CLIMATEMASTER®

West Chester University, Anderson Hall
West Chester, PA

Commercial Case Study

West Chester University's Anderson Hall Receives Notable HVAC Upgrade Featuring Geothermal Heating and Cooling System from ClimateMaster

As part of a campus-wide sustainability initiative, West Chester University (WCU) of Pennsylvania began examining the various ways in which it could reduce energy consumption. At the time, WCU heated most of its North Campus buildings with steam supplied by a coal and oil-fired central plant. While still reasonably functional, the system was becoming increasingly costly in terms of maintaining the plant and its distribution system. In addition, the system's environmental impact did not align with the University's latest sustainability goals.

Comprehensive studies conducted on the system indicated that WCU could reduce its heating costs by 50 percent and cooling costs by 20 percent—equating to more than one million dollars per year—by replacing it. Consequently, the University decided to phase out its steam heat and conventional chilling systems over the course of a decade, replacing them with a centrally operated geothermal system.

The plan anticipated extending the North Campus geothermal loop and converting/tying in numerous buildings over a period of 10 years, eventually reducing the heating plant load to near zero. This was projected to yield substantial energy savings, while also significantly reducing the University's carbon footprint. The plan entailed converting 26 buildings on the North Campus, with buildings on the South and East Campuses of WCU were considered as possible candidates for conversion in the future.

In 2008, the first phase of the geothermal conversion began with the 25 University building, a 55,000 sq. ft. academic and administrative facility originally

constructed in 1959. At the time, the building's original wooden slat cooling tower, located on the roof, was still in operation—along with the original forced hot water system, which was heated by the University's central steam plant. With coal and oil as the plant's source of fuel—in addition to the in-ground pipe distribution and transfer of heat through heat exchangers—the existing system's inefficiencies were quite high.

A complete building life-cycle renovation and geothermal conversion were conducted over the course of a year. The building was fully renovated with a new roof, windows, interior construction and all new utilities, including a geothermal system, which uses the earth as a heat source during the winter and a heat sink during the summer.

"The addition of geothermal wells serving ground source heat pumps at 25 University afforded West Chester University the opportunity to institute sustainable technology that cut utility costs for this large building by $19,685 per year," said David Gulick, WCU project manager, facilities design and construction. "This conversion also reduced local airshed pollutants by 703,108 pounds of CO2 yearly from less burning of coal and oil at the central steam plant."

Following the success of this first phase, the geothermal conversion on the North Campus continued with the conversion of several buildings, including that of Anderson Hall in 2011. Originally constructed in 1938, this 88,189 sq. ft. building is the University's largest classroom facility. In addition to 27 general-purpose classrooms, the building houses the academic computing center, as well as WCU's accounting, economics and finance, marketing and philosophy departments.

The work at Anderson Hall, which began in October 2011, consisted primarily of HVAC and electrical renovations and modifications to the existing building, including the removal and disposal of the existing heat pumps; installation of new horizontal, vertical and console geothermal heat pumps from ClimateMaster; and installation of a new DDC ATC control system.

"The existing heat pumps had been in Anderson Hall for the past 20 years," said Bruce Wilson, WCU energy projects manager. "Our timing on this conversion project was good because the pumps were at the end of their lifespan, and it was time to remove them."

Engaged to oversee the project, geothermal engineering firm Alderson Engineering specified a geothermal heat pump system from ClimateMaster to meet the HVAC needs of the Anderson Hall conversion project. The new system included 21 Tranquility® 20 Single-Stage (TS) and 44 Tranquility® 20 Two-Stage (TT) Series horizontal units, as well as five Tranquility® Large Vertical (TLV) Series units, six Tranquility® High Efficiency (TRC) Series console water-source units and four Tranquility® Modular Water to Water (TMW) Series

Tranquility® Large Vertical
(TLV) Series

units, all of which included the new environmentally-friendly EarthPure R-410 refrigerant technology, motorized water valves and ECM fan motors.

"Our goal was to focus on sustainability by replacing aging equipment with new geothermal heat pumps," said Neal Babcock, project manager and engineer at Alderson Engineering. "In addition to becoming more environmentally minded, there was a great potential cost savings in converting the existing mechanical systems to a geothermal water-source heat pump system with air-to-air energy recovery."

"Anderson Hall's existing heating and cooling equipment was ClimateMaster, so we were confident in the new heat pumps supplied by the same company," added Babcock.

In addition to Alderson Engineering, the construction team, including architect and structural engineer Buchart Horn, Inc., mechanical contractor Fluidics and electrical contractor BSI, collaborated throughout the project to make the conversion a success. Also, regional ClimateMaster representative Sass, Moore & Associates, Inc. worked closely with all entities to meet the project's dynamic requirements.

"This was a very tricky project for us because the day-to-day work had a significant impact on the use of Anderson Hall, which is a heavy traffic building," said Wilson. "Because the WCU campus has very little overflow space available, we had limited ability to relocate occupants during the project."

Tranquility® High Efficiency
(TRC) Console Series

"While we hoped for a quick turnaround on the project, this was not easy to accomplish due to the heavily utilized space," Wilson added. "To accommodate students, faculty and staff, the construction team worked on four rooms at a time, while classes were relocated to other parts of Anderson Hall for a week at a time until construction was completed."

The work, which mainly took place in the ceiling, was accomplished after 10 pm and before 7 am—except during holiday periods and over the summer break. The geothermal conversion was completed in-full as of August 2012, just prior to commencement of the fall semester.

"While it is too early to tell exactly how much the University will save in heating and cooling energy with the new geothermal heat pump system, I am confident it will be impressive," said Wilson. "If it is anything like our past geothermal HVAC initiatives, the savings will be substantial."

"This project was a true partnership between the equipment supplier, engineering, construction and contractor teams," said Bill Moore, president of ClimateMaster's regional distributor Sass, Moore & Associates. "It was an example of the various teams' trust and professionalism working together to achieve success."

West Chester University, Anderson Hall
West Chester, PA

Architect:
Buchart Horn, Inc.

Mechanical Engineer:
Alderson Engineering

Mechanical Contractor:
Fluidics

Electrical Contractor:
BSI Electrical Contractors

Manufacturer's Representative:
Sass, Moore & Associates

ClimateMaster Equipment:
21 Tranquility® 20 Single-Stage (TS) Series units; 44 Tranquility® 20 Two-Stage (TT) Series horizontal units; 5 Tranquility® Large Vertical (TLV) Series units; 6 Tranquility® High Efficiency (TRC) Series console water-source units; 4 Tranquility® Modular Water to Water (TMW) Series units

Project Website:
http://www.wcupa.edu/campustour/anderson.asp

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