MODERNIZING EXISTING CHILLER PLANTS

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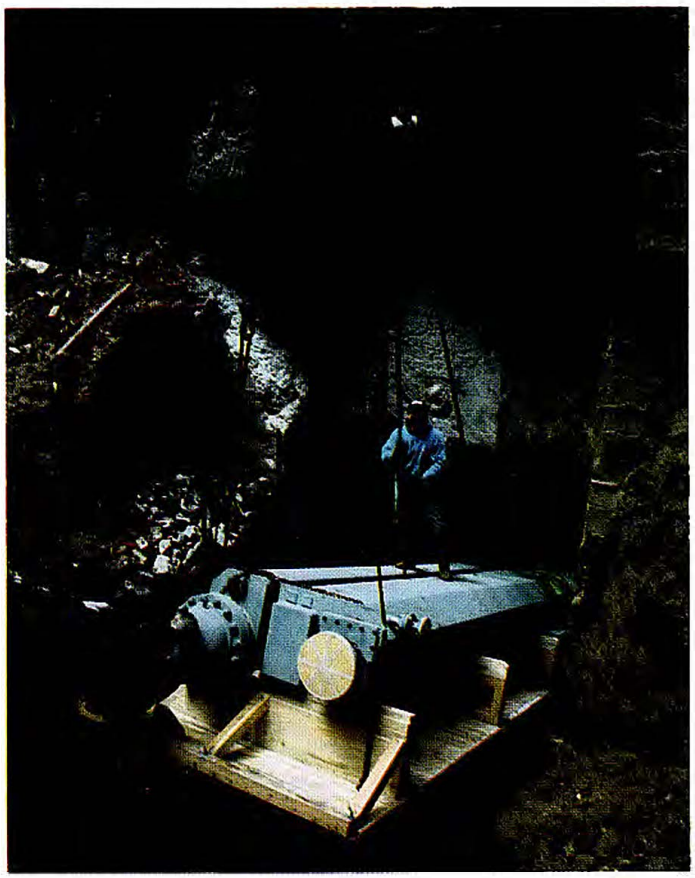
There are many good reasons to replace aging chiller plants in the nineteen-nineties. Unfortunately, very few installations were straight-forward in execution because the designers of the original structures rarely considered the necessity of replacing these machines in the future. For this reason, building owners and managers have to be alert to opportunities that make the installation process easier and less costly. An example of this quick-thinking is the manager who had new basement chillers installed through the floor of a retail tenant whose lease had just expired. Another owner slid new chillers in through the basement foundation wall next to a recently demolished building site.

The primary reasons to change out old refrigeration machines are as follows:

1. Most old plants employ refrigerants such as R-11 and R-12 which have a mandated timetable for replacement since they adversely affect the atmosphere. In addition to potential costs to upgrade old machines, refrigerant prices are escalating rapidly as the supply diminishes and speculation takes place.
2. Thirty and forty year old chillers are less efficient and require more maintenance than current units. Although this improved performance may not be a sufficient enough reason to change out a plant by itself, it certainly helps the annual operating cost bottom line.
3. Con Edison currently offers large rebates for replacing chillers with steam or gas units. When converting from electric to steam the rebate is up to 500 dollars per ton, which usually covers the entire cost of the equipment. Converting from steam to steam the rebate can be 250 dollars per ton, which generally supports about one-half the equipment cost. No one is sure how long these generous rebates will last.
4. Contracting costs are at record lows in



This owner took advantage of a recently demolished structure by rigging before a new building was erected. Shown is a top portion of a new two-stage steam absorption chiller sliding through an opening into the basement chiller room.

the current recession. Low bids are 20% to 30% below budgets. It is an excellent time to build.

Most of the replacement chillers projects designed in recent years have utilized two-stage high-pressure steam absorption machines. These units represent a mature technology, well-honed compared to the models of early years. Moreover, the equipment is extremely efficient, performs well at part load and is reliable. The working fluid in these chillers is water and lithium bromide, thus eliminating future concerns about chlorofluorocarbon refrigerants and their adverse effect on the atmosphere.

An alert building manager replaced this midtown structure's aging chillers as soon as a first floor retail bank lease expired. In this picture the two-stage chiller is about to be lowered into the basement using hydraulic jacks.

Optimally, a chiller installation is planned as much as 16 months before the season that cooling is required. This is because an engineering feasibility study should be performed and there is a substantial lead time required to obtain delivery - normally 22 to 32 weeks for two-stage absorption chillers. A feasibility study involves an analysis of the various chiller options available and should resolve most of the installation problems. Con Edison pays one-half of the cost of this study. Studies can be performed using many techniques. A preferred method utilizes a computer simulation which serves the dual purpose of establishing an accurate cooling load on the building, as well as creating a base energy use. This base energy use is tuned to the actual building's electrical and steam usage, thereby allowing the engineer to accurately compare various chiller configurations. Improvements such as variable speed pumps, high-efficiency motors and winter heat exchangers can also be simulated.

Once a feasibility study is completed and approved by Con Edison, the first task of the engineers is to prepare a pre-purchase specification which is separately bid to the chiller manufacturers. This process has two major advantages over the traditional contractor purchase and build methodology. First, the owner has the opportunity to evaluate the best equipment for the building rather than accept a machine selected by someone else based only on lowest price. Given the choice, most owners have not necessarily selected the lowest bidder. The second advantage is that there are significant cost savings since there are no markups on the chillers by the contractor. However, the owner and engineer must now insure that the equipment fits and can be properly rigged, responsibilities normally the province of the contractor. Once the equipment is ordered it cannot easily be changed.

After the equipment is pre-purchased, the engineering documents have to be prepared. For a typical winter installation, plans and specifications must be completed and

bid in order to allow selection of a contractor by the fall. The schedule usually requires the contractor to begin demolition as soon as the cooling season is over and prepare the site for the new chiller(s). In midtown Manhattan, New York City imposes a moratorium on street closings between Thanksgiving and Christmas which generally prevents a rig from taking place until the New Year. It is sometimes possible to obtain emergency permits to rig in certain areas during this period. From the early part of January to April 15, the beginning of the cooling season, there is a limited amount of time to install a new plant. As much work as possible has to take place before the rig, usually consisting of demolition, ordering of miscellaneous equipment, and sometimes, prefabricating piping.

SELECTED CHILLER REPLACEMENT PROJECTS — *APPROXIMATE COSTS TO PREPURCHASE & INSTALL*

NAME	INSTALL YEAR	NO. CHILLRS	TONS	TOTAL TONS	EQUIP. COST $	EQUIP. COST $/TON	EQUIP. REBATE $	EQUIP. REBATE $/TON	LABOR COST $	TOTAL COST $	TOTAL COST $/TON
MIDTOWN BWAY	1992	2	550	1100	$571,560	$520	$267,300	$243	$600,550	$904,810	$823
MIDTOWN RETAIL	1992	1	1500	1500	$583,000	$389	$292,500	$195	$1,600,000	$1,890,500	$1,260
QUEENS RETAIL **	1994	2	400	800	$460,000	$575	$400,000	$500	N/A	$60,000	N/A
EAST MADISON	1993	2	500	1000	$517,170	$517	$500,000	$500	$835,000	$852,170	$852
UPTOWN EAST	1992	2	800	1600	$810,766	$507	$400,000	$250	$675,000	$1,085,766	$679
UPTOWN UNIVER	1987	3	400	1200	$582,600	$486	$291,600	$243	$450,400	$741,400	$618
UPPER BWAY	1986	2	1000	2000	$1,020,000	$510	$500,000	$250	$1,325,000	$1,845,000	$923
UPPER SECOND AVE	1988	3	1400,700,440	2540	$1,397,000	$550	$635,000	$250	$1,422,400	$2,184,400	$1,110
WEST MADISON	1989	2	800	1600	$816,000	$510	$400,000	$250	$1,200,000	$1,616,000	$1,010
MIDTOWN MADISON	1993	1	700	700	$350,000	$500	$175,000	$250	$400,000	$575,000	$821
WALL ST. AREA	1994	1	1000	1000	$520,000	$520	$250,000	$250	$700,000	$970,000	$970
MIDTOWN TRANS.	1993	4	500	2000	$950,000	$475	$476,000	$238	$1,100,000	$1,574,000	$787
SOHO	1987	2	500	1000	$444,930	$445	$400,000	$400	N/A	N/A	N/A

** FUTURE

It is important that the construction team have experience in this type of work. Two special concerns for chiller replacement projects that highlight the need for this experience are: (1) Do the contractors have rigging expertise and (2) The organization ability and manpower to meet the tight schedule. Needless to say, regarding the first issue, a rigging collapse from the upper floor of a high rise building has serious consequences for a property. Some owners have considered this to be of such importance that they have hired the rigging installer separately. The rigger must be very familiar with this type of lift to minimize controversy over damages to the building or equipment. It is also a good idea to hire a professional photographer to document the rig. The second concern to be addressed is whether the contractor has the ability to complete the work before the cooling season. Again, a contractor with stability and background in these types of installations will help insure a timely installation. Problems with either the rigging or time schedule could not only have legal consequences, but could also adversely affect lease renewal, which in this economy could be an even greater concern.

Finally, if the team has done the preparatory work properly, the installation will have a better chance for success. The construction partners have to make sure all the shop drawings are approved, all agency and utility requirements have been met and all inspections satisfactorily completed. The one overriding goal is to have the new chiller plant up and running as soon as possible.

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