TRANE®

1155 Avenue of the Americas

Manhattan, New York

Durst takes unusual approach to reduce electric demand and avoid cooling tower expansion

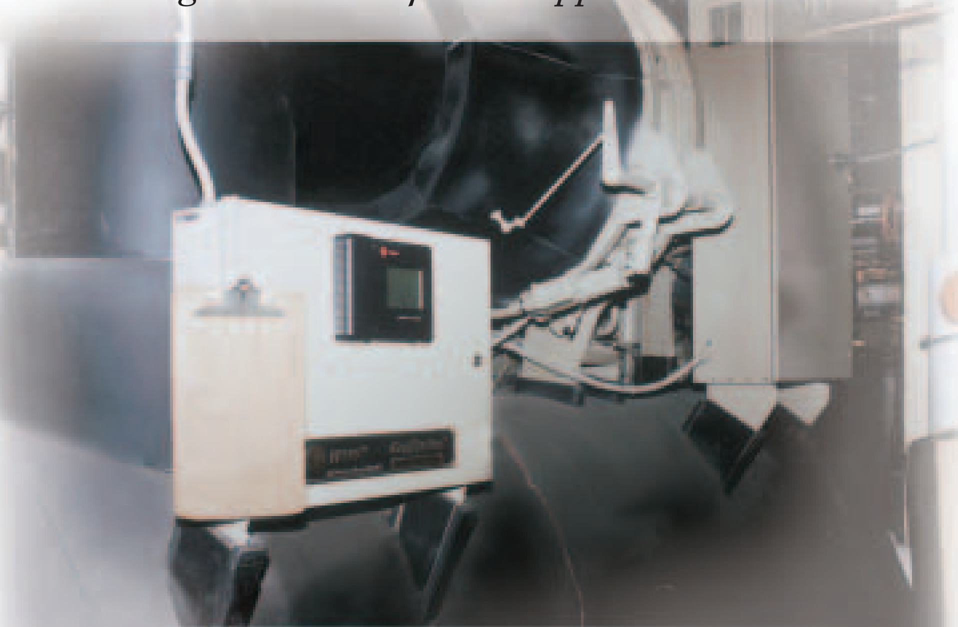
Building owners in Manhattan face many of the same challenges as building owners everywhere – it's just that in Manhattan, the challenges are usually on a larger and more complex scale. A respected owner of a midtown property recently chose to question the conventional wisdom for New York HVAC plant design and upgraded a major building cooling plant. The project involved installation of new chillers, along with an ice storage tank plant, thereby reducing electrical demand and reliability.

Prime Location

The1155 Avenue of the Americas Building comprises 42 stories. The sleek, black structure is at the corner of 45th Street, just one block from Times Square in a prime midtown business location. The building opened in 1984 and is owned by The Durst Organization, a prominent owner and operator of Manhattan real estate. Major tenants include two large law firms and a business office of The Wall Street Journal. The tenant list also includes several retailers and many other offices.

The original comfort system serving the building consisted of two 700-ton Trane centrifugal chillers, Model CVHE, that were installed in a high second basement level chiller plant. These received condenser-cooling water from two rooftop cooling towers. Chiller water from the plant is delivered to air handlers, one each on alternate floors for the full height of the building. Conditioned air is distributed through a VAV system. The building airside system was converted to direct digital control (DDC) in 1994.

"But we asked the engineer to look at the numbers. It turns out that ice storage was a logical decision for this application."



Because of tight clearances, the chillers were moved into the building in sections and assembled in place.

Building Cooling Loads Increase

In the late 1990s, several situations caused Durst to begin looking at a replacement for the chiller plant. First, with the widespread addition of heat-producing office computer equipment, building cooling requirements had increased and the existing chiller plant was fully loaded. Soon the building would not have enough capacity, particularly during summer workday afternoons.

Secondly, the Durst staff had followed the development of newer, more energy efficient chiller equipment, and saw an opportunity to reduce both total energy usage and peak facility electrical demand. This could be achieved either through thermal storage, or through the use of alternates to the use of electricity as a primary energy source.

Finally, one of the major building tenants requested that as a part of the negotiated agreement for a long term lease extension, the building be equipped with redundant cooling capacity so that their business would be unaffected by a possible chiller outage. The Durst Organization was eager to find a way to meet this tenant's requirement.

All Replacement Options Studied

Tangel Engineering Associates of Bohemia, N.Y., was requested to do a study of the nature of the committed electric load in the building and to evaluate options for a chiller plant upgrade. Daniel Tangel, the president of the firm, describes the approach to the project, "We were asked to review all of the options, not to rule out anything without first giving it a look. We looked at steam turbine-powered chillers, steam absorption, gas fired absorption, and various electric and ice storage possibilities. In fact we looked at twelve different chiller combinations."

The result of the studies was a decision by the Durst group to go with electric centrifugal chillers and ice storage. Donald Winston, PE, Assistant Director of Technical Services for the firm remarks on the decision, "This took a lot of people by surprise. It had always been said that ice storage doesn't work out in Manhattan, because the value of the real estate makes the space needed for ice storage tanks too expensive. But we asked the engineer to look at the numbers. It turns out that ice storage was a logical decision for this application."

After the decision was made to use new electric centrifugal chillers and ice storage tanks, it was time for the engineer and the owner to work out the details of floor space and installation scheduling. The time frame selected was during the winter of 2001-2002. The old chillers could not be taken down until the end of the cooling season, and the new system had to be available April 1, 2002. As it turned out, this tight schedule was made even more demanding by warm late fall weather in 2001. In fact, the plant didn't shut down until December 1. The prime contractor selected for the project was JDP Mechanical of New York, who did all of the mechanical system work.

High Efficiency Chillers Selected

The chillers selected were two Trane two-stage CenTraVac™ centrifugal chillers, Model CVHF, nominally rated

One of the reasons these machines were selected was their known high operating efficiency.

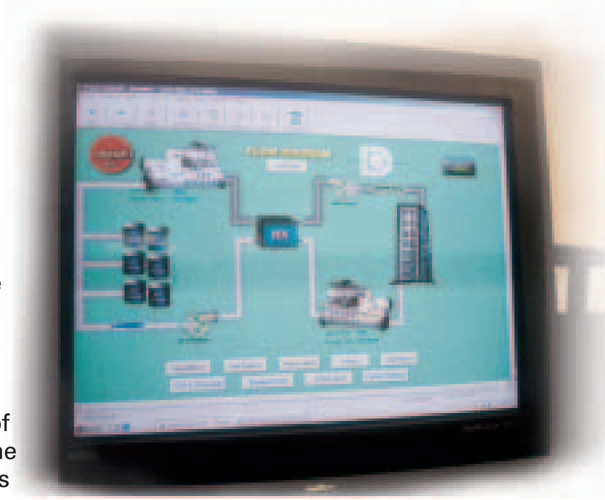
at 1,000 and 800 tons. One of the reasons these machines were selected was their known high operating efficiency. The 800-ton machine was selected for ice storage and uses a 25% glycol solution to operate at ice making temperatures. The project would also include a Calmac ice storage system and related equipment.

Because of extremely tight clearances, the chillers were shipped prepared to be installed into the sub-basement mechanical room in sections and assembled in place. According to Trane's New York representatives, who worked with the engineer and owner on the project, this requirement for rigging the units in disassembled is quite common in projects in the tight spaces of Manhattan.

The chillers were lowered into the basement area through a hatchway temporarily created in the floor of the building's loading dock. The opening was also used for the ice storage tanks, piping and structural materials involved in the project, and for removal of the old chillers. Because of the inconvenience caused by using the loading dock area, the rigging process was accelerated.

Finding Places for Ice Tanks

One of the major project design challenges was finding space for the optimum number of ice storage tanks. The solution was to install the tanks as close together as possible consistent with service needs, and to create an elevated "mezzanine level" grid above the mechanical room floor to allow the tanks to be double decked.



Chiller plant and ice storage operation are managed by Tracer Summit system.

While the spaces were being evaluated, Tangel's firm identified a storage room adjacent to the mechanical room that could also be partially dedicated to an additional eight ice tanks. Ultimately, the project involved 20 Calmac Model 1098 tanks and 8 Model 1190 tanks, for a total of 3,280 ton-hours of storage. The engineering firm recommended a series-flow design for the chilled water, with the 800-ton machine used for ice making, and the 1000-ton machine for standard chilled water operation.

Building Ice at Night

The ice for the storage tanks is normally built from 6 p.m., when most of the building tenants have left, to 1 a.m. In ice making, the 800-ton chiller uses a glycol return temperature of 27°F (-3°C). For daytime building cooling, ice is used to pre-chill water going to the standard chiller during the hours 8 a.m. to 6 p.m. or even later if available. The system is designed for 44°F (7°C) leaving chilled water and 59°F (15°C) return. If necessary, the two chillers can also be operated simultaneously, however this is normally avoided during daytime hours to minimize electric demand and energy usage.

By virtue of the storage capability of the ice tanks, the goal of system redundancy is achieved. Tangel points out that an additional benefit is that the existing cooling towers and risers,

Extra space for ice storage tanks was created by building a mezzanine supporting structure.

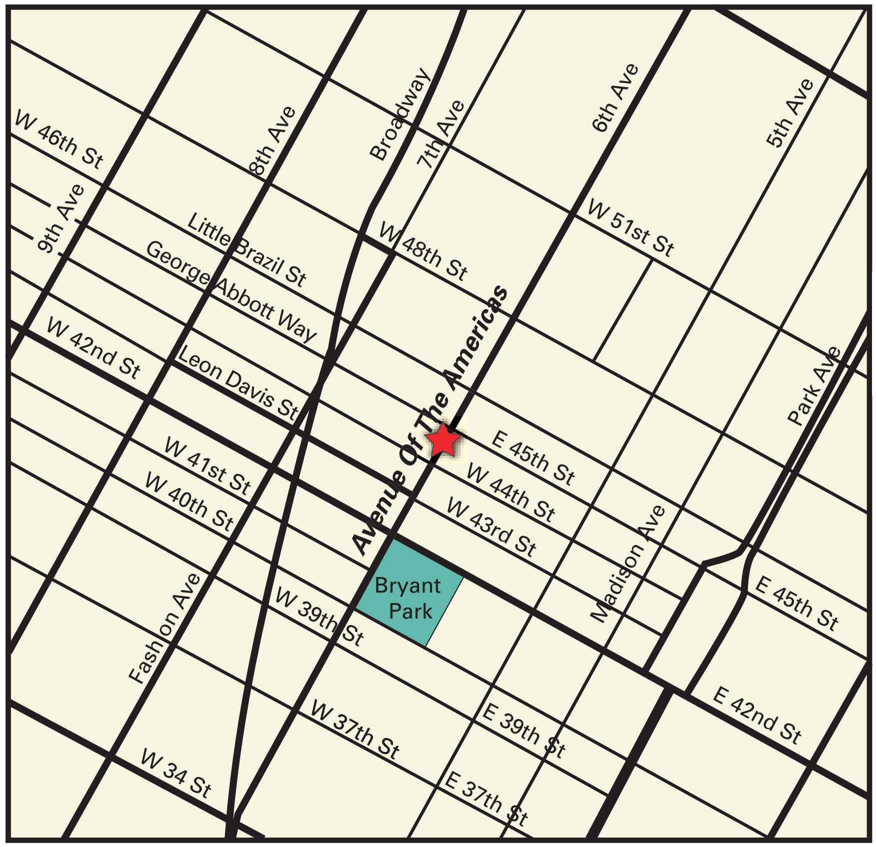
“We’ve done something that surprised a lot of people, and opened some eyes about the possibilities with ice storage in this city.”

which were in excellent condition, could continue to be used to meet the needs of the larger capacity system. He notes, “The towers had been approaching full capacity. What made ice more viable and attractive was not only that we could reduce electric demand and on-peak energy use, but because we were shifting ice making to night time we were gaining condensing water.” Winston adds, “It was very important to Durst that we be able to update the plant without making changes in the condensing water system.”

In addition to the chillers and ice storage, the chiller plant upgrade also involved installation of a Trane Tracer Summit™ building management system. Jeffrey Jerman, facilities manager with Durst, says “With this system’s extensive metering and logging capability, we can watch building operation very closely. It helps us make decisions on how to optimize chillers and ice usage.”

Control Energy and Demand Costs

The benefit that immediately accrues to The Durst Organization is the ability to control electric demand and energy charges. Winston says, “Our financial success depends on being able to manage operating costs in all of our buildings. At 1155 Avenue of the Americas, that meant upgrading the chiller plant and using ice storage to shift load off peak.”



He points out that his firm contracts for energy with the New York Independent System Operator (NYISO). The contract has both a demand charge and a three-tier energy rates that strongly favors nighttime energy use. NYISO has a program for “Energy Curtailment on Request”. In all of its buildings, last year the company controlled 2 MW. “This was done without curtailing tenant comfort,” Winston emphasizes. The Durst Organization participates in this program in all of its facilities, and the ice storage system at 1155 Avenue of the America will be an important addition.

The use of ice storage has required Durst to train the building mechanical staff in the special needs and opportunities with the system. Winston indicates that the project has also given the entire organization a chance to learn about the ice storage option firsthand and consider it for future projects as well. He notes that Durst’s use of ice storage has created a lot of interest on the part of other New York building owners. “We’ve done something that surprised a lot of people, and opened some eyes about the possibilities with ice storage in this city.”

TRANE®

Literature Order Number	CASE-SLX078-EN
Date	June 2003
Supersedes	New
Stocking Location	Inland

Trane
A business of American Standard Companies
www.trane.com

For more information contact your local district office or e-mail us at comfort@trane.com