MITSUBISHI ELECTRIC TRANE HVAC US

NEW HAVEN, CONNECTICUT

HOTEL MARCEL

CHALLENGE

Revitalizing a historic building into an energy-efficient hotel meeting green building certifications

SOLUTION

CITY MULTI® VRF zoning systems, Heat$_2$O® Heat Pump Water Heater systems and integrated controls from Mitsubishi Electric

RESULT

A Passive-house certified, zero-emission hotel setting new standards for sustainability

Hotel Marcel, a 110,000-square-foot rehabilitation and adaptive reuse of New Haven, Connecticut's historic Pirelli Building, has raised the bar for sustainable hospitality as the first Passive-house certified, zero-emission hotel in the U.S.

The hospitality industry is huge and continuously growing. There are over 91,000 hotels and motels in the U.S. alone, generating more than $194 billion in annual revenue.[1] However, the booming industry comes with environmental challenges. The Sustainable Hospitality Alliance estimates the hospitality industry produced one percent, or approximately 364 million tons, of annual global carbon dioxide (CO_2) emissions in 2021.[2] Research from the Alliance suggests the industry will need to cut overall emissions by 90 percent in 30 years to meet decarbonization parameters set by the Paris Climate Agreement.[3]

Fortunately, developers are up to the challenge, including Bruce Redman Becker, FAIA, LEED AP, President of Becker and Becker Associates. Becker is the architect, developer, and owner behind Hotel Marcel's transformation.

"The Hotel Marcel building has a legendary past, but it was abandoned for over two decades," said Becker. Designed in 1970 as an office and research facility by modernist architect Marcel Breuer, the building predominantly features Brutalist design, was home to the Armstrong Rubber Company, and later known as the Pirelli Tire Building. After being sold in the 90s, the building remained vacant until now. "We put together a plan to redevelop this building into a 165-room boutique hotel. In addition to preserving the building as a historic preservation project, we also sought to have it set a new standard for sustainability in the hotel industry," said Becker.

While the practical design of the existing structure, with deep-set windows and natural shading, helped to enhance efficiency, Becker and his team had loftier efficiency goals for the building's revamp. They sought a LEED® Platinum rating and Passive

[1] Condor Ferries, 2020
[2] https://www.carbonbrief.org/global-co2-emissions-have-been-flat-for-a-decade-new-data-reveals/
[3] https://sustainablehospitalityalliance.org/resource/global-hotel-decarbonisation-report/


Heat$_2$O Outdoor Units


VRF Outdoor Units

House certification. The efficient all-electric mechanical system, along with a 1,000+ panel solar array on the parking canopies, helped the team realize their sustainability vision.

The pursuit of maximized energy efficiency led Becker's team to all-electric, all-climate solutions from Mitsubishi Electric Trane HVAC US (METUS).

THE RIGHT SYSTEM FOR THE JOB

Variable-capacity heating and cooling

A CITY MULTI® air-source Variable Refrigerant Flow (VRF) system from METUS complemented by energy recovery ventilators (ERV), was selected for the hotel's heating, cooling and ventilation requirements.

VRF systems operate by moving heat via refrigerant between an outdoor unit and indoor units. Each outdoor unit can connect to up to 50 indoor units. Linear expansion valves (LEV) and INVERTER-driven, variable-capacity compressors allow for energy-efficient operation and customized temperature control for the various zones served by indoor units.

With heat recovery and simultaneous heating and cooling capabilities, VRF systems are ideal for hospitality applications where restaurants and other amenity areas may require different temperature set points than guest rooms and staff offices. Additionally, the zoning capabilities of VRF systems allow guests to enjoy their rooms at their individual comfort preferences.

"For us, VRF technology solved a big problem by being able to simultaneously heat and cool different spaces in a building," said James Messenger, project manager at Eastern Mechanical Services, the hotel's mechanical contractor. "For example, here at Hotel Marcel, one guest room can be in heating mode while another is cooling. It gets you the zoning capability you're looking for and is super quiet, efficient and pretty much runs trouble-free for us. That's the biggest thing we liked about the CITY MULTI product."

Introducing Heat$_2$O

Hotel Marcel marks one of the first installations of Heat$_2$O®, Mitsubishi Electric's all-electric solution for commercial, high-volume domestic hot water. The hotel installed three Heat$_2$O units, totaling 120 kilowatts (409,000 BTU/H) of heating capacity.

"We were delighted to find that Mitsubishi Electric had a commercial scale system for domestic hot water," said Becker. "The system handles all the domestic hot water needs for the hotel rooms, laundry and kitchen. This technology enabled us to be one of the first all-electric hotel buildings in the U.S."

Heat$_2$O uses natural CO_2 refrigerant with a global warming potential (GWP) of one and an ozone depletion potential (ODP) of zero. The system achieves highly efficient heat exchange using Mitsubishi Electric's patented Twisted Spiral Gas Cooler where three refrigerant lines are wrapped around a twisted water pipe. Transferring thermal energy from outdoor air to potable water by cycling natural CO_2 refrigerant, the Heat$_2$O system supplies hot water up to 176° F even when outside temperatures are as low as -13° F. Mitsubishi Electric's INVERTER-driven scroll compressor in the heat pump further increases Heat$_2$O's energy efficiency, providing over four times more energy as heat than the system consumes in electricity.

All roads lead to sustainability

Hotel Marcel is the country's first Passive-house certified, zero-emission hotel and one of only a dozen LEED Platinum-certified hotels.

Ben Webster, Hotel Marcel's general manager, elaborated, "We have developed a hyper-efficient building and a lot of that comes from how the envelope of the building was built. We have a pretty good wind load outside of this building, being on the harbor here, and it is fascinating that even when it's below freezing outside we must cool the rooms. We barely have to heat them because of how well-insulated our building is." Selecting VRF technology and the $Heat_2O$ system to meet efficiency and sustainability goals has been instrumental in these achievements.

"For those more forward-thinking developers taking on projects like Hotel Marcel and looking for ways to decarbonize, we offer that 'one-stop shop' to allow them to achieve their goals," added Jason Rosenthal, vice president of marketing, METUS. "It used to be that we only offered all-electric heating and cooling, which was one part of the equation, but now with the introduction of $Heat_2O$, we really do solve the bigger problem of how to take out the gas-burning systems from an entire building."

"We were able to do away with any use of natural gas in the entire building," confirmed Joe Miranda, senior project manager of applied controls, METUS. Miranda worked closely with Eastern Mechanical Services and the project's distributor, Homans, throughout the selection and installation of the systems, adding, "The combination of teams also really helped the installation and commissioning process to go as smoothly as possible."

CUSTOMIZED CONTROL

Credit for the hotel's incredible efficiency measures also goes to the customized Diamond Controls™ solutions.

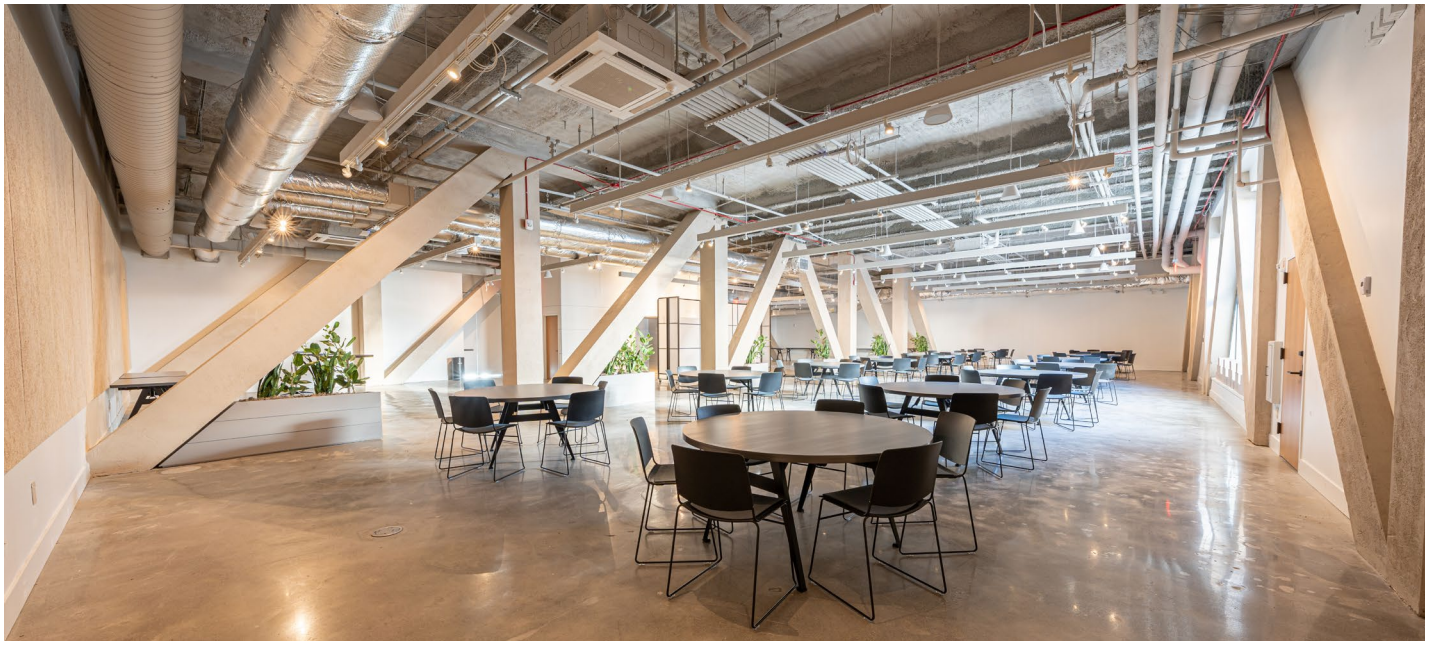
"The $Heat_2O$ water system is combined with the Mitsubishi Electric CITY MULTI VRF system and Mitsubishi Electric controls into a singular platform," said Greco. "Everything is funneled up to the cloud, so our team of integration experts can monitor the health and performance of the system remotely, anytime, anywhere. When you mix that performance and the integration capability with extremely low global warming potential, using these systems is a no-brainer."

Webster agreed. "I was blown away by the controls solution we have in place. It allows us to better utilize our system here on the property. If there's a guest who feels it's a little too warm or a little too cool, we can take care of that for them no matter what time of day it is or where we are. The controls help us deliver the best guest experience possible."

The robust controls allow the building management teams to better monitor efficiencies and respond quickly to any fluctuations in energy usage.

Demand Response

$Heat_2O$ can receive signals from grid operators and facilitate participation in utility demand-response programs. In advance of demand-response events, the system runs in capacity mode to preload tanks and provide occupants with uninterrupted access to hot water. Teirre James, controls applications project manager, METUS, explained, "When we get a demand-response signal, we're sending set points to the VRF and $Heat_2O$ systems to reduce energy usage so we can meet our net-zero requirements."



THE GUEST EXPERIENCE

Guests checking into Hotel Marcel are treated to a range of amenities. The hotel features a full-service restaurant and bar, a sunken lounge, an interior courtyard, a 24-hour fitness center, solar-powered EV parking canopies, Tesla Superchargers and over 9,000 square feet of event space.

The contemporary and luxurious guest rooms and suites feature powered window shades and a blend of midcentury and Bauhaus aesthetics including original artwork. Many offer sweeping views of the waterfront below. Guests can relax in comfort thanks to the reliable heating and air conditioning provided by the Mitsubishi Electric VRF system.

However, the system's benefits extend beyond thermal comfort. "The other great thing about the Mitsubishi Electric units is that when a guest walks into their room, it's so silent, you wouldn't even tell it's on," said Webster. "It also does not obstruct anybody's walking path. Typically, in a hotel, you might have a unit that may be a little clunky, that's sitting by a window and taking up space, but our units are mounted on the ceiling, so you wouldn't even know that they're in the room, and they still provide the comfort needed."

THE ALL-ELECTRIC DIFFERENCE

The efficiencies offered by the Mitsubishi Electric VRF system and $Heat_2O$ domestic hot water heater allow Hotel Marcel to enjoy significant energy savings while optimizing the guest comfort experience. With a projected energy use intensity (EUI) of 80 percent less than the median U.S. hotel's EUI, Hotel Marcel is paving the way for a more sustainable hospitality industry.

"It's inspiring to see these developers taking on these projects centered around sustainability because that's where we've always been," said Rosenthal. "And to be able to offer these products that fit their needs, it feels good that we're helping them cut down on their bills and future-proof their buildings as the whole country moves toward electrification."

Becker echoed the sentiment. "As architects and developers, no one wants to build a building that's going to harm the planet or be responsible for making it less livable for future generations," he said. "The good news is that's a simple consumer choice. We can buy electric products instead of fossil-fuel-based systems. And with the Mitsubishi Electric product, particularly their scalable, commercial domestic hot water system, there's now a solution that enables any building to be all-electric."

"I think that in some ways, Hotel Marcel can be a game changer, not just for the hotel industry, but for all commercial buildings," said Becker.

PROJECT TEAM

Architect and Developer:
Becker and Becker Associates

Distributor:
Homans Associates

General Contractor:
Consigli Construction Co., Inc.

Engineer:
L&N Consulting

Mechanical Contractor:
Eastern Mechanical Services

Management Company:
Charlestowne Hotels

EQUIPMENT

CITY MULTI®

- (19) PURY R2-Series Outdoor Units
- (7) PUHY Y-Series Outdoor Units
- (197) PMFY One-way Ceiling Cassette Indoor Units
- (41) PLFY Four-way Ceiling Cassette Indoor Units
- (50) PFFY Floor-mounted Indoor Units
- (26) PKFY Wall-mounted Indoor Units
- (36) PEFY Horizontal-ducted Indoor Units
- (5) PVFY Multi-position Air Handlers
- (3) Simple MA Controllers
- (2) AE-200 Centralized Controllers
- (5) EW-50 Centralized Controllers
- (1) Diamond Controls™ solutions
- (5) PAC-LV LEV Kits

Heat$_2$O®

- (3) QAHV Heat$_2$O Heat Pumps
- (4) NST 285-gallon Storage Tanks
- (2) JEV 200-gallon Swing Tanks