



Fox Chase Golf Club Lancaster, Pennsylvania

System Features

- C Vertical closed loop (4 x 600 ft boreholes and 2 x 300 ft boreholes)
- C Total heat exchanger length: 6,000 ft
- C Borehole length per ton: 118 ft/ton
- C Heat exchanger pipe: 1 ½ " polyethylene
- C Secondary heat transfer fluid: propylene glycol/water
- C Flow rate through ground loop: 77gpm
- C Total installed GeoExchange capacity: 25.5 tons
- C Number of GeoExchange units: 6 units, 2.5 - 5 tons each
- C GeoExchange manufacturer: Hydro Delta Corp. and WaterFurnace
- C Internal distribution system: individual loops
- C Flow rate/installed capacity: 3.0 gpm/ton
- C Installed pump size: 12 x 1/6 hp
- C Operating pump size: 0.039 hp/ton

The 15,000-square-foot clubhouse of the Fox Chase Golf Club, a luxurious new 150-acre, 18-hole golf club just west of Philadelphia, has been heated and cooled since 1991 with six GeoExchange (geothermal) heating and cooling systems. This system, which uses vertical closed-loop wells for the heat exchanger, provides hot water for restrooms and the clubhouse kitchen, which operates year round as a restaurant and catering service.

GeoExchange Benefits

In the clubhouse's initial planning stages, the A&E contractors showed the club's owners that a GeoExchange system would have lower initial and life-cycle costs than the gas-fired system proposed for the clubhouse, when the cost of connecting the clubhouse to the nearest available gas was included. An added bonus of the GeoExchange system was the elimination of the need for an unsightly outdoor

condensing unit, in addition to allowing golfing customers to play undisturbed by the noise a condensing unit would make.

Each of the six GeoExchange systems is connected to one vertical well. Four five-ton pumps are connected to four 600-foot wells, and two pumps of 2.5 tons and three tons respectively are connected to two 300-foot wells. A desuperheater is connected to one of the five-ton units to provide hot water. Each independent system has two circulating pumps, which alternate service and cycle on when compressor action is required. Each heat pump is controlled by a single wall thermostat; typically, temperatures are maintained at constant levels without night set-back.

The energy efficiency of the Fox Chase Golf Club is enhanced by design features of the clubhouse building: R-30 insulated ceiling space, R-19 wall insulation, and double-paned windows.

Lower Life-Cycle Costs

The entire installed cost of the system was \$40,000 --- only about \$1,400 more than a conventional packaged rooftop system with electric air conditioning and propane heat. However, annual operating costs are about \$1,200 less than with the conventional system. Heating and cooling the clubhouse costs about \$.30 a square foot. Total annual energy costs for Fox Chase-- including heating, cooling, and hot water -- average about \$.90 a square foot. The GeoExchange system had a payback period of less than 1.2 years.

Low Maintenance

The system requires only routine filter maintenance for trouble-free operation. Owners of the Fox Chase Golf Club have reported no problems with the GeoExchange system in five years of operation. Says Doug Graybill, one of the owners of Fox Chase, "We're very pleased with it."

Comparative Economics

Costs	Conventional System	GeoExchange System
Building HVAC Capital Cost	\$38,600	\$40,000
Heat pumps	N/A	\$14,200
Air distribution & miscellaneous	\$11,900	\$16,800
Pumps and circulating loop	N/A	\$2,000
Vertical drilling	N/A	\$7,000
Rooftop equipment	\$26,700	N/A
Annual Building Energy Cost	\$14,700	\$13,500
Annual Unit Energy Cost		
Electricity	\$0.095/kWh	\$0.095/kWh
Propane	\$1.08/gallon	

Project Participants

Owner/Operator: Doug Graybill, Fox Chase Golf Club, Lancaster PA, 717.336.3673

Utility: Derek Jones, Pennsylvania Power & Light, Lancaster PA, 717.560.2538

Mechanical Contractor: Ken Leaman, J.K. Mechanical, Lancaster PA, 717.464.0111