

Case Study

The Perfect Fit for this Colorado Mall

Customer	Flatiron Crossing Mall
Location	Broomfield, CO
Industry	Additional Markets
Sales Representative	Thermco
AERCO Product Installed	Benchmark 2.0*



What the Client Needed

When drawing up plans for the climate control system of the two-level, 700,000 sq. ft. Flatiron Crossing mall in Broomfield, Colorado, mechanical engineers and designers at Seattle-based Abacus Engineered Systems were presented with a situation common to shopping centers. The retail space inside the mall would be in continuous flux. This meant that any permanent HVAC system would have to be extremely adaptable to the frequent changes that occurred among the 153 small retail spaces.

“When you deal with a mall, you are dealing with a continuously changing internal landscape,” said Wes McDaniel, vice president of the Energy Solutions Division of Tour Andover Controls, parent company of Abacus Engineered Systems. “Stores are continuously opening and closing, and changing their sizes and dimensions. However, when you’re designing a climate control system, you’re trying to design for a certain space to ensure maximum comfort for all tenants and visitors. This is where our problem lies.”

To solve this problem at Flatiron Crossing, the mechanical engineering team employed a water loop heat pump system because of its flexibility, its efficiency and its zone-specific climate control. The Heat Pumps Provide Climate Control Flexibility “In addition to their ability to support both heating and cooling, it is relatively easy to place heat pumps anywhere along the loop,” said McDaniel. “Each retail space can have its own. If a store’s space doubles during a future renovation and extra heat pumps are required to provide adequate heating or cooling, they can be added without incurring major construction costs.”

This ability to easily add or move pumps along the loop provides the ultimate in long-term flexibility – any time a space is changed, the heat-pump configuration can be adjusted without the facility having to undergo a major renovation project. In fact, Flatiron Crossing has a unique agreement with its tenants. Each tenant, when moving into a new retail space, or in cases when they add to their own space, has to pay for its own heat pump[s].

AERCO’s Solution

Low water temperatures – more specifically a 55°F-95°F loop parameter – are a major requirement for water loop heat pump designs. The engineering team chose to anchor the heating side of the system with five high-efficiency 2.0 MBTU/hr. AERCO Benchmark boilers to reduce both the initial project costs and long-term operating costs of the system.

*This case study references a previously available version of the Benchmark boiler.

"The team recognized that because the AERCO boilers are designed to condense, they can accept cool return water directly from the building loop," said McDaniel. "This enabled us to simplify the mechanical room and avoid the expense of supplemental piping and mixing valves that would have been required with non-condensing equipment. And the mall gets the added benefit of increased system efficiency to reduce fuel consumption in the long term."

Condensing is a natural process that occurs when water vapor, found within the boiler's combustion gases, is forced into a liquid state. Releasing approximately 1,000 BTUs of heat for every pound of liquid created, this change of state occurs when the water vapor falls below its dew point as a result of its exposure to a cool heat exchanger surface. Consequently, bringing <135°F return water into the boiler increases energy efficiency by as much as by 11%-12%.

Importantly, the stainless steel construction of the Benchmark's heat exchanger, and its freely draining design, protects the boiler from both thermal shock as well as the corrosive impact of the acidic condensate.

Return on Investment

The mall's heat pumps operate within a loop temperature range of 55°F-95°F, and individual units will shut down if water temperature falls outside this range. "Conventional on/off boilers offer limited temperature control, and supply temperature swings of 10%-20% are common," said McDaniel. "Not only is cycling a waste of energy, it can cause individual heat pumps to shut down – requiring each to be reset manually by the maintenance crew at the mall."

Each Benchmark boiler is designed with a 20:1 combustion turndown. The five-unit boiler plant at the mall precisely matches supply and demand by varying output between 100,000 and 10 million BTU/hr. Such smooth temperature control helps ensure the reliable operation of the heat-pump network and offers exceptional part-load efficiency for even greater fuel savings.

"The design for FlatIron Crossing relies on AERCO's Boiler Management System (BMS) to coordinate operations and maximize system efficiency," said McDaniel. "The engineering team knew that Benchmark boilers run more efficiently at part load – that is, having three boilers running at 20 percent is more efficient than running one unit at 60 percent. So they designed the mall's system to operate with five units acting as one heating component. This reduces fuel consumption and helps equalize run time to ensure that some units don't endure more wear and tear than others."

An added advantage of the AERCO units is their small size. Each Benchmark unit occupies a 12 sq. ft. footprint and can be installed with zero side clearance. The mechanical room at FlatIron Crossing measures only 30 ft. by 6 ft. In addition to each set of side-by-side boilers, it contains a 3,000 gallon storage tank that supports the system's cooling tower. It is co-located inside the mechanical room to prevent the water from freezing in the winter.



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