

## Life Cycle Planning for Refrigeration Systems: Guidelines to Help Determine Future Costs

by Derek Hawes

The importance of life cycle planning for recreation facilities (ice arenas) has been emphasized in recent years. An initial study of the facility is the first step in establishing the plan. Sometimes referred to as “Aging Building Audits,” these studies are typically performed by established engineering firms and cover all aspects of the building, including structural, electrical, mechanical, major equipment, grounds, etc.

This is an important first step in identifying what will be required to maintain your facility over the years. A thorough study will disclose many immediate and future cost considerations that the facility management will have to address. Prioritizing items and establishing a plan to implement them are the next steps of the plan. Some items may have to be done immediately for safety reasons. Other items may have a high priority because they will yield significant savings in operating costs. The priorities and the plan will vary for each and every facility, as will the associated costs.

Many rinks have already had formal studies done, some of which are using the information and following an established plan. Other rinks have developed their own informal plan internally. Unfortunately, too many rinks have had no study, no priority items identified, and no practical plan to deal with inevitable costs. This puts the future of the facility in jeopardy.

Unfortunately, members of rink committees (boards, commissions, councils, etc.) or municipal councils seldom have a true “hands-on” appreciation of what it takes to make the place work. Understandably, their knowledge is usually limited to that of the general public and what they see or use regularly, such as dressing rooms, lobby, canteen, parking lot, etc. Therefore, mechanical systems and preventative maintenance are often overlooked. The following explanations will provide a better appreciation of what should be considered in a life-cycle plan for the refrigeration system.

### Compressors

Compressors require regular preventative maintenance to ensure a long life, reliability, and energy efficient operation. Providing this is done by qualified service technicians, your compressors should last a long time without major problems. Scheduling for complete overhauls can usually be determined based on manufactures’ recommendations and your operating season.

There are some compressors that have been in operation for 40 or more years. Replacement parts for these machines will become increasingly difficult to source, and therefore will demand higher prices and longer delivery. In this case, it may be more feasible to budget for a new, more efficient compressor to be installed.

### Chiller

The life expectancy of a shell-and-tube chiller is usually in the vicinity of 15 to 20 years, providing the brine is properly maintained. Older models of chillers were constructed using heavier gauge tubes and usually lasted longer, but any of these left in operation are probably nearing the end of their useful life. Also, if the chiller was ever re-tubed, you should only plan to get another five years or so before considering replacing it.

A chiller should not be left in operation until it fails. One of the most critical commonly made

mistakes is to “try to get one more year out of it” ... then another... then another. Eventually the odds catch up to you and the chiller has a catastrophic failure during the operating season. This can end up costing more than double what it would have to schedule replacement of the chiller during down time, not to mention lost revenue and inconvenience to your customers. The risk of postponing the replacement simply does not justify the potential extra costs.

## Condensers

The life expectancy of evaporative condensers is typically about 15 years, but this can vary dramatically based on the level of seasonal maintenance that is performed annually and the quality of the water used. When budgeting for the eventual replacement of your condenser, it is highly recommended to allow for a slightly larger capacity and not just replace what you have now. This will provide you with significant reductions in your operating costs for a relatively small premium. Also, you should investigate the variety of new features that are available for condensers to reduce noise or eliminate leaks, or even consider adding an extra coil for compressor jacket cooling.

## Pumps

Having your brine pump fail can shut down your operation. Repairs can usually be made within a day or two, but for older models this could cost more than a new pump. Having a stand-by pump either installed or kept on site is a prudent contingency plan. Having the pump properly maintained can prolong the life of your pump and reduce the risk of a break down.

## Brine Piping System and Floor

Most rinks that originally had steel headers have since replaced them with PVC headers. If your rink has steel headers, make sure the brine has proper levels of rust inhibitor and allow for the headers to be replaced in the near future. (\*Note: This would not apply to rinks with curved or winged headers or to rinks that use glycol instead of calcium chloride.)

The condition of the refrigerated floor depends on the quality of the original installation. If your floor has experienced excessive cracking or heaving over the past few years, there is a good chance it will have to be replaced. This is a very expensive procedure, so if you expect to be faced with this in the future you should start budgeting for it now.

## Electrical

Many arenas built in the '60s (or earlier) have had few, if any, upgrades to the electrical components. Quite often, replacement parts for these are no longer available. Modifications or wiring changes over the years can leave the electrical system in a state where it is difficult to incorporate any energy saving initiatives. A control panel, dedicated to the electrical distribution for the refrigeration components is recommended for any system and should be built into a life cycle plan. In some rinks, this should be considered a priority item as a safety issue.

Motors for refrigeration system components should also be covered in your life cycle plan. Check to see if all motors are “high efficiency.” If not, then changing them out will save you money in your operating budget.

## Miscellaneous

There are a number of valves and controls associated with any refrigeration system. These can include relief valves, compressor safeties, thermometers, etc. Over the years, these will require service or replacement and should be allowed for in your plan.

There are a variety of options available for refrigeration systems today that may not have been included with your refrigeration system. These could include glycol cooling for your compressor

jackets, a heat recovery system to provide hot water, an ice surface temperature controller, or other modifications. Establishing a plan, complete with a schedule and a budget, is the best approach to having these upgrades incorporated in your system. Usually these have an associated savings in annual operating costs which can also be factored in the plan.

Each facility's system is different, whether individual equipment components, level of preventative maintenance, length of operating season, existing condition of the system, etc. The two things they have in common are that they all require regular maintenance to extend their life expectancy, and they can all benefit from modern technology and design practices.

Your operators can usually help identify potential problems with your refrigeration system since they are the most familiar with it. Sometimes, however, it is easy for them to get too complacent with the operation since gradual changes or inefficiencies can easily go unnoticed on a day-to-day basis. Therefore, it is still recommended that regular inspections be performed by a qualified service technician. As long as the operators keep informed on what is possible for the system, are open to change, and remain objective, they can often provide a good perspective of what will be required in the future. Their input in your life cycle plan can be valuable.

Having a formal study of your facility done by an engineering firm is recommended as the first step of your life cycle plan. However, if your arena decides to handle this on its own, remember to consider the mechanical systems as well. Do your homework, talk to your operators, and make realistic allowances in future budgets for maintenance and upgrades.

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