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Park Avenue Skyscraper Cuts Cooling Costs, Improves Efficiency With Chlorine-Free Chiller

World Financial Properties, Inc. , owners of a 45-story office building in midtown Manhattan, improved cooling efficiency, increased operating flexibility, and reduced its cooling costs an estimated 67 percent for night and weekend cooling by adding Carrier's chlorine-free Evergreen chiller to the HVAC system at its 245 Park Avenue property.

World Financial also met its production schedule – taking delivery of the Evergreen within a tight, eight-week time frame. And the machine's bolted assembly enabled the rigging crew to hoist the chiller to the rooftop in three separate pieces – cooler, condenser and compressor – making the installation easier and less expensive.

“We were looking at the most cost-effective way to use the existing equipment – two 30-year-old steam turbine-driven chillers,” says Alfred San Filippo, vice president of World Financial Properties.

“We originally were going to tie a smaller HFC-134a electric-driven compressor to the existing chillers so one set of shells would be used for both compressors. After comparing prices, we found the installed cost of *piggybacking* another compressor to the existing chiller would be the same as adding another chiller, but would be less efficient. In the long term, we would achieve a higher efficiency with the new Evergreen chiller,” San Filippo adds.

The first centrifugal chiller designed from the ground up to use non-ozone depleting, chlorine-free refrigerant, the Evergreen uses HFC-134a to produce 38⁰ F chilled water.

With operating efficiencies approaching .50 kW/ton at American Refrigeration Institute (ARI) conditions, the Evergreen chiller offers an environmentally responsible refrigerant without compromising energy efficiency or safety. And, unlike chlorine-based refrigerants, HFC-134a is not subject to a legislated phase-out.

Matching Chillers and Air Distribution

After surveying competitive chillers, the owners chose the Evergreen for its operating efficiency, its use of environmentally responsible refrigerant, and because of Carrier's superior track record.

"We have two 1977 vintage Carrier 17M turbo refrigeration compressors," notes San Filippo, who was with the company when the original chillers were installed. "Over the years, Carrier's units have delivered lower maintenance costs. The 17M chillers run like brand new – and they are 30 years old."

To provide better temperature and ventilation control for each floor and greater customized comfort for each tenant, World Financial Properties converted its 45-story office building to a variable air volume (VAV) air distribution system equipped with variable-frequency drive (VFD). With VAV, building management provides overtime air conditioning floor by floor and cools only the floors in use on weekends, reducing operating costs. To maximize efficiency and cost-effectiveness, however, the HVAC system needed a small chiller that operates efficiently at low levels.

The two 17M chillers are rated at 2,500 tons of capacity each and are incapable of operating at less than 30 percent of capacity, or 750 tons. By contrast, 245 Park Avenue's new Evergreen chiller operates at a maximum of 750 tons and at part load down to 100 to 150 tons, filling the gap left by the larger machines.

The electric and steam utility, Con Edison, supplies steam at a fixed rate during peak and off-peak hours for the city's larger commercial customers. Electric rates, however, are lower during the off-peak hours, making operation of the steam-driven chillers cost-prohibitive on a ton hour basis.

“We have great flexibility – the best of both worlds,” says San Filippo. “We have electric-driven and steam-driven chillers. We can use all combinations of the three units: the 750-ton Evergreen alone, the Evergreen plus a 2500-ton chiller, the 2500-ton chiller alone, both 2500-ton chillers or both 2500-ton chillers and the 750-ton chiller.”

Reducing Costs Off-Peak and On

245 Park Avenue uses the steam-driven 17M chillers during the day and the Evergreen at night and on weekends to lower overtime air conditioning costs. The steam-driven chillers cost upwards of \$550 an hour to operate. On the weekend, when only some tenants are working and only part of the building requires cooling, the Evergreen handles the smaller load. Overtime operation with VAV, VFD, and the new Evergreen is expected to cost about \$150 an hour, a 67 percent savings.

“Even during peak hours, the Evergreen is more cost-effective,” San Filippo notes. “We expect total savings of \$13,000 a month for intermediate operations during the spring and fall.”

The Evergreen chiller went on line in the latter part of the cooling season, so World Financial hasn't calculated exact savings, says Mike Lillis, the building's mechanical supervisor. But, he adds, in the fall building management definitely saw cost reductions as compared to running a larger, steam-powered chiller. The steam-driven chillers, meanwhile, have been converted to HFC-134a now that the Evergreen is on line.

For more information on Carrier or the Evergreen chiller, visit Carrier's website at www.carrier.com.

Carrier Corporation is the world's largest manufacturer of heating and air conditioning systems and equipment. It is a subsidiary of United Technologies Corporation, provider of a broad range of high-technology products and support services to the aerospace, building systems and automotive industries.

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