HEAT-TIMER® CORPORATION

# CASE NO. 25

**BUILDING:** Kips Bay Towers

**NO. OF UNITS:** 1100

**LOCATION:** Manhattan, NYC

**ENGINEER:** Robert F. Germain Engineering

**CONTRACTOR:** Abilene, Inc.

## Central Steam to Onsite Boiler Plant Conversion Yields a 3 Year Payback for Kips Bay Towers

**PROBLEM:** Con Edison Steam was once considered the lifeblood of Manhattan, providing steam heat to thousands of apartments and buildings. Even today, Con Edison provides steam for heat and hot water to approximately 1,800 customers in New York City. However, an aging infrastructure and upkeep has made Con Edison Steam New York City's most costly utility. Kips Bay Towers is one of many high rise apartment buildings in New York that has had to reconsider its dependency on Con Edison centrally supplied steam.

Built in 1961, the two 20-story Kips Bay Towers were designed by famed architect I.M. Pei at the height of Con Edison's proliferation in NYC. Located practically next door to a Con Edison station, the facility's use of central district steam was a no-brainer at the time. This heating choice meant that neither building was ever properly equipped for an onsite boiler plant. Although the South Tower had been constructed with a chimney, it was never actually used. When the North Tower was built, the owner avoided the construction cost of the chimney altogether, assuming that the building would always rely on Con Edison to supply steam.

**Central Steam Blues**

For decades Con Edison supplied the towers with 180 psig high pressure steam which was used to provide hot water for both building heat and domestic water. The steam had to go through two separate reduction stations to bring it down to the 10 psig required by the mechanical equipment in the building. In each tower this lower pressure steam was piped into a shell and tube heat exchanger with a hot water coil for building heat. Downstream of this heat exchanger, three pneumatic zone valves controlled heating distribution to the three zones of each building. These valves were operated by a proprietary control system, which was complex and virtually impossible to service.

The system's complexity and lack of serviceability wasn't the only problem. It generated large amounts of high temperature condensate, which had to be disposed of. New York prohibits dumping water hotter than 149°F (65°C) into the sewer. To lower the temperature of the water and avoid wasting the heat, this condensate was piped into a separate heat exchanger and used to preheat the cold water feeding the domestic hot water tanks in each building. This removed some, but not all, of the necessary heat from the condensate. Downstream, some degree of fresh, street water had to be added to the condensate just so it could be dumped into the sewer. This, of course, meant higher water and sewer fees that, even now, continue to escalate in NYC.

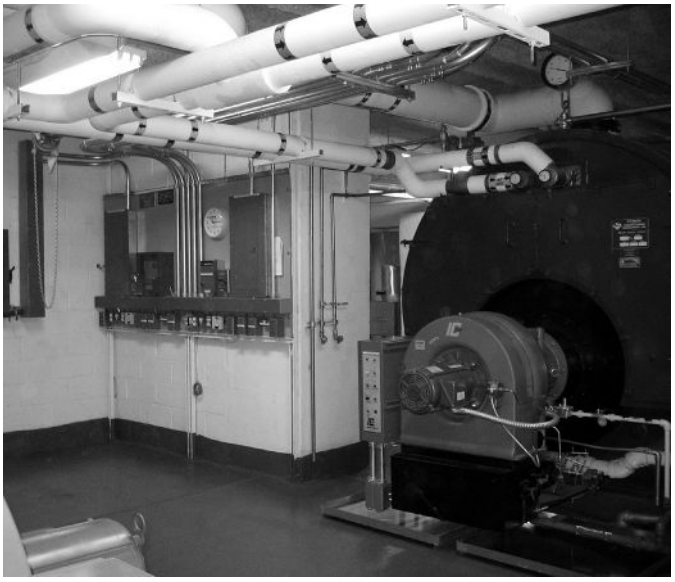
High utility costs and a complex system that lacked serviceability finally prompted the managing agent for Kips Bay Towers, Cooper Square Realty, to take action.

**SOLUTION:**

Cooper Square Realty, the property management group for Kips Bay Towers, began investigating the payback of a conversion from centrally supplied steam to an onsite boiler plant. Part of this investigation involved their eligibility for New York Energy $mart$^{SM}$ Loan Fund Program which offers reduced interest rate financing to building owners. Once this eligibility was confirmed, they sought the expertise of Ralph Germain of Robert F. Germain Engineering firm, a company with extensive experience in steam conversion projects in the NYC area.

"Typically a building will save 50% in energy cost by converting from central steam to an in-house heat source," said Ralph Germain. "The trick is finding space for the boilers and a way to locate a chimney."

Finding this space is difficult because many of the buildings built in 20th century Manhattan were built without smokestacks or individual heating plants simply because of the availability of Con Edison Steam. As a result, many owners and property managers are indefinitely burdened by the expense of Con Edison Steam.



*Heat-Timer Multi-Mod controls provide modulating control of the two new Scotch Marine type, 3-pass boilers installed at Kips Bay.*

**Making Room for a Boiler Plant**

Mr. Germain, with the assistance Heat-Timer Inc., found a solution that would at last put an end to Kips Bay Tower's painfully high utility cost and inefficiency.

First, they dismantled the two large cast iron domestic hot water tanks in each building's basement. These tanks had an internal steam coil and were used to heat the domestic hot water for the towers. Opting for a new means for domestic hot water, Kips Bay was able to free up this space for two new Scotch Marine type, 3-pass boilers. These boilers are designed to use natural gas as the primary fuel and oil as back up. Both boilers make steam although space heating in the apartments is all hydronic. This steam is piped directly into a shell & tube heat exchanger, rated for high water pressure, which is necessary in order to get water to the top floors of the building. A boiler rated for such high-pressure water would have been cost prohibitive.

For domestic hot water, a coil was located in the steam boilers below the water line. Street water is piped into the coil, and heated by the water below the water line of the steam boiler. In the summer, a low fire flame maintains enough heat in the boiler to heat the domestic hot water, but not enough to make steam when it is no longer needed for building heat.

Of course, both boilers, in each tower, had to be vented and finding a location was one part luck and one part ingenuity. The South Tower had been built with a chimney which could be used to vent the South Tower boilers. For the North tower, the project team decided to convert an existing trash compactor into a chimney. They were able to do this because they discovered that the chute, originally built as an incinerator, was actually made of brick. Although a painstaking process, the mechanical contractor, Abilene, Inc. was able to line this incinerator with 10-gauge steel and thus convert it to a suitable boiler stack for the North Towers. Abilene, Inc. also lined the South Tower as a precautionary measure to prevent any deterioration of the brick and mortar chimney that might occur as a result of condensation.

**Getting It Under Control**

The next step was tying the steam, hydronic, and domestic hot water systems for each building all together with a more modern, effective, and reliable control system. Heat-Timer Inc. provided the solution beginning with the Multi-Mod to control the modulating operation of the two 300 horsepower boilers in each tower.

The Multi-Mod modulates boiler operation to precisely meet system set point requirements based on load requirements. This is by far the most efficient means of system heat output because it anticipates the varying loads of the building and adjusts accordingly. Also, because the Multi-Mod utilizes PID-type logic, it collects and stores data based on the reaction time of the system, so it is constantly trying to match the boiler output to the current load conditions.

Because Kips Bay was originally designed as a 3-zone system, 3 motorized valves were installed between the shell and tube heat exchanger (which transfers heat from the low pressure steam) to the hot water used to distribute heat to the baseboard radiation located throughout both buildings. These motorized valves are controlled by Heat-Timer HWR hot water reset controls with ICMS (Internet Communication Management System). These controls modulate the hot water valves according to hot water reset principles. This means the HWR automatically varies it's target supply temperature based on outdoor air, increasing temperature in colder weather and decreasing it in milder weather.


*Heat- Timer ETVs (Electronic Tempering Valves) mix hot and cold water accurately to provide a safe domestic hot water temperature of 135°F at Kips Bay.*

On the domestic hot water side, Kips Bay has a new, more efficient (and more environmental) system. As described above, domestic hot water is heated via a coil located inside the steam boiler. Downstream, this hot domestic water mixes with cold water via two 2" Heat-Timer ETVs (Electronic Tempering Valves). These valves are piped in parallel to provide sufficient volume for each of the 500+ unit towers. They mix hot and cold water accurately to provide a safe domestic hot water temperature of 135°F.

Although boiler operation is still required in the summer to provide domestic hot water – steam is not. Therefore a Heat-Timer Digi-Span MCP controls the boiler burners in the summer, providing control of a lower level flame to make hot water, but not steam. This set point control functions simply as a modulating aqua-stat, but still functions using the same rate of change control intelligence as a Multi Mod.

The fact that Heat-Timer controls are non-proprietary and easy to use has made Vincent Logozzo, of Abilene, Inc. a loyal user. "That's the main reason we install so much Heat-Timer equipment. It is very contractor friendly. And Heat-Timer's technical support is impeccable." Finally, all of the controls are tied into Heat-Timer's Internet Communications Management System (ICMS). This web-based system lets authorized building or management personnel monitor and adjust the entire boiler system remotely from the internet. No special software or hardware is required. All Heat-Timer Platinum controls have the option of this communication capability.

**Virtues of ICMS**

The ICMS is a property manager or owner's best friend when it comes to managing the heating, cooling and domestic water systems in multi-unit properties. First, the operator can access all the individual controls' functions without having to be in the boiler room. He or she can also monitor virtually endless operation data within the system. The ICMS can even be set up to send regular history reports via e-mail or text messaging. It can also send alarms to cell phones or pagers should the system drift outside of any of its prescribed parameters. Like many other facilities, Kips Bay took full advantage of the ICMS by integrating various wireless sensors located throughout the building. These sensors, which can be located virtually anywhere in the building, relay information back to the ICMS, so operators can monitor space temperatures, water levels, oil tank levels, etc. It also provides a means of verification if a tenant continues to complain about the temperature inside their apartment.

ICMS not only makes Kips Bay Tower's heating and cooling systems more manageable, it makes it more efficient. 24/7 monitoring gives operators endless opportunities to "tweak" the system. No one is disappointed with the savings this new boiler and control system provides. Prior to beginning the conversion project, Germain conducted a feasibility study which indicated that the project would save the owner $500,000 in energy a year. Their estimate was too low.

"It was an extremely successful project from everyone's perspective – from the board to the project management team," said Keith Werny, Senior Vice President of Cooper Square Reality. According to Mr. Werny, Kips Bay Towers spent $600,000.00 less during the first heating season after the conversion than what had been budgeted for in the previous year. That level of savings, along with the $mart[SM] Loan Fund program afforded Kips Bay a payback of only 3 year.

Comfort is up and complaints are down, according to Rich Aguire, Building Engineer at Kips Bay Towers.

"It's been a home run," said Mr. Aguire, noting that tenant complaints regarding building heat and hot water are all but nonexistent. He had also enjoyed the "web browsing," basically monitoring the system from home or anywhere else. "That's the fun part," said Aguire.

Converting from Con Edison steam also gives properties some bargaining power when it comes to gas and oil. These utilities actually have to compete for Kips Bay Towers' business, whereas Con Edison did not—something the property owners throughout New York City can appreciate.