CLIMATEMASTER®

A Tale of Two Buildings

Commercial Case Study 3

A Tale of Two Buildings

The best of times is when operating costs are cut in half and customer satisfaction is up. That's the case with Steve Garrett, building owner, who has seen the difference a well-designed geothermal heating and cooling system can make in operating costs and occupant comfort. His two buildings, located on the same property in Oklahoma City, demonstrate the stark contrast in energy costs between the variable air volume (VAV) and the geothermal closed-loop system.

In 1987, the two-story Garrett Building #1 was built utilizing a VAV air handler system that included an air-cooled condenser, gas-fired boiler, electronic controls and an economizer to heat and cool approximately 15,000 square feet (1,390 square meters) of office space. The equipment is located on the roof.

A roof top brick room houses the conventional HVAC equipment.

Ten years later, Garrett constructed a nearly identical office building of approximately 20,000 square feet (1,860 square meters), but decided to use the closed-loop geothermal heat pump system recommended by his heating and cooling contractor. Not only did the geothermal heating and cooling system offer the highest energy efficiency, but the elimination of outdoor or rooftop equipment meant that the equipment would not be exposed to the temperature extremes, dirt, and pollution of the harsh outdoor environment. For this reason, these systems require less maintenance than conventional systems and retain their high efficiency over the years. Since units are protected from weather, equipment life is extended and repairs are rare.

Geothermal loop grid located under the parking area.

The Geothermal system installation began with a vertical loop grid located under the parking area. The loop field layout consists of 40 boreholes drilled approximately 250 feet (76 meters) deep on 20 foot (6 meter) centers each with 3/4 inch (19mm) diameter polyethylene

high-density piping. Every loop zone of 10 bores has a short header manifold in the center. The loops are connected to a small central pump room that feeds the 16 ClimateMaster horizontal, ceiling-mounted units throughout the two-story building.

Both buildings are similar office facilities with cubical areas in the center surrounded by private offices and conference rooms on the perimeter. The similarity in the two buildings allows for a fair comparison in energy costs and load factors.

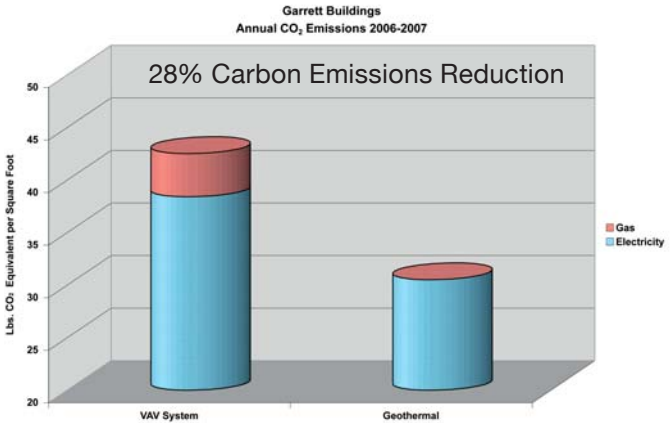
Average annual energy costs for building #2 (Geo) is $0.96/sf. ft. ($0.10/sq. meter); average annual energy costs for building #1 (VAV) is $2.12/sq. ft. ($0.23/sq. meter.).

Installation costs were notably comparable at $128,700 for the geothermal system versus the $100,000 for the VAV system in 1987. But, the VAV system cost did not take into account the expense of the rooftop brick equipment room and the lesser square footage. In addition, a $30,000 upgrade to the VAV system was completed in '2001, which further bumped up costs for the conventional installation. In comparison, the geothermal system has already returned fifty percent (50%) of the initial investment via energy savings.

"The low maintenance and operating costs of the geothermal system makes financial sense for me as an owner and occupant of the building. Plus, you add that it's environmentally friendly and saves energy... going geothermal is the right choice," said Garrett, owner.

The Bigger Picture

The benefits of geothermal technology affect not just owner/occupants but also the environment and utilities. The earth-friendly nature of the technology offers a clean and green renewable energy source. With trace CO_2 emissions, the geothermal application helps protect the ozone layer. According to the US EPA, a typical 3-ton (10.5kW) residential GHP system produces an average of about one pound (0.45kg) less CO_2 per hour of use than a conventional system. Just 100,000 homes converted to GHPs would reduce annual CO_2 emissions by 125,000 tons (114,000,000kg) per year. And, with all the equipment underground and inside, the architectural design and environmental placement of a structure is preserved naturally.



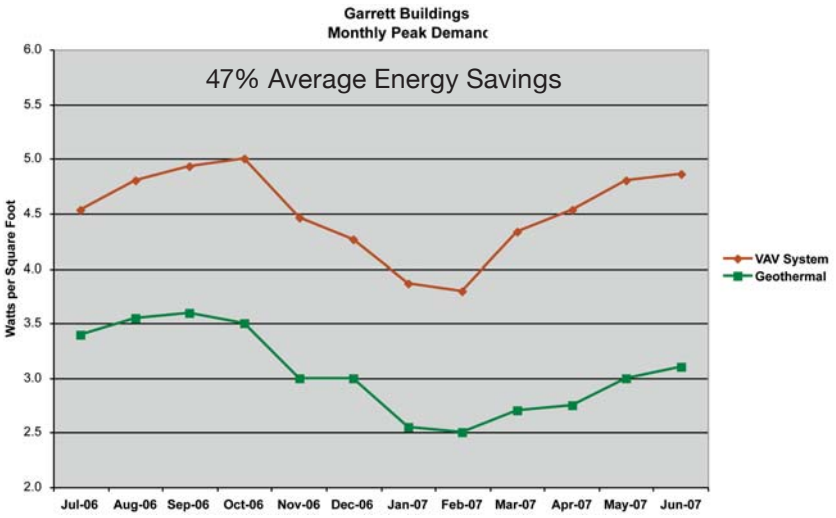
For utilities, the geothermal system offers solutions for leveling out peak demands and improving load factors. The electric utility load factor is a measure of how efficiently the power generation system is being utilized. A low load factor demonstrates more erratic usage. A high load factor customer is less costly to serve because the generation capacity required is more level throughout the year (less "peaks" and "valleys"). The geothermal system facilitates a much higher load factor than the conventional system creating a win-win for both the utility and the customer.

"After comparing the utility information of the two buildings, there's just no contest on the benefits of the geothermal system," said Garrett, building owner.

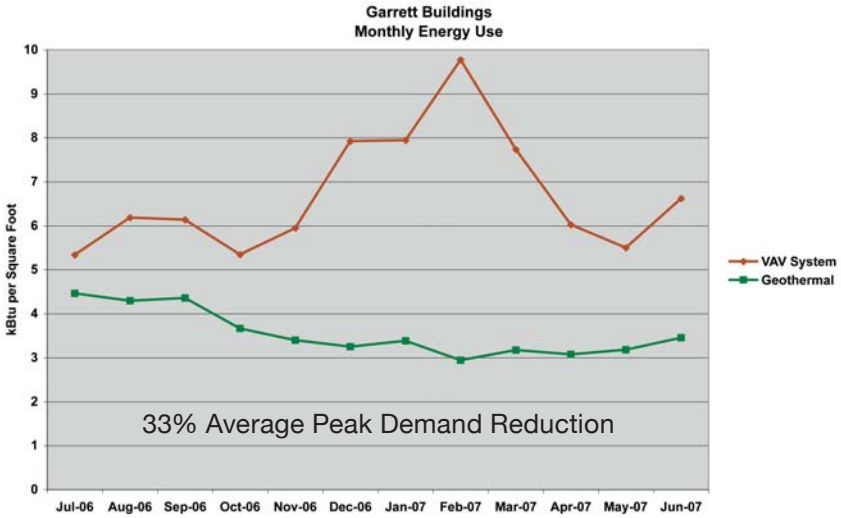
Energy efficiency, environmentally friendly and improved comfort levels all attest to the benefits of geothermal technology and what it offers to the world as a renewable energy source.

"If we had the opportunity to make one change that would provide the greatest effect on the concerns of the state of our nation's electrical power grid, dependency on foreign fuels and ozone depletion, choosing a geothermal heating and cooling system would be it."

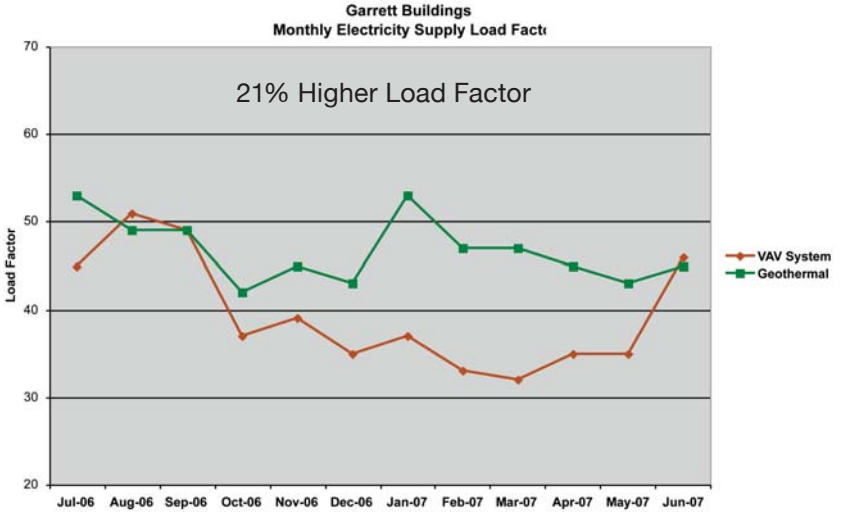
Dan Ellis, President - ClimateMaster, Inc.



Analysis:
The Geo system has consistently lower peak demand all year as compared to the VAV system.



Analysis:
The Geo system uses substantially less energy each month than the VAV system.



Analysis:
The electric utility load factor is a measure of how efficiently the power generation system is being utilized. A low load factor demonstrates more erratic usage. A high load factor customer is less costly to serve because the generation capacity required is more level throughout the year (less peaks and valleys). The geo system has a much higher load factor than the VAV system.

The Garrett Buildings
9701 Broadway Extension
Oklahoma City, OK

Owner:
Steve Garrett

Contractor:
All Weather
Conditioning and Heating, Inc.
Oklahoma City, OK

Driller:
Air-O Heat & Air Conditioning
Lynn Vick
Stillwater, OK

Utility data:
Mike Newcomb of OG&E
Oklahoma City, OK

Manufacturer:
ClimateMaster, Inc.
www.climatemaster.com

ClimateMaster is the world's leader in the design and manufacture of water source heat pumps. For more than fifty years, ClimateMaster has been servicing the needs of the commercial and residential construction industry worldwide with the most comprehensive line of water source heat pumps.

ClimateMaster's corporate headquarters in Oklahoma City, Oklahoma reflects the company's commitment to it's customers, employees, and products. The company stresses quality in its modern factory through extensive quality control programs. ClimateMaster's 400,000 square foot (39,000 square meter) facilities include state of the art R & D and sound labs.

At ClimateMaster we've made a commitment to excellence. We are building quality heat pumps for life... the life of buildings and the people who use them.

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