allow the systems to send you notification of malfunctions. Knowing about equipment failures earlier rather than later should help you reduce repair costs as you will have more options with respect to overtime costs and selection of contractors. Having internet based control systems also allows you to monitor the temperature within refrigerators and freezers. Once again if you set up alarm parameters that allow you or your service provider to be notified in the event temperatures rise to unacceptable levels, you may be able to prevent loss of product and reduce repair costs.

The aforementioned recommendations are meant to provide some guidance as to the issues that should be discussed with your HVAC/R vendor when attempting to reduce costs. Challenge your vendor(s) to think about lowering the costs of operation for your particular facilities. Review every facet of your operational protocols with your operations people, and challenge the way things are being done. Does the first man in the kitchen really need to energize the hood fans when he walks in, or can he delay this an hour? The cost to turn the switch on an hour later is zero. The savings could be the cost to run two 10 HP motors for 365 hours annually and the cost of heating and cooling 16,000 CFM of make up air for 365 hours annually. Don't be afraid to propose spending

some money to obtain large savings. If significant savings and a one year payback appear possible, try a pilot program. You may be amazed at the results and so may your boss.