Bonneville
POWER ADMINISTRATION

Emerging
Technologies

CASE STUDY

THE HOSTEL: EPHOCA AIO WALL MOUNTED HEAT PUMP

THE BUILDING

Nestled at the base of the Teton Village Ski Resort in Jackson, Wyoming, The Hostel was built in 1967. With its proximity to Grand Teton National and Yellowstone National Parks, the area hosts year-round outdoor adventurers. When current owner, Cody Mueller, bought the property in 2008, it was in need of repairs and upgrades.

In 2021 a major remodeling project was launched with full room renovations. Energy-efficiency upgrades were part of the renovations, including LED lighting and HVAC.

As a representative on the Teton Village Architectural Committee, the owner wanted to find an innovative heating and cooling system that could be implemented not only by his own property but potentially by other businesses and hotels in Teton Village too.

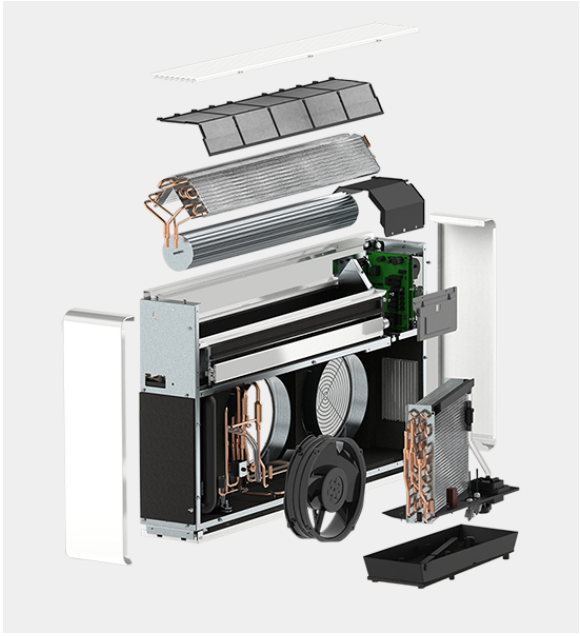
- Ephoca AIO (all-in-one) 1800W wall-mounted units were installed for heating and cooling.
- Units can be controlled remotely by Android or iPhone app.
- Each unit has two 6-inch exterior ducts, no other outdoor equipment.
- Epocha wall units are built to comply with AHRI Standard 390.
- Each wall-mounted unit costs $4,408 and with installation costs from $500-$1500 per unit.
- Energy savings of 333.8 kWh during 3-month monitoring period.
- Projected annual savings of 1,391.45 kWh, average system COP of 2.14.

BACKGROUND

RETROFIT CONSIDERATIONS

Due to the building's age and room design (with each room holding up to 4 twin-size beds), finding a heating and cooling option that fit the confined space was challenging. Before this retrofit, the building used baseboard heating and had no air conditioning. The owner investigated various all-electric options but eventually chose Ephoca AIO (all-in-one) Wall Mounted units which are surface mounted without taking up additional space, and which offered a two-in-one heating and cooling system.

Having this auxiliary heating meant it would be possible to remove the existing baseboard heaters. It also meant that hotel guests would have a single thermostat control for both heating and cooling, instead of two separate controls for two separate systems.



A diagram of the Ephoca AIO unit courtesy of Epocha

U.S. SUBSIDIARY OF INNOVA

Innova was established in Italy in 2004 with a team led by residential air conditioning innovator Oreste Bottaro. By 2014 Innova units were installed in over 30 countries. In 2019 Innova opened its U.S. subsidiary Ephoca in Cleveland, Ohio, with a design tailored to U.S. safety and energy code compliance. Ephoca has plans to eventually open a U.S. manufacturing facility as well as a U.S. service center.

Energy Code Compliance: Epocha wall units are built to comply with AHRI Standard 390. Ephoca ducted units are built to comply with AHRI Standard 210/240.

Safety Certification: The standard Ephoca wall mount is UL certified, and the the PRO unit is ETL certified. All units are certified for efficiency and sound by Intertek. Vertical stack and ceiling ducted units are in the process of receiving ETL certification. All large projects are currently being field certified until ETL lab certification is achieved.

US Ordering Process: Replacement parts and units are warehoused in Ohio and shipped out as needed. There are representatives in most states that handle warranty service requests. The lead time ranges from 1-5 months.

INSTALLATION OPTIONS

Auxiliary Heating: In environments with low winter temperatures, Ephoca offers options for either 900W or 1800W resistance heat, which is built into the units.

Fresh Air Kit: Energy Recovery Ventilators are available in cases where air quality and humidity require additional management.

Multiple Voltage Options: Both 115V and 230V options are available for installation. Either voltage option requires a minimum circuit ampacity (MCA) of 15 amps.

Typical Installation Cost: Per unit installation cost for the wall mounts ranges from $500-$1500, depending on project conditions, such as new build vs. retrofit or concrete vs. wood frame. HVAC contractors can complete most unit installations with no special training required, though electricians may be necessary if new circuits must be run.

SYSTEM DESIGN

Ephoca wall mounted unit in a guest room

UNIT INSTALLATION AND SPECIFICATIONS

Ephoca AIO Wall-Mounted AWK10N4L2 units are installed in the guest rooms, an office, and the lobby. The units measure 39.7” W x, 21.9” H x 6.5” D. The AIO system is ideal for rooms requiring a capacity of 4,000-9,000 BTU. The per unit product cost was $4,408, and the installation costs ranged from approximately $500-1500 per unit. The refrigerant is R410A. The heat pumps work efficiently down to 5°F outdoors, and the heating capacity at 5°F is around 3 kBtu, with an additional 3kBtu of electric resistance built in.

CONTROLS

The owner wanted a wall mount thermostat that included remote control capability to be able to schedule a daytime temperature setback to reduce energy when guests were out of the rooms. Since Ephoca’s third-party wall-mount thermostat is not remote capable, the owner opted for the controls that are built into the unit since these can be controlled and scheduled by an Android or iPhone app. Guests will also be able to control the unit in room, and the set schedule will only override the room setting one time per day.

CONDENSATE DRAINAGE

By strategically opening sections of the wall in each room and employing PVC drain lines, the team successfully established an efficient drainage network. The system involved connecting individual unit drain lines to a main central PVC line, culminating in a sump pump installation in the basement. This innovative solution effectively addressed the building's condensate drainage needs while ensuring simplicity and reliability.

Each Ephoca appliance has two 6-inch exterior ducts.

RESULTS

MEASUREMENT AND VERIFICATION

The performance data, gathered over a nearly 3-month period, closely aligned with the published performance data for the Ephoca, with energy savings comparable to that of a high efficiency PTHP (packaged terminal heat pump). Only one of the three units was tested due to limited testing equipment availability.

This unit was located in an unoccupied third floor room with one exterior wall and maintained a constant temperature of 72°F. The system displayed an average COP of 2.14, resulting in energy savings of 333.8 kWh during the monitoring period, and a projected annual savings of 1,391.45 kWh.

Two exterior ducts of an Ephoca heat pump unit.

"I looked around and for people in cold climates, this is the only manufacturer I found that had auxiliary heat….And so this was just a game-changer for us to not have to have backup heat, separate from the unit"

- CODY MUELLER, BUILDING OWNER

CONCLUSIONS

In addition to the need for air conditioning and energy efficiency, the building owner's selection criteria for choosing a heat pump product included ability to provide auxiliary heat during colder weather. The Ephoca AIO units were chosen for their ability to fulfill these criteria, featuring built-in auxiliary heat and eliminating the need for exterior components.

Challenges identified during the planning phase, such as ducting and exterior unit placement, were effectively mitigated. Pre-installation measures included reframing and adding outlets for ease of future maintenance.

The only unforeseen issue encountered during installation was how to thread the rubber drain line into the "Y" connection in the PVC drain line. This challenge was addressed by installing small panels in the wall below each unit to facilitate the connection, demonstrating the importance of adaptability in overcoming unexpected obstacles during project execution.

These experiences underscore the importance of thorough planning and adaptable solutions for successful project execution.

In total, 67 Ephoca AIO wall mounted units and one AIO ceiling mounted unit were installed in the Hostel. The Hostel's electrical system has been fully updated and all units are currently operational.

The hostel experienced a 25% increase in its electric bill,which was significantly less than anticipated given that t hey were adding air conditioning. Equally impressive is t hat the Ephoca units are extremely quiet compared to t he typical PTHP unit found in motels. Overall, the data suggest that the technology exceeds performance expectations and provides greater energy savings than t raditional units.