CLIMATEMASTER®

Dunston I Innovation Centre
Chesterfield, England

Commercial Case Study

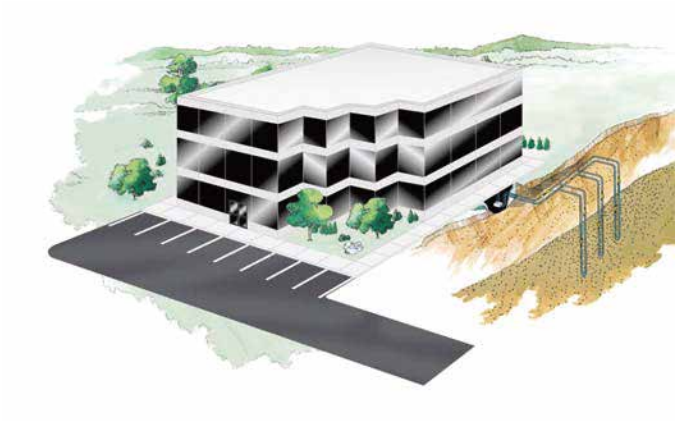
Europe Goes for the Green

The "green" conscience of England welcomed with open arms the environmental benefits of geothermal technology. Europe continues to promote renewable energy with a mission of increasing green building applications. Interesting projects like British Petroleum's installation of green fueling stations in Spain and Portugal, which used a combination of horizontal and console units connected to a geothermal vertical loop system, exemplify the push for environmental safeguards. Another British venture, the Cotswold Water Park office complex in Cirencester, England, achieved the Queen's Award for its green design using a lake loop geothermal system.

In Chesterfield, England, the Dunston I Innovation Centre is a perfect example of government support to renewable energy sources. The Chesterfield Borough Council developed the 25,000 square foot Dunston Innovation Centre as a business opportunity for the older coal-mining town to generate new jobs and community growth. ClimateMaster's distributor Clima-Gas worked with the project designer to specify a geothermal heating and cooling system for the three-story new construction office building. The Dunston I Innovation Centre was designed for start-up companies and is subdivided into a number of self-contained units, with common conference and meeting room facilities.

Using the Earth to Save Energy

The geothermal application included the installation of four ClimateMaster two-ton horizontal units and 97 one-ton console units that are decentralized room terminals designed for field connection to a closed-circuit-piping loop. The units were wall-mounted around the perimeter of the building, mostly under windows. Six ClimateMaster GR horizontal units were used for large open areas. These water-to-air heat pumps featured a reverse cycle and provided independent heating or cooling to each office by a unit-mounted controller. The tenants are simply metered for their heating and cooling, using standard meters in each console unit. Risers take the ground loop water and distribute it on the three floors of the building. The supply air is discharged directly into



Vertical Closed Loop System

the conditioned space through a discharge grille located in the top of the unit.

The central conference facility, which is available to all tenants, is located in the Rotunda above the main entrance. This common area is air conditioned by means of recessed chassis style two-pipe fan coil units, which are supplied with either chilled or warm water from the reverse cycle water-to-water heat pump unit. This heat pump unit is also ground coupled and can provide a cooling capacity of 22kw and heating of 20kw.

The internal loop piping was designed to facilitate energy recovery by transferring excess energy from one area to another in need of it. The heat pumps are capable of simultaneously heating and cooling space in different areas. Normally, two heat pump units operating on cooling mode will support one unit in the heating mode without additional energy being added to the loop circuit. This capability allowed for the individual temperature control of each office space, maximizing the comfort level as well as saving energy. The connected capacity of the heat pump units in the cooling mode is 242kw and the heating 130kw at ground operating conditions. The internal water loop circuit was installed in ABS thermoplastic pipe.

The ground loop system consisted of 32 vertical boreholes laid out in a 13 feet X 26 feet (4 meters X 8 meters) grid and was installed underneath a landscaped garden area at the rear of the building. Each vertical loop was constructed from high-density polyethylene tubing placed at a depth of around 200 feet (60 m). The boreholes were manifolded together and a set of supply and return mains terminated in a small equipment room with a set of pumps. The loop system was then flushed and freeze-protected.

One Success Leads to Another

The success of the Dunston I project resulted in a second similar geothermal application for the Dunston II office building. This project featured approximately 40,000 square feet of office space, which required 122 horizontal water-to-air heat pump units. As with the first Dunston project, installing the individual controllers for conditioning each office space provided maximum comfort to the occupants.

A comfortable reception area welcomes visitors

As the project construction proceeded, the installation encountered an interesting find. According to Richard Skinner of Clima-Gas, when drilling the boreholes for the loop system on the Dunston II project, ancient Roman ruins were discovered at the site. A brief pause in construction resulted for an archeological evaluation of the discovery. After the study was completed, it was determined that no significant artifacts existed so

the installation resumed as scheduled.

The Dunston I and II projects showcased the environmental benefits of the geothermal systems featuring no overall CO_2 emissions. According to the U.S EPA, if just 100,000 homes converted to geothermal heat pump systems, CO_2 emissions would be reduced by 125,000 tons per year (114,000 metric tons). Over 20 years, that is equivalent to converting 54,200 cars to zero emissions, or planting about 111,000 acres of trees.

Europe's commitment to renewable energy sources has been reflected in the United States. Governments around the globe are being petitioned to consider new environmental standards in energy production and consumption. The reasons the world is looking at geothermal technology are simple: energy efficiency, environmentally friendly and reduced maintenance and operating costs. When the big picture unfolds, it's a great return on investment not just for the developers, but also for communities, for families—for all of us.

Dunston I Innovation Centre

Dunston I
Square Footage: 25,000
Type of System: Geothermal Closed-Loop System
Number of Units: 97 CL012 and 4 HE024
Total Capacity (HVAC Ton): 105

Dunston II
Square Footage: 40,000
Type of System: Geothermal Closed-Loop System
Number of Units: 122 GHR Units
Total Capacity (HVAC Ton): 116

Facility Manager:
Jon Vaughan
Energy Manager of Chesterfield Borough Council

Mechanical Engineer/Contractor and Electrical Engineer:
William Bailey and Sons

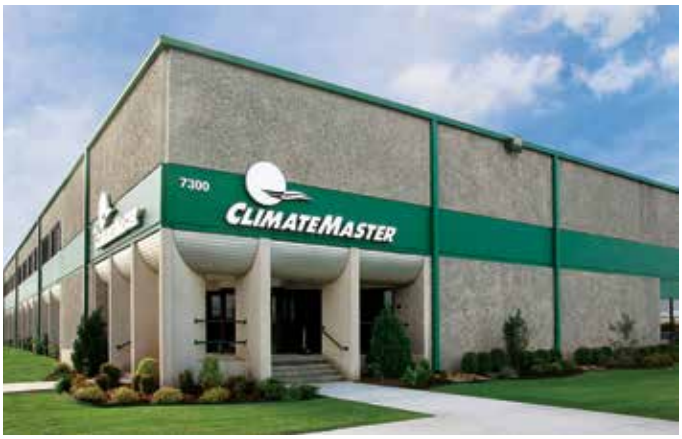
Electrical Contractor:
William Bailey and Sons

Loop Contractor:
GeoScience, Ltd.

Architect:
Chesterfield Borough Council

Manufacturer:
ClimateMaster, Inc.
climatemaster.com

Distributor:
Richard Skinner, Clima-Gas



ClimateMaster is the world's largest and most progressive manufacturer of geothermal heat pumps. The company is committed to innovation and dedicated to environmentally clean, economically sound and superbly comfortable home and business environments.

ClimateMaster has been designing and building equipment that enhances the environments we live and work in every day for more than 50 years. In addition to geothermal heat pumps, ClimateMaster offers the most extensive product line of water-source heat pumps for use in a wide variety of applications. ClimateMaster products are proudly built in the U.S.A.

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