GEO OUTLOOK

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Lake Las Vegas: Ground Source Heat Pumps are a Winning Bet

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Directors' Forum

Notes from GHPC

By Wael El-Sharif
Executive Director,
Geothermal Heat Pump Consortium

Geoexchange has been proved as a smart HVAC solution for schools, hospitals, office buildings and houses. DOE states that building lighting, appliances, space conditioning and water heating account for 36 percent of primary energy use in the United States. This is far greater than the total of energy use in the transportation sector and nearly equals that of the industrial sector, two-thirds (2/3) of that is supplied by electricity. Residential and commercial buildings use 65 percent of all electricity generated. Forty percent of the total energy used in those buildings is for space conditioning (heating and cooling) and water heating.

Although there are more than a million geoexchange units currently in use nationwide, our technology represents less than one percent of all heating and air-conditioning units in the United States. However, with the new provisions in the Energy Policy Act of 2005, the rising cost of operating conventional HVAC systems and the increasing focus on efficiency and environmental stewardship nationwide, our industry is poised for growth like never before.

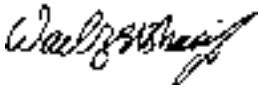
The call volume at GHPC has tripled in recent months with calls flowing in every minute from Americans looking to use geoexchange as their heating and cooling system of choice. Manufacturers' geoexchange shipments have more than doubled in the last quarter compared to the year's beginning. This growth is not showing signs of slowing, either.

If our industry were to grow to gain just 10 pe}—ent of the HVAC market, the results would be phenomenal. Geoexchange would be responsible for the annual savings of more than 12 million kWh and almost 61 million MMBtu. We could also reduce America's electricity demand by close to 4,000 MWh. This can eliminate the burden on electric power producers, significantly reduce end user's utility bills and reduce the risk of brownouts and/or blackouts.

We could help our country realize the elimination of almost nine million metric tons of CO2. This would be the equivalent of removing almost two million cars off the road or planting more than 581 million trees. Our industry's growth to just 10 percent of the market share can also mean that we will help our nation's dependency on foreign oil, saving more than 32 million barrels annually, or almost 89 thousand barrels daily.

Our industry has been working hard to spread the word about this technology for years, and our market growth so far reflects that. However, the fruits of every member of our industry's labors are finally getting their moment in the sun, a moment we so certainly deserve. Our technology really is this good – there's no catch, and people are starting to sit up and take notice in numbers we've never seen before.

We can change the way the world operates with geothermal heat pumps, and we're well on our way now. We can help America take a major step closer to independence and environmental stability, which will have a major, positive impact on the nation's economic development. All we need to do now is keep doing what we're doing. Our time is now, and we couldn't be happier to have you as part of the team that's going to make it all happen.



Directors' Forum

Notes from IGSHPA

By Jim Bose
Executive Director,
International Ground Source Heat Pump Association

In the 1980s an energy crisis was consuming the headlines of newspapers and Americans' discretionary income, while the ground source heat pump (GSHP) industry was getting established. As a fledgling group, the industry was not ready to tackle that opportunity. Twenty-five years later, not much has changed in the United States' approach to development of renewable technology, conservation of energy resources nor reduction of our dependence on foreign oil. Today, the U.S. is in the same boat in regards to energy. The 2005 energy crisis is now emotionally charged with the recent natural disasters around the world affecting millions of lives. At home, Americans anticipate paying at least 30 percent more this winter to heat their homes.

What has changed? The GSHP industry now has a 20 year record and over one million installed systems in the U.S. In the U.S, the technology has grown steadily, with a 2005 anticipated rate approaching 20 percent. The rate of improvement of the technology in the last 10 years has been nothing short of phenomenal. The application is worldwide and the range of applications continues to grow in residential, commercial, institutional and agricultural.

So, where do we go from here? New thinking in applications of GSHPs must be initiated. The use of GSHPs as an assisting unit to an existing heating, ventilation, air-conditioning system (HVAC) needs to be evaluated. A GSHP mini-split (through-the-wall) can be designed to provide base loading without the normal added expense of reworking the existing thermal energy distribution system or the residential electric service sizing. Other ideas are out there that can help accelerate the use of the systems.

In order to reach mass deployment of the systems, the technology also needs to be recognized as renewable and given the same considerations by the US government as other renewables (i.e., solar, wind). A significant education program should be implemented to educate the public at every economic level and market segment. The program can show potential customers that the issue of upfront cost and payback on their investment has changed. No longer will they have to wait for 10 years to recoup their investment. Because of current electric pricing in the U.S., the payback period is less than five years.

Expansion of GSHPs is presently being accomplished, but at a higher rate due to energy costs, environmental concerns and the more active participation by government leaders. While this is great, it is no time to for the industry to stand back and wait. A window of opportunity is open for us to show that GSHP technology is a key solution technology for the energy problems facing the world today and into the energy demanding future.

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Bob Hawkins

Marketing Services Manager
Alabama Power Company

Throughout his 40-year employment history, Bob Hawkins has held various management positions. At Alabama Power Company he currently serves as sales and technical trainer for all corporate marketing and manages the HVAC Training Center conducting training for over 1300 dealers and employees annually. Through his involvement with ERRI he is responsible for the Electric Transportation Function, which promotes the electric option to all combustion transportation technologies. Alabama Power Company received awards for excellence at national and state levels in electric transportation the past four years. Hawkins is a board member for Geothermal Heat Pump Consortium, board member and executive committee vice-chair for North American Technician Excellence, chairperson for Infrastructure Steering Committee-Electric Power Research Institute, and board member for Alabama Clean Cities Coalition.

John Turley

President
Middleton Geothermal Services

John Turley is President of Middleton Geothermal Services in Akron, Ohio, a leader in the Midwest in geothermal testing, designing and installation of commercial applications.

Middleton has been designing and installing commercial geothermal projects since 1994 when they completed their first system for First Energy Corporation. Since then, Middleton has over 50 geothermal projects to their credit, representing thousands of tons of capacity.

Turley has a BA in Business Economics from the College of Wooster and an MS in Mineral Economics from Penn State University. Previous to Middleton he was a consultant in the Houston office of Data Resources, Inc., working with customers in the electric utility and oilfield services industries.

Turley is currently serving on IGSPHA's advisory board and is an IGSHPA Accredited Geothermal Installer and Trainer and an IGSHPA/AEE Certified Geothermal designer.

Photo courtesy of Lake Las Vegas resort.

GSHP: A Smart Bet for Lake Las Vegas Resort

By Jennifer Hale

The Gamble

In the mid-1980s, Ronald F. Beoddeker, President and Chairman of Transcontinental Properties, Inc., took a gamble when he envisioned creating a 320-acre lake surrounded by a luxurious resort in the middle of the Nevada desert. Due to the touch of engineering magic used to create an 18-story dam and use of water from Lake Mead, Lake Las Vegas has been a reality since 1994. Restaurants, casinos, premier golf courses, luxurious homes and hotels surround the lake and help make this resort, enclosed by mountains painting the horizon, an oasis of luxury.

The 3,592-acre resort community has something to satisfy almost any desire for a utopian getaway. Tourists can stay in one of the AAA Five Diamond-rated hotels like The Ritz-Carlton, enjoy a round of golf on a Jack Nicklaus Signature Golf Course, or relax in any of the spas, restaurants or casinos the resort has to offer. Nineteen communities including condominiums, luxury homes and custom homes are also available for those not wanting to leave this seventh heaven. At Lake Las Vegas Resort, the comfort of luxury is more of a temptation than slot machines.

The Smart Bet

After taking such a risk with a $4-5 billion project now called Lake Las Vegas, Boeddeker made a logical decision to utilize the resource of a 320-acre, man-made lake and install ground source heat pumps (GSHPs) in five different areas of the resort in 1997 and 1998. Bella Vivente, a subdivision of patio homes, MiraMonte, a luxury housing community, South Shore Yacht and Beach Club, Reflection Bay Golf Club and Restaurant, and the Discovery Sales Center all use GSHP technology.

"We chose geothermal because we realized the energy efficiency in the GSHP units," said Chris Schulte, vice president of Lake Las Vegas Marina LLC, a joint venture partner with West Trec Marina management in California and Trans Continental Corporation who owns Lake Las Vegas Resort. "We recognized early on what the energy savings was on this system and the advantages of utilizing the technology and man-made lake that exists at the resort."

Pumping systems are Schulte's area of expertise. New construction and maintenance of the GSHPs at the resort are his responsibility. He worked with developers to ensure the installation of high density

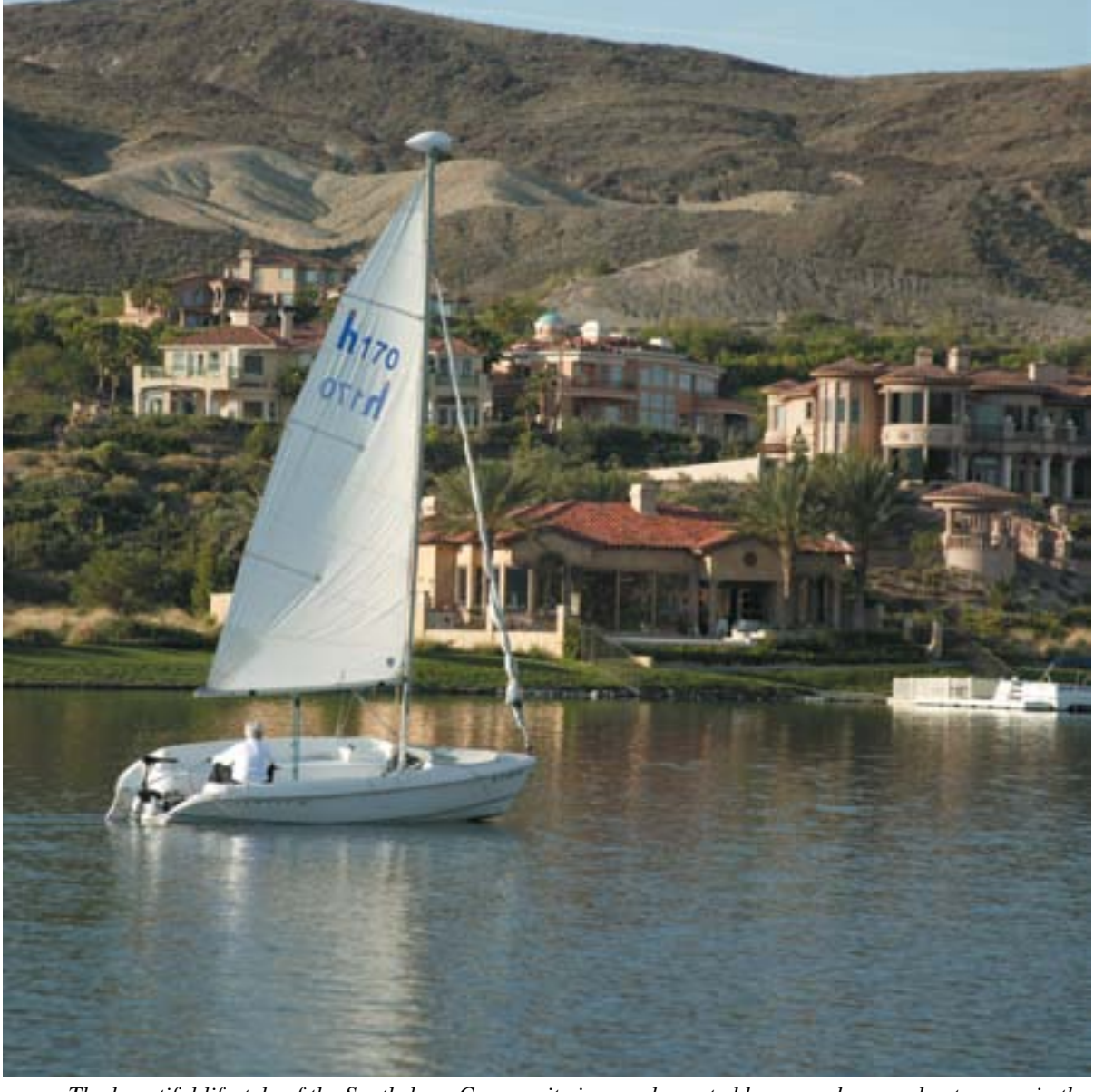

Photo courtesy of Lake Las Vegas resort.

The beautiful lifestyle of the Southshore Community is complemented by ground source heat pumps in the Bella Vista subdivision.

polyethylene piping into Lake Las Vegas for the GSHP systems. Schulte oversees the grounds, waterfall and pumping systems, landscaping, and basic horizontal site construction that takes place at the resort. He has a heating ventilation air-conditioning (HVAC) group that works for him to take care of all the GSHP units in the resort houses.

"I have been the guy who is told to go fix the problems for the resort," said Schulte describing his role at the resort. "I fell into it by default in 1998 with the Bella Vivente project and assisted with the installation of some of the utility lines and pumping systems."

According to Mike Kapps, project manager for Lake Las Vegas during the GSHP installation, Beoddeker is an environmentalist and believes strongly in GSHP technology. During the Lake Las Vegas adventure, Beoddeker and Kapps helped design many geothermal projects in the West and served as key players in three geothermal schools in Utah.

Kapps worked for Lake Las Vegas during the two-year installation process of the GSHP systems. The units are WaterFurnace manufactured. He has many years of experience in the GSHP industry and is now in Indianapolis, Ind., working as the General Manager for one of Indiana's largest geothermal HVAC contractor, Precision Comfort Systems, Inc.

"The story of Lake Las Vegas Resort and Beoddeker's passion to make it environmentally friendly is just pretty neat," said Kapps. "It is a project I am proud to be a part of."

Five GSHP Systems: A Winning Flush

Bella Vivente translates from Spanish to English as beautiful lifestyle and this is exactly what the subdivision of 41 patio homes wrapped by a lavish golf course portrays. These 2,500 square foot homes, valued at about $1.5 million each, are the perfect picture of a weekend getaway in paradise. Located on SouthShore of Lake Las Vegas, Bella Vivente utilizes 82 heat pumps. There are a pair of 4-ton, two-speed units in each home. They all connect to one common pond loop submerged in a small golf irrigation pond, using 12,000 feet of 1 1/4 inch high density polyethylene pipe.

"A GSHP system was ideal for Bella Vivente because the homes are built only about 10 feet apart," said Kapps. "A traditional system has a bunch of outdoor equipment, is noisy and also GSHPs serve residents the benefit of energy cost savings."

In the original installation, the development ran on an open loop system. However, after three years of battling water problems, the system was changed to closed loop in 2001. According to Kapps, since the change there has been little or no maintenance involved.

"I think GSHP is a great idea!" said Schulte. "We learned a lot from the Bella Vivente project and everything we do from here on out will be on a closed loop."

For those seeking a more permanent stay in paradise, MiraMonte, a housing development containing 23 individual homes, also exists at Lake Las Vegas with the assistance of GSHPs. Every home is equipped with a private boat dock and valued at around $2-3 million. Located on a small peninsula on the waters edge, each home contains two 5-ton units. Separate pond loops, using 3000 feet of 3/4 inch high density polyethylene pipe, complete the home's closed loop systems.

The SouthShore Yacht and Beach Club, a private clubhouse for residents on SouthShore, provides restaurant, exercise room and bar access. This $8 million, 10,000 square feet building, utilizes 33,600 feet of 3/4 inch polyethylene pipe that runs into the master lake. The total tonnage of this closed loop system is around 120.

No resort experience is complete without golf courses and Lake Las Vegas Resort offers many op-

An environmentally healthy ground source heat pump system is logically placed in the South Shore Yacht and Beach Club, which promotes the emotional and physical health of resort guests.

tions for passionate golfers, and those pretending to be while on vacation. Reflection Bay Golf Club, including a restaurant and Jack Nicklaus Signature Golf Course, is equipped with GSHPs. The $8 million golf club buildings are heated and cooled by a 115-ton open loop system. The convenience of golf irrigation water flowing from the golf course is used by the system.

The Discovery Sales Center for Lake Las Vegas contains GSHP technology as well. It runs on an open loop system via golf irrigation water that also flows to the golf courses. It contains 22 pieces of equipment totaling 80 tons. Like the prior four developments, the center's system requires little to no maintenance, is environmentally friendly, offers the benefits of energy costs savings and serves as the fifth card in Beoddeker's winning flush.

The Next Flop

The GSHP game is not over yet. There are many homes yet to be built around the master lake that will all be on closed loop systems.

"Closed loop is a pretty problem free system," said Schulte. "It costs more to install a GSHP system than a traditional system, but energy savings are much greater and make up for it later."

Planning stages are currently underway for a new development of floating homes that will be on the actual master lake with GSHP technology designed for them. According to Schulte, placing the homes on the lake lowers the power requirements for the homes substantially.

Also, anyone who purchases land on the resort is given the option to install GSHP. The major stumbling block in individual builders using GSHPs is it is a relatively unknown technology in the West.

"A lot of people don't understand the technology and therefore shy away from it because of their ignorance to it," said Schulte. "If someone is on the water, I encourage them to use GSHP. It is a very basic and

simple technology and if you install it correctly it is pretty problem free."

The land at Lake Las Vegas resort is 70 percent sold and owners are now in the planning stages of building $5-10 million homes. One owner has already built on the water. Schulte and his staff anticipates more people coming in to use the technology.

Boeddeker was lucky in his gamble to turn the Nevada desert into a luxurious lake resort, but he placed a smart bet when he decided to embrace GSHP technology. This proven technology now compliments a utopian desert oasis and will continue to add value to the resort as it offers energy savings, efficiency and a preserving hand to the beautiful environment of Lake Las Vegas Resort. ◆

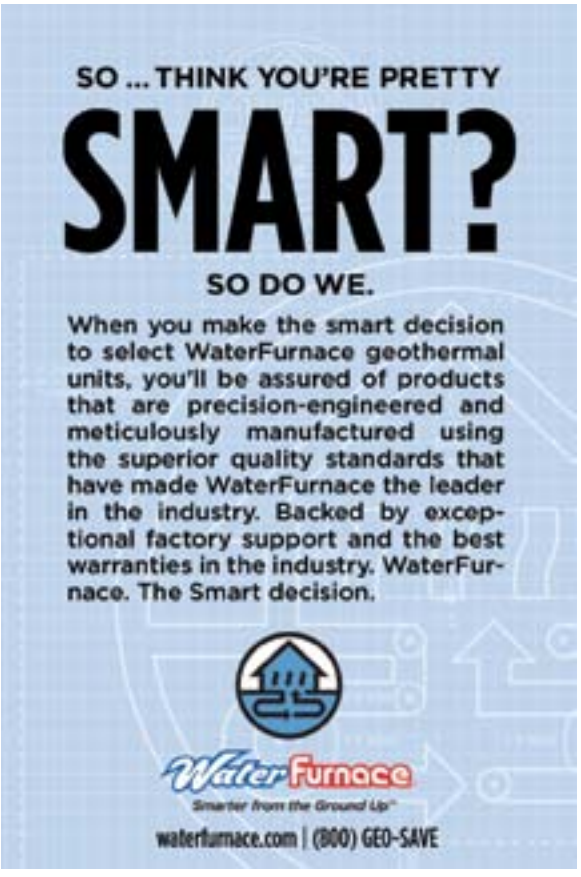

Photo courtesy of Lake Las Vegas resort.

Photo courtesy of Lake Las Vegas resort.

The long-term residents of Mira Monte enjoy the long-term benefits of a ground source heat pump system.

Geothermal Versatility at the Prairie Berry Winery

By Kelly Green

Tucked away in the Black Hills of South Dakota, the winery offers a cozy atmosphere and delicious wine with the aid of a ground source heat pump system.

Photo courtesy of Prairie Berry Winery.

Large windows in the tasting room allow visitors a glimpse of the sensitive wine-making process.

Ground source heat pumps (GSHPs) provide a number of obvious benefits. The systems offer reliable heating and cooling while being energy efficient, quiet and virtually maintenance free. In addition to these more apparent benefits, the systems are also versatile. They provide a level of design freedom unmatched by other heating and cooling systems. Just ask Matt Keck, owner of Prairie Berry Winery located in the Black Hills of South Dakota.

Keck and a team from Skyline Engineering in Rapid City, S.D., designed a GSHP system that not only heats and cools Prairie Berry Winery but also controls the sensitive winemaking process. The system consists of two water-to-water heat pumps that regulate wine production, two water-to-air heat pumps that serve the rest of the facility and radiant floor heating that helps dry the production floors after washings and warms the outdoor patio.

"Winemaking is a fairly energy-intensive operation with large cooling requirements," Keck said. "My thoughts were geared to minimizing the operating costs of the cooling plant."

A chemical reaction known as fermentation is required for wine production. Fermentation uses yeast to convert sugar to alcohol and creates two byproducts: heat and carbon dioxide. Temperature plays a major role in the process because fermentation must proceed slowly. The higher the temperature, the faster fermentation will progress. During one of the final stages of winemaking, known as cold stabilization, the wine must remain at 30 F for two weeks. According to Keck, the loss of temperature control can ruin an entire batch of wine and generate a costly loss.

Keck said his wife is the winemaker. When asked what type of temperature control she needed for the wine-processing tanks she said the tanks should be individually controlled with the ability to be heated, cooled and sub-cooled.

"As a professional mechanical engineer with 10 years experience in the heating, ventilation and cooling industry, I had a firm knowledge of all the types of systems that were possible for our application," Keck said.

Photo courtesy of Prairie Berry Winery.

Versatility At Work

The engineers designed a water-to-water system that produces three temperatures of water: 110 F, 45 F and 20 F. There are three storage tanks for each temperature of water and a control system that alternates the heat pumps to maintain each temperature. Each tank is covered by a jacket and valves are used to manually select which water temperature is fed into the jackets.

Prairie Berry not only produces wines from domestic fruits such as: apples, rhubarb, raspberries and strawberries but it also uses fruits native only to the Black Hills region. These include: chokecherries, buffaloberries, wild plums and wild grapes. Keck said most of the fruit arrives frozen so they have the ability to ferment wine all year.

Photo courtesy of Prairie Berry Winery.

Wine processing tanks are covered by jackets that hold the temperature-controlled water necessary for fermentation.

When the frozen fruit arrives it is put into a tank and heated. As fermentation begins and heat is released, the valve on the tank is switched to cool, removing the heat inside the tank and recycling it back into the GSHP system.

Keck said one of his favorite aspects of the design is its ability to provide free process cooling in the winter. The winery's system employs a manual crossover that uses geothermal condenser water as a replacement for the 45 F water that would otherwise have to be produced by the system. As part of a traditional GSHP system, a desuperheater can provide a similar benefit by recycling waste heat to produce hot water in the summer. The winery's condenser water runs at about 35 to 40 F. The heat of fermentation is then added to the condenser water and extracted for use in the tasting room's water-to-air pumps.

"The system performance is certainly improved by this free cooling," Keck said. "In theory, we are able to operate a closed loop scenario without the need for the loop field."

The design also features redundant loop pumps that increase the reliability of the system. Three separate manifolds operate with seven wells on each. If damage occurs to one of the manifolds, it can be isolated and the winemaking process can continue with reduced capacity using the two remaining manifolds. There are also provisions for the addition of a back-up generator, which is a great defense against heavy snowfalls that could cause power outages and impede the winemaking process.

"It is difficult and costly to obtain the same level of redundancy with a cooling tower or dry cooler," Keck said. "In addition, these devices are subject to failure and vandalism."

Versatility Receives an Economic Benefit

Groundbreaking for the winery took place in November 2003. The 18-ton system uses Florida Heat Pumps, which were installed by Action Mechanical of South Dakota. The installation required 20 wells dug to a depth of 200 feet. Black Hills Power, a local utility, offered incentives to the winery for the installation and use of a GSHP system.

"The intent of our customer incentives for geothermal systems is to encourage the installation of energy efficient electrical equipment, help offset the cost of loop

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Photo courtesy of Prairie Berry Winery.

Geothermal's design flexibility helps the winery provide signature wines produced from domestic and native fruits.

fields and better use our generating capacity," said Jim Keck of Black Hills Power.

Black Hills Power also bills the winery based on an energy storage rate. This rate was created for customers who operate systems that promote off-peak energy use. Off-peak times are defined as overnight, early morning, weekends and major holidays. A GSHP system makes better use of generating capacity because it reduces the utility's on-peak energy demand, J. Keck said. Typical energy storage applications include: ice storage, heat storage and pumped water storage. Energy storage equipment is metered separately from a facility's general electric loads.

"Although geothermal systems use both on-peak and off-peak energy, Black Hills Power qualifies them for our energy storage rate," J. Keck said. "We do not penalize them for on-peak energy use because of their benefits to Black Hills Power and the fact that these applications are energy storage in nature."

Based on billing records, Black Hills Power approximates the winery's first year operating costs were $0.76 per square foot. Compared to the cost of propane, the area's only heating competitor, the winery has saved over $5,000 in its first year by installing a GSHP system. M. Keck estimates the total cost of the installation to be $30,000. These figures project that the system will begin payback in

Prairie Berry's Cost Breakdown

Cost of installation:	$30,000
First year utility operating costs:	$0.76/sq. ft.
First year geothermal heat pump system operating costs:	$3,582
First year general electric load costs:	$6,240
Total first year utility costs:	$9,822
Estimated savings vs. propane heat (@$1.40/gal)	$5,325 OR 35.2%
Expected payoff:	6 years

*Source: Jim Keck of Black Hills Power

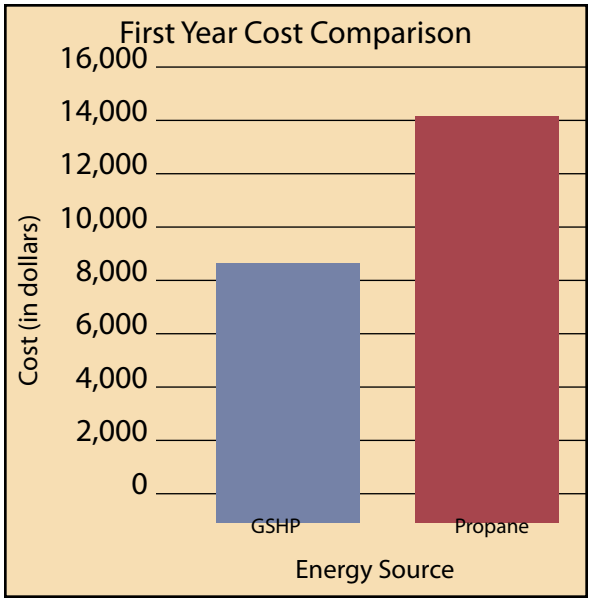
as soon as six years. M. Keck also said the GSHP system runs exceptionally well with little supervision.

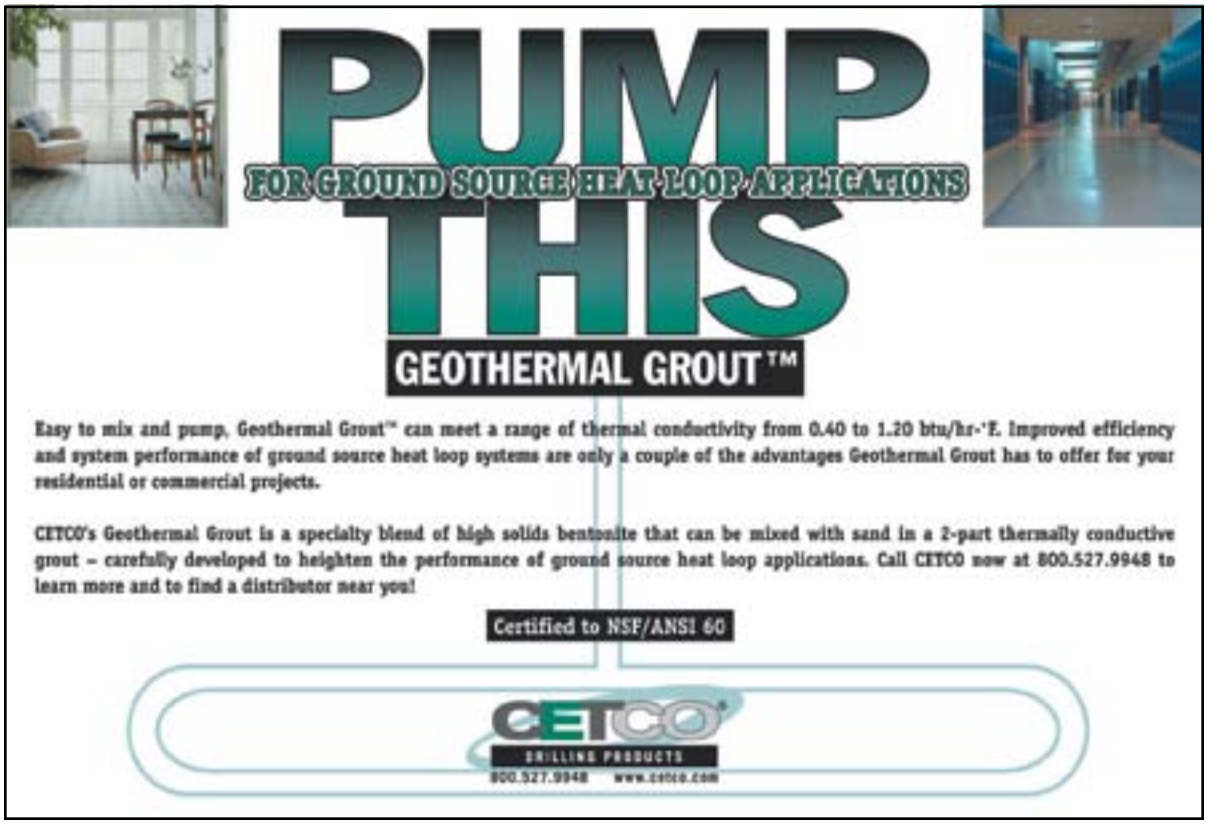
"The operational cost savings alone are a great benefit and our electricity bill is amazingly low," M. Keck said. "Additionally, the system is quiet, there are no outdoor units and maintenance is minimal."

Versatility On Display

The winery's tasting room opened in June 2004 and wine production began in November 2004. It is a 13,000 square foot facility and is open six days a week for wine tasting. Tours of the production areas are offered only during special events or on a pre-arranged basis, however, part of the production area can be seen through large windows in the tasting room. M. Keck said the winery is also currently working on a display explaining how the facility utilizes geothermal heating and cooling.

The winery is located near popular South Dakota tourist attractions such as Mount Rushmore and the Crazy Horse Memorial. M. Keck says the winery sees most of its visitors during summer vacation and the winter holiday season. So to witness true energy efficiency and experience the benefits of geothermal versatility, visit Prairie Berry Winery in the Black Hills of South Dakota. ◆





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El Monte Sagrado–a Spa with an Environmental Heart

By Trisha Swindle

Guests can indulge themselves during their stay at the El Monte Sagrado Resort and Spa in Taos, New Mexico, while relieving their environmental conscience. The Sagrado was created with the environment as well as their potential guests in mind. Innovations such as seasonal collection of rainwater, ecological treatment and reuse of wastewater, onsite/local production of food, environmentally friendly disinfectation and a ground source heat pump (GSHP). Tom Worrell owner of the Sagrado, created his company, Dharma Living Systems, to design machines that would allow people to enjoy their homes or commercial endeavors without taking away from the environment. El Monte Sagrado resides between the best of both worlds. Every spa indulgence imaginable can be enjoyed by guests as they dine on spectacular food and look out into a lush haven in downtown Taos, all while giving back to the environment.

Photo courtesy of Dharma Living Systems.

El Monte Sagrado respects the beautiful nature surrounding it through the use of a ground source heat pump system.

The Resort Basics

The El Monte Sagrado is in the historic urban district near the Taos plaza. Originally, the spa was a small motel. The adobe casitas have been renovated and are now used as guest suites. During the remodeling of the existing casitas and in building of the new structures, native building materials were used. According to the Sagrado Web site, "Compressed earth blocks were created from soils onsite with a hydraulic press and used for eight of the units."

Photo courtesy of Dharma Living Systems.

The spa uses an ecologically engineered system to purify an reuse the water that flows peacefully through the resort.

By employing this building method, which is similar to adobe, these structures will use less energy to keep their guests comfortable during the temperature extremes that can be found in the desert. Several structures and walkways were also built with gunash. A mixture of Class F fly ash–a by product from coal power plants, cement, sand and aggregate, gunash is a replacement for concrete. Gunash was again employed during construction of the Biolarium Space and Torreon Spa. It has a compressive strength of 3,400 PSI and can be made even more cost efficient by using a spray on application. The 36 suites and casitas are broken up into four distinct sections.

The Native American Suites feature such amenities as kiva-style fireplaces, stone tile work, king-size beds and beautiful bathrooms with stained wood, stone tiles and a tub/shower combination. The Historic Art Suites have appropriately descriptive names such as the Magpie Suite. Local Taos artist Jim Wagner designed the interior of these suites. Wagner hand-painted the walls with pastel colors and the bathroom is decorated with hand-painted ceramic tiles. Each Historic Art Suite also includes access to a private courtyard filled with flowers, herbs and bushes. The Exclusive Casitas are named for exotic locations. Inside the Bali Suite visitors will find stained pine wood floors and custom made king size beds with matching nightstands. Luxurious bathrooms have walk-in showers where oversized rain showerheads can be enjoyed. Shower floors are designed as a mandala, a traditional Balinese depiction of the cosmos made of black and white river stones.

If all this beauty isn't enough, visitors can enjoy the outdoors in their private hot tub or make use of their private outdoor dining area. The Global Suites have equally enticing names. The Argentina Suite has leather furniture surrounded by iron and copper accent pieces. Two unique features of this suite are the antique phonograph, which plays Buenos Aires tango music, and the 1920's original Tramp Art mirror. The master shower includes one side as a breathtaking tumbled rock cliff made from natural stone. A private outdoor hot tub is also included.

El Monte Sagrado is an award winning spa and resort. The notoriety covers each aspect of this unique spa experience: from the delectable menus in the hotel restaurant, the decadent spa services, to their innovative environmental choices have received notice by the travel community. The accolades include, *Top 10 Great Mind/Body Retreats–Spa Magazine*, *Top 66 Hot Tables–Conde Naste Traveler Magazine, UK*, *25 Great Ecological Lodges–Travel and Leisure*, to name a few. Most recently, the spa was named as one of the most luxurious spas in the United States by *Forbes Magazine*.

Guests seeking a peaceful spot need only look to the Sacred Circle. The Sacred Circle, located in the center of the resort, is simply a large grass circle and a most treasured feature of the complex. Around the exterior of the circle, 80-year old cottonwood trees stand sentry. Soothing waterfalls, stone water sculptures, a wooden footbridge, a stocked trout pond, and an abundance of regional flora and foliage border the circle. Employees recommend guests use this contemplative space for meditating, doing Tai Chi, taking one of their outdoor Yoga classes, or even enjoying an outdoor massage. Guests can even request suites with semi-private balcony's or patios overlooking the Sacred Circle.

A beautiful and impressive art collection is housed at El Monte Sagrado. Along with the suites designed by a local artist this collection includes painting and

sculptures by Pablo Picasso, Andy Warhol, Jean Michael Basquist, and James Rosenquist. Regional artist Jim Wagner and Anita Rodriguex can be found here as well. Art and functionality can be found throughout the resort including the sculpture named SolarTree–a solar paneled tree.

Innovative and Environmental Design Features

Photo courtesy of Geo-Enterprises, Inc.

A ground source heat pump system was installed by Geo-Enterprises to complement the spa's commitment to overall energy efficiency.

The resorts ecological goals are met through their many unique design features. Dharma Living Systems, the company owned by Mr. Worrell, strives to create and provide services and machines that help businesses and private homes coexist with nature without leaving a lasting mark. Living Machines is a branch of Dharma Living Systems; they design ecologically engineered natural wastewater treatment and reclamation systems. Sagrado's Living Machine was installed for $500,000. The Biolarium Space houses the Hybrid Horizontal Advanced Wetland Living Machine System which filters the resorts wastewater through a pool rich with bacteria, fish, plants, snails and a variety of other natural cleaners. Wastewater at the resort includes water used from toilets, showers, hot tubs, restaurants and the onsite laundry facility. After the wastewater is run through the Living Machine, which has numerous, fascinating and all natural steps, the water is then used to provide water for the plants and animals in the Biolarium Space as well as exterior landscaping. Completing its path in the rain cycle, the water then returns to the aquifer.

The Biolarium Space looks like a rich, lush rainforest instead of the mechanical wonder it is. Tours can be arranged during working hours. In the Biolarium, guests can find a variety of exotic fruits and herbs that their local specialty market cannot rival. Some species in residence are Starfruit, Kumquat, Dwarf Banana and Bay Rum. Each of these is used seasonally in the resorts restaurant. Someday soon guests will also be able to enjoy eating the spectacular assortment of fish and shellfish found in the Biolarium. These include Tilapia, giant freshwater prawns and Crayfish. Before adding this particular fish selection to the menu, studies on the fish are being done to ensure the guest's utmost safety. The delicious fish currently thrive in the recycled water of the resort.

In the desert, water is a valuable commodity. Sagrado respects this in their use of storm-water and rainwater, which is caught on site and reused in a variety of different areas across the resort. Water is caught using a system of roof guttering and underground drainage pipes. The water is then run through coarse gravel filters, which remove sediment. Until it is needed to replenish the trout ponds surrounding the Sacred Circle, the water can be stored. An old idea was resurrected for use at the resort. The resort Web site states that a historic acequia runs along the perimeter of the El Monte Sagrado site. Acequias or irrigation ditches were once used throughout the Southwest as the only means of transporting water to farmers. These particular acequias have been restored and now runoff, from the Torreon Spa and four adjacent units, flows down it to help support agriculture downstream.

A GSHP was a natural choice for the heating and cooling of the resort. Geo-Enterprises, Inc. drilled 100

wells at 200 ft deep, in sets of 10 to hold the 2-inch diameter pipe for the system. The GSHPs heat and cool 39,200 square feet of building space. The general contractors on this project were LCI-2, and the ClimateMaster GSHP was installed by Geo-Enterprises. According to Phil Schoen of Geo-Enterprises, Inc., two main valve vaults were created and installed to serve the 64 boreholes. Utilizing valve vaults ensures ease of repair to the valves should any be needed. Dharma Living Systems oversaw the entire project. The GSHP payback period is only five years. To further the energy savings of the GHSP system, a computerized thermostat system was installed. The thermostat system is connected to the paperless reservation system of the resort. It "tells" each room when a guest is going to arrive or be leaving the resort so the room's temperature will adjust automatically.

Several systems were designed and installed to further reduce the resorts need for outside electrical supplies. Photovoltaic arrays are part of the shade structures in the parking lot and entryway to the resort. Energy from the sun is collected by the cells and used to run the GSHP system for the resort. Photovoltaic panels can also be found as part of the roof for the Biolarium Space. Not only do they provide some much-needed shade for the area, they help create energy for the resort. As part of the resorts goal to incorporate beauty with function, a SolarTree was created. According to the resort's Web site, this metal sculpture sports upturned photovoltaic limbs that follow the sun during its daily trek across the sky.

Photo courtesy of Dharma Living Systems.

A Solar Tree, created from photovoltaic cells, is only one of the energy efficient technologies at this facility.

Other Resort Services

Guests can enjoy use of the Aqua Center which houses a plunge pool, wading pool and hot tub. While using this pool, one can look out the numerous floor-to-ceiling glass windows to a view of the Sacred Circle. The plunge pool is also environmentally friendly as well as people friendly. The Sagrado uses no chlorine in their pool, Instead, they treat the water with Curoxin, a highly pure liquid without undesirable or regulated by products. Worrel's company, Dharma Living Systems, created this amazing product and it can be used in any pool for home or commercial use.

The Fitness Center boasts state-of-the-art cardiovascular and weight systems. A day of exercise can be followed by a more relaxing day trip to the Torrean Spa. There guests can choose from a long list of products and services provided by highly trained employees. Spa services include acupuncture, Egyptian Anointing and a Life Reading Massage. A more interactive spa treatment could be taking one of their classes, which include Tai Chi, Yoga, Massage for Partners or one of the Fitness Hikes.

Giving Back to the Community

El Monte Sagrado does not end simply with their award winning spa and resort, they extend their social and environmental responsibility to the community they share in Taos, New Mexico. Cooking lessons at the Taos School of Cooking are available to guests. The

finer points of southwest cooking, including the art of making Native American bread, are taught. The chefs that fill the spa's four-star restaurant, De la Tierra, with unique and delicious food can be found teaching some of these classes. According to their Web site, Yaxche Learning Center receives funds raised by the cooking school, a non-profit organization.

Tom and Odette Worrell founded the Yaxche Learning Center in 1998 as an alternative to the local public school system. The Worrel's donated the school building and all of the initial scholarships for the students. These lucky K-8th grade students enjoy a more balanced curriculum than their public school counterparts. Curriculum includes a focus on the arts, environment, emotional intelligence and spirituality with an appreciation for the Northern New Mexico cultures. Found in downtown Taos, the innovative school houses state-of-the-art technology equipment alongside its art studios. They have a technology center, ceramics studio, drawing and painting studio, science lab, grow dome (like a green house), professional kitchen, astronomy lab and playgrounds. Along with the three R's, children also get to learn alongside a professional artisan. The Artist in Residence is a program established by the school to expose the students to the real process an artist goes through to create their art. In January 2006, Larry Herrera, a silversmith will be the Artist in Residence. Students will learn the art of silversmithing and create projects of their own to be displayed at the end of the semester.

Latir Mountain Ranch

If the Resort itself is not quite what a guest is looking for, they have several other options. The Sagrado also offers everything from a two-bedroom condominium to the 6,500 acre Latir Mountain Ranch. Corporate retreats, family gatherings and weddings are always welcome at any of the El Monte Sagrado sites. The ranch boasts llama trekking, horseback riding, fly-fishing, hiking and much more. Guests can stay at the Main House or in the more rustic Ranch House. If a more outdoors experience is needed, at the top of the mountain an upscale wilderness retreat can be found complete with well-appointed teepees, bathrooms and showers, and a log cabin where gourmet meals can be prepared and enjoyed. While staying at the ranch, guests can take a tour of the third largest and only certified organic yak farm in the United States. No hormones or steroids are used on these yaks. The Dahlia Lama has blessed two of the herds. The Spa restaurant is one of only ten restaurants that proudly serve yak, which has less fat than beef.

Fine Dining

Not only does the Sagrado use the yak meat farmed on the ranch, but bison are also raised and eaten. A farm and greenhouse were also built to provide local organic vegetables and fruits through the year. The spa's main restaurant, the De la Tierra, was named one of the world's best new restaurants by the Conde Naste Traveler magazine. Kevin Graham, executive chef, is also an award-winning member of this restaurant. His talents are reflected in his seasonal menu choices, which include Blue Corn Calamari and Organic Homegrown Yak Chili. For a more casual environment, guests can enjoy a margarita or some tasty tapas at the Anaconda Bar. A giant anaconda sculpture slithers across the ceiling over the bar. Drinks can be enjoyed near the 1,100-gallon salt-water aquarium filled with brightly colored fish. Live entertainment is served up with the excellent cuisine several days a week. Adjacent to the bar, visitors can find casual dining ambience in the Garden's Restaurant. Three dining experiences provide guests with the perfect option for any occasion.

The El Monte Sagrado and its owners, the Worrel's, have created a haven for the mind, body and spirit. They have done this without causing damage to the earth. This is no small feat considering the luxury and

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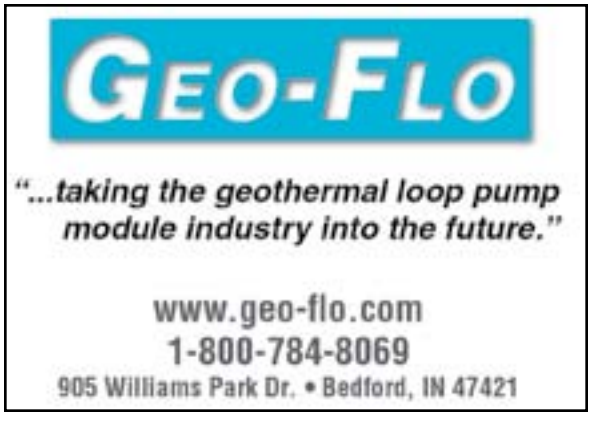
cost of running an award winning spa and resort. Each guest can find their own niche within this spectacular space whether they need the relaxation of a massage or the spiritual reflection found trout fishing in the Sacred Circle. By choosing to use environmentally friendly equipment and practices like GSHPs, the Sagrado sets an example of how to run a successful but eco-friendly business.



Whalehead Club

A North Carolina tradition benefiting from a non-traditional system

By Jennifer Hale

On the Currituck Outer Banks of North Carolina, Corolla Island, the original name of what is now known as the Whalehead Club, continues to stand in its traditional magnificence. In the mid-1920s, a wealthy northern industrialist, who enjoyed water foul hunting and knew the North Carolina Outer Banks was a prime location for the sport, built the residence on its original 4 1/2 miles of ocean to sound front property.

This 21,000 square foot, five-floor structure exhibits the unique style of art nouveau architecture, Tiffany lighting fixtures, corduroy walls and cork flooring. It was also equipped with the first swimming pool, basement and elevator on the Outer Banks and is now equipped with the most environmentally friendly and energy efficient heating and cooling system available: ground source heat pump (GHSP).

Photo courtesy of IGSHPA staff.

The restoration of a North Carolina tradition, the Whalehead Club, was not complete without a non-traditional ground source heat pump system.

According to Edna Baden, Whalehead Club Executive Director, the Whalehead Club is currently open seasonally from Easter to Thanksgiving, but personnel are available year round to give tours by appointment. The Whalehead Club is one of the most spectacular landmarks on the Currituck Outer Banks and still enchants an average 20,000 tourist per year.

The Beginning of a Tradition

From 1925 to 1934, Edward Collings and Marie Louise Knight made the spectacular structure, sitting on 39 acres of beautiful sound front property, their seasonal home. Fifty-six hunt clubs already existed on the Outer Banks so the Knight's called their new home Corolla Island rather than a hunt club. However, they did choose the location because of their passion for water foul hunting.

After the death of the Knights, Ray T. Adams bought Corolla Island for a discounted price and renamed the property Whalehead Club to reflect the local area known as Whalehead. In the late 1960s to early 1970s, the residence began to deteriorate due to a lack of maintenance. After passing through many owners, the club fell into the hand of developers in 1970. Until 1992, developers spent a lot of needed time restoring the property land, but paid no attention to maintenance of the residence. Currituck County purchased the Whalehead Club and remaining 39 acres of land for the purpose of restoration in 1992. At this time the property was in heartrending shape, and according to Baden, one of the major parts of renovating the residence into a museum was the installation of GSHPs.

A GSHP system seems fitting for a home once owned by the Knights. According to Baden, they installed a resourceful heating and cooling system in the residence long before the word air conditioning existed. The 21,000 square foot house has five floors and five chimneys. Four of the chimneys were working chimneys, but the center one was installed solely for airflow. The airflow chimney stops at attic level and the Knights installed a window at this point to suck up all the hot air in the house and let it out through the center chimney.

"Depending on how high they had the window, it provided for nice cooling that actually moved cooler air throughout the house," said Baden. "The Knights installed interior windows throughout the house to allow for a steady, balanced flow of cool air all through the house. It was pretty ingenious."

The Renovating Hand of GSHPs

Photo courtesy of Currituck County Chamber of Commerce.

The Whalehead Club contains 22 Florida Heat Pump manufactured heat pumps that heat and cool its 21,000 square feet. Three are in the attic, eight in the basement and eleven inside the walls of the third floor. The intriguing part about them, according to Baden, is they are not only hidden so the touring public never sees them, but also are quiet and do not pollute the enchantment of the museum with noise.

"There is great debate in the museum field on whether GSHPs should be placed in structures that did not originally have them and there was much discussion among our board members in the early 90's about our decision to use the system," said Baden. "We chose GSHP because most recent research says the system's ability to control the humidity levels really is very beneficial to the artifacts and archives inside the museum."

Photo courtesy of IGSHPA staff.

The ground source heat pump ductwork serves as the veins of rebirth to the Outer Banks legend, the Whalehead Club.

Baden also commented on the systems use of steady ground temperature to heat and cool, which reduces the energy used for the Whalehead Club, making the electric bill lower than a traditional system would allow. Baden vividly remembers the six to eight month system installation process. The yard was completely dug up due to the 63 wells involved. The horizontal system includes 18 trenches, each 24 inches deep and 1 foot wide, and 2 inch polyethylene pipe.

"I would highly recommend the GSHP system," said Thomas Rhea, maintenance man for the Whalehead Club. "It uses ground water to cool, and keeps temperature steady, producing energy savings and high efficiency. GSHPs also have less corrosion since they are indoor units and corrosion problems on the beach are a big deal!"

Completion of the physical restoration of the Whalehead Club in 2002 began the furnishing stage of the restoration process that is currently underway. The Whalehead Preservation trust is trying to acquire as many original pieces of furniture as possible to reflect the Knight era, 1925-1934. Due to meticulous investigation regarding the original pieces in the house from a research team, including a historic decorative arts specialist, many original pieces have already been purchased and close to exact duplicates are in the process of being bought.

"We are building a pretty extensive collection of furniture and accessories," said Baden. "We have recently purchased a chandelier pretty much exactly like the beautiful, crystal, Louie XV chandelier that hung in the library."

The Tradition Continues

The Whalehead Club is the part of Currituck Heritage Park that focuses on the influx of wealthy northern industrialists to Currituck County for the purpose of water foul hunting. Although the population of water foul has decreased significantly since the Knight era, hunting is still a very popular recreation for the area. To aid in preservation of water foul, laws and restrictions, such as bag limits, exist today and are strongly monitored and adhered to by the North Carolina Wildlife Resources Commission.

Along with the Whalehead Club, other historic at-

tractions add to the tradition of Currituck Heritage Park. Many boaters still look for the lighthouse at Currituck Light even though they have technology to navigate without it. The lighthouse is one of only two in North Carolina open to the public and still climbable, according to Baden.

Scheduled to open the first part of 2006, The Outerbanks Center for Wildlife Education will be a new addition to the area. The center will represent the actual fishing and hunting heritage that is so rich in the Currituck Sound of North Carolina. One entire gallery is to be dedicated to the very extensive collection, owned by the Whalehead Preservation Trust, of decoys dating back more than 100 years.

With the renovating hand of GSHP technology, the tradition of the Whalehead Club continues to represent the cultural heritage of the beautiful Currituck Outerbanks of North Carolina. The club reaps the benefits of the system's efficiency and preserving assistance while fascinating tourists with its established splendor.

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Flush Front Loop Pump Module

Geo-Flo Products Corporation
www.geo-flo.com

Geo-Flo Products Corporation manufactures two of the most advanced front flush loop pump modules on the market, giving you a choice of composite or brass valves. Plus, our front flush modules are the only ones with the double o-ring family of adaptors that completely eliminate the possibility of leaks from leak prone tapered pipe threads. These modules are available through your Geothermal Heat Pump Suppliers.

Judy Moan / Customer Service
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Phone: 800-784-8069

XCI Computer Controlled HVAC Building Management Systems

Geo-Enterprises, Inc.
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The XCI family of Network Controller & Schedulers, Communicating Thermostats, Internet/Ethernet Bridge and Windows Based Software are designed to be user-friendly point and click. The software is designed to work on all windows based operating systems. The operator develops the schedules that are required for the building and then transmits this information to the network controller(s). The computer then can be used for other purposes. This system can control heating, cooling, lighting, pumps, exhaust fans, fresh-air intake dampers and the list goes on and on.

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DriscoPlex® 5300 Climate Guard®

Performance Pipe
www.performancepipe.com

DriscoPlex® 5300 Climate Guard® is the right choice to enhance the benefits of ground source heating and cooling. Unicoil™ is the original prefused U-bend, two pipe coil system. The U-bend fitting is factory fused to two coils of pipe to provide an entire geoexchange loop well in one convenient package. The Unicoil™ also has fewer joints buried at extreme depths. Its unique design helps resist buoyant forces and enables it to slide through the toughest borehole conditions. To find out about more benefits of DriscoPlex® 5300 Climate Guard® pipe and fittings, visit us at www.performancepipe.com or call us at 800-527-0662.

800-527-0662

Earth Insights

If you have a question about geothermal installation, design or troubleshooting, send it to Phil Rawlings in care of *Geo Outlook*, Oklahoma State University, 374 Cordell South, Stillwater, OK 74078 or via e-mail to insight@igshpa.okstate.edu.

This column is supposed to focus on "thinking outside the box." However, it's not thinking outside the box, its realizing there isn't one! After nearly 30 years, I continue to be amazed at the "But will it work here?" question. So, let's tear the box apart!!

When asking the question, "Will it work here?" remember:

- Numerous geothermal heat pump systems have been successfully operating in every state, province, and territory in North America for many years.
- Geothermal heat pump systems have successfully operated for many years in many areas around the world, including Europe, China, and Australia (to name a few).
- You want extremes? There are geothermal heat pump systems in Riyadh, Saudi Arabia and inside the North American Arctic Circle that have been successfully operating for years.
- It will work at any "here" you can find. Why aren't you doing more of them?

When considering a geothermal application, think about all ground heat exchange options:

- Closed loop - vertical, horizontal, pond loop
- Open loop - ground water, surface water
- Standing column well
- Hybrid systems

Depending on site constraints and building size/type, all are in play when you begin evaluating a new project. Site constraints and application will lead you to the best option - don't arbitrarily discard any option.

Depending on the size, type, and facility usage, consider your geothermal heat pump equipment options:

- Water to air - ducted or not - vertical, horizontal, console units, vertical stack, rooftops, etc.
- Water to water - radiant, fan coils, process heat/cool, fluid coolers, etc.
- Water heating - desuperheater, dedicated, etc.

Geothermal heat pump systems can condition major commercial or industrial facilities, institutions, multi- and single family housing - the list goes on and on. Want to think outside the box? The real question is if it can be heated or cooled with normal temperature chilled or heated air, considering the growing fossil fuel dilemma, why isn't it geothermal? Or, if the process, system, fluid temperature, etc. falls within the 20-130° F water to water geothermal heat pump fluid temperature range, why isn't the fluid being conditioned with geothermal?

Mr. Rawlings has over twenty-five years experience in the geothermal industry. He is a Certified Geoexchange Designer (CGD) and an IGSHPA Accredited Installer and Trainer.

Performance Pipe the name you trust in geothermal pipe and fitting systems.

You know all about the benefits of ground source heating and cooling – 40-50% reduced operating costs, environmental protection, and extremely quiet aboveground operation. But did you know that choosing the right pipe can make a big difference, too?

Unicoil™ is the original pre-fused u-bend, two pipe coil system created by Performance Pipe. The patented one-piece Polywing u-bend fitting is factory fused to two coils of **DriscoPlex® 5300 Climate Guard®** pipe to provide an entire geoexchange loop well in one convenient package. The Unicoil™ also has fewer joints buried at extreme depths. Plus its unique design helps resist buoyant forces, and enables it to slide through the toughest bore-hole conditions.

Performance Pipe is the name you trust in geothermal pipe and fitting systems.

To find out how you can benefit from DriscoPlex® 5300 Climate Guard® pipe and fittings, visit us at www.performancepipe.com/geo or call us at 800-527-0662.

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