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Going Green at the Beach

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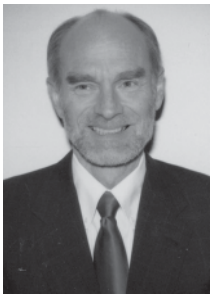

By John Kelly
Executive Director,
Geothermal Heat Pump Consortium

Home sweet home. Next to our families and our pets, there's nothing else we bond to like our homes. And as we transform a house into a home, we personalize every aspect of our living environment. Whether it's a 1,500-square-foot bungalow or a 15,000-square-foot trophy home, we care about all the small details. We want security, comfort, convenience, and economy. You name it – we want it all.

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Notes from IGSHPA

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

The 9th International Energy Agency Heat Pump Conference in Zurich, Switzerland, on May 20-22, 2008, has as one of its workshops, "Reaching the Kyoto targets by means of a wide introduction of ground coupled heat pumps (GCHPs) in the built environment." To accomplish this "wide introduction" will take a heroic effort in all market areas of application. Residential markets have proven to be more than a passing interest around the globe. This is an international initiative that bears our support and collaboration: www.hpc2008.org.

IGSHPA and GHPC members continue to press for governmental support to launch initiatives that will encourage more successful builders, manufacturers, installers and professionals to break from conventional systems to geoexchange – to "get the free energy below their feet" and at the same time reduce our dependence on fossil fuels. If one estimates the number of jobs that would be created it seems almost unreal in comparison to other technologies being considered. What is good is that it is local, which every politician loves.

IGSHPA is spending a great amount of effort to upgrade training manuals and electronic delivery to encourage and recruit more users. We need your support and participation.

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Paul Bony

Marketing and Member Service Manager
Delta-Montrose Electric Association

Paul Bony has over 20 years of utility experience, including energy conservation, demand-side management and customer service. Under his leadership during the past 10 years, more than 400 GeoExchange systems have been installed in over 20 towns in Southwest Colorado through Intermountain Energy, a subsidiary of Delta-Montrose Electric Association. Their innovative Co-Z Energy Plan (a loop tariff) and 100 percent financing programs allow customers to be confident their geothermal heat pump systems will provide long-term comfort and savings, via a single monthly payment on their electric utility bill. Bony is also a member of the Steering Committee for GeoPowering the West. He earned his M.B.A. from the University of Nevada and a B.S. from Kansas State University's College of Agriculture.

Charles Remund, Ph.D.

Professor, Mechanical Engineering
South Dakota State University

Dr. Charles Remund received his undergraduate and masters' degrees in Agricultural Engineering from South Dakota State University, and his Ph.D. in Engineering from the University of Nebraska in 1988. He has been on the mechanical engineering faculty at South Dakota State University since 1988, where he teaches thermodynamics, heat transfer, fluid dynamics, design of thermal systems and applied laboratory courses. Remund has been principle investigator on many research projects associated with ground source heat pumps, specifically addressing heat transfer characteristics of grouting materials, soil and rock. He worked with regional electric utilities and the Geothermal Heat Pump Consortium through the Northern Geothermal Support Center at SDSU, through which many have been trained in various aspects of ground source heat pump design and installation.

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Going Green at the Beach

By Megan Wible

Photo courtesy of Northwest Property Imaging, Inc.

Segments of the Porters' roof are vegetated for energy and storm water management.

Cover Story

Dave Porter and his wife, Anna, made a life-changing decision in 2004 when they bought a 100-year-old house on Warm Beach located just 50 miles north of Seattle. Because the home was so old, it suffered from significant wood rot, poor energy efficiency, vermiculite ceiling insulation and more. However, the Porters didn't mind its flaws one bit because they bought the home for a specific reason–to go green.

Up until this point, the Porters hadn't realized what an effect their lifestyle was having on the earth. Their home at the time was more than 4,000 square feet and sat on a large lot. In 2006, the Porters decided to take action. They committed to transforming their old, rotting beach house into an energy-efficient, environmentally friendly home. In fact, they took it a step further. The Porters decided they wanted their home to meet the strictest green guidelines available in their area. The plan for their house included technologies that would meet the guidelines of Built Green, ENERGY STAR Home, American Lung Association Health House, Environments for Living and LEED for Homes. They even anticipate the home will meet the guidelines of the new National Association of Home Builders Green Building standards, which just launched in January. The project was dubbed "Going Green at the Beach," and the Porters had high hopes it would serve as a demonstration of the latest green technologies. One of the things they planned to include to help accomplish their goal was a ground source heat pump (GSHP).

"For any of the certifications GSHPs are beneficial," Dave said. He also chose radiant floor heating and cooling for his property to eliminate duct work. Although not the most common way to go, radiant cooling works for the Porters because of the moderate temperatures in the Washington area. "Forty percent of a heat loss occurs through the ducts of a home. And so by not having ductwork in this home we feel that we're ahead of the game," Dave said.

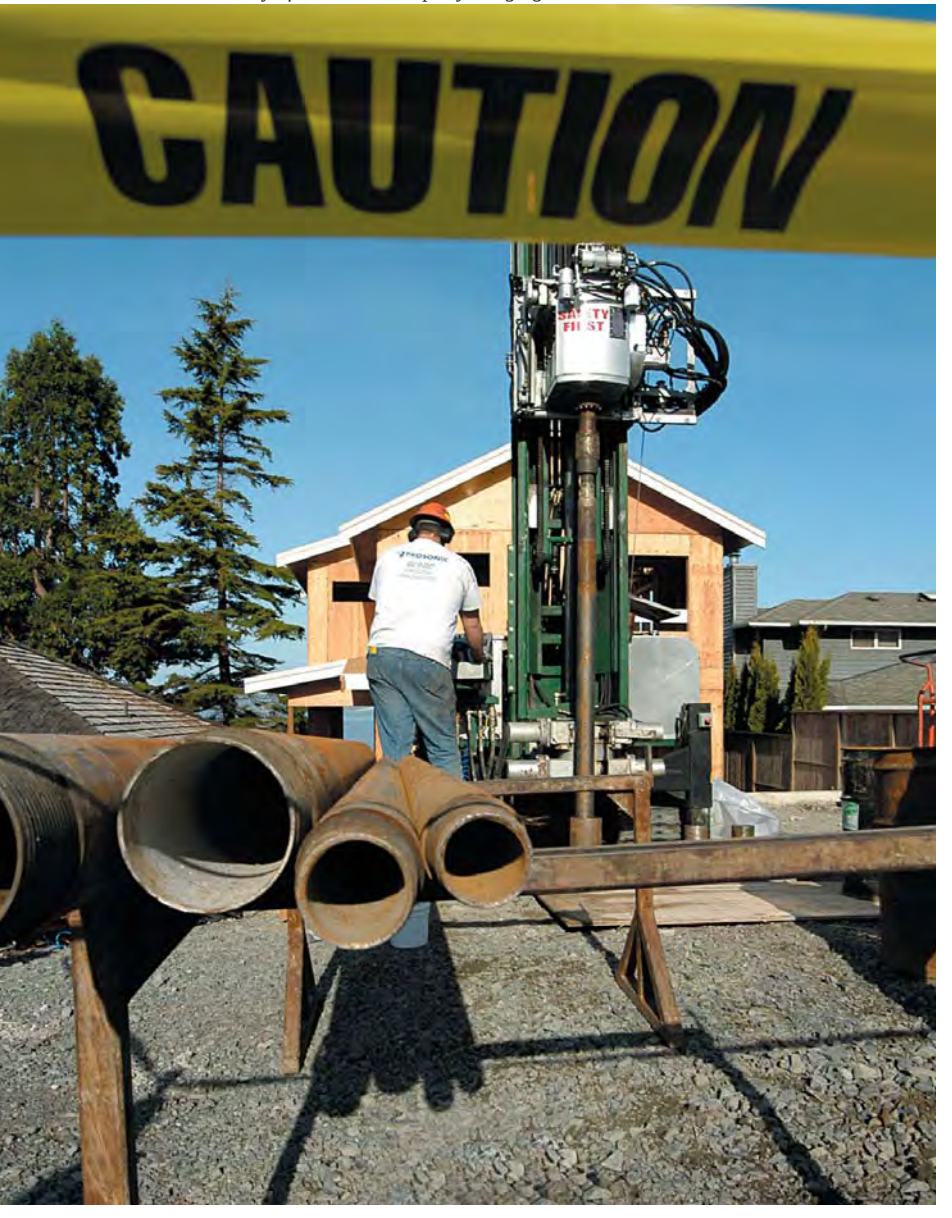
Not-So-Humble Beginnings

The Porters' decision to go green didn't happen over night. In fact, it was more like a series of small improvements to their lifestyle that eventually led to their ultimate decision. With both of their parents being products of the Great Depression, Dave and Anna new how to reduce, reuse and recycle. In 1982, Dave was transferred to Anchorage, Alaska, to work for a mortgage company. The Alaska Housing Finance Corporation offers incentives for energy-efficient homes. Dave became very interested in these loans, but when he moved back to Washington years later he realized that they were just beginning to discuss energy efficiency. "The biggest thing we brought back from Alaska was the knowl-

edge of the importance of building tight but ventilating right," Dave said.

With Washington so far behind Alaska, Dave was instantly an expert on the subject. He now is a mortgage banker working with home builders, providing them information on finance, marketing, and building energy and resource-efficient homes. Even though Dave was helping others obtain energy-efficient homes, his family was still living very comfortably in their large home. In March 2004, the Porters had a major epiphany. Dave had just spoken at another "green" conference, telling builders and real estate professionals about energy efficiency. "I feel like such a hypocrite," Dave told Anna on the way home, according to Going Green at the Beach's Web site. "I teach and speak about building green and then I get into my big Jaguar and drive to my big house on my big lot that consumes a ridiculous amount of energy and water!" The Porters were ready to fully dedicate themselves to making a smaller footprint on the earth. They put their home on the market and opted to downsize considerably with a Built Green-certified condominium at the Issaquah Highlands. Dave also traded his Jaguar for an environmentally friendly Toyota Prius. Soon after, they found their dream-home-to-be, a little run-down house on Warm Beach. It was finally time to get started.

Photo courtesy of Northwest Property Imaging, Inc.



Boart Longyear drilled the 200-foot boreholes for the Porters' home.

The Green Standard

The Porters didn't want their house to have just a few green features; they wanted it to be the best green technology has to offer. The house includes top-of-the-line energy-efficient components, such as geothermal heat, high-efficiency windows, an awning to reduce sun exposure, natural light, advanced framing, ENERGY STAR appliances and compact fluorescent lights. The home also conserves water by using dual flush toilets and low-flow showerheads and faucets. The deconstruction of the original home also played a part in going green because about 80 percent of material was diverted from the landfill. Doors and cabinets from the original home were also used and wine racks were made from the salvageable components of the old

deck. As part of the American Lung Association Health House requirements, the Porters have taken extra measures to ensure high air quality. They used low VOC paints, non-toxic finishes on floors and cabinets, and operable windows so that their home could have efficient ventilation.

Never doubting what geothermal could do for them, the Porters chose Earth Heat to install their system. "I thought of it (geothermal) as a sustainable heating source," Dave said. "It is certainly not cheap but we believe in the end that it will show other people that it can be done." Boart Longyear did the drilling for the vertical system, which was a challenging task considering the Porters' lot is only 30 feet wide. The 2-ton, closed-loop system, with heat pumps manufactured by Hydron Module, has two boreholes drilled 200 feet deep. A first for Earth Heat, the boreholes for the Porters' system are under the garage floor because of the limited space available on the lot. Gerard Maloney, owner of Earth Heat, said the Porters' home uses four different applications of radiant floor heating and cooling: climate panel, thin slab concrete over pour, high mass flap and Warm board. "We've been doing radiant floor now for almost 17 years and I've never had one project that had such diversity to it in that respect," Maloney said. "It's pretty unique."

Photo courtesy of Northwest Property Imaging, Inc.

The 2-ton system keeps the house at the perfect temperature year-round.

Adding a touch of luxury to their 2,700-square-foot beach-front home, the Porters have a guest retreat. Resembling a studio apartment, the retreat has one room that includes a washer and dryer, a full-sized bathroom and a closet. Along with this luxury, the home has many space-saving features, including multiple-use rooms and built-in bookcases. The home also has universal design features, which allow people with disabilities to get around with ease.

Learning Opportunity

More than 40 companies sponsored the Porters' project, mainly through product discounts. "Some of them came to me when they heard that I wanted to build a high-profile demonstration home," Dave said. "Some of them I've known for many years and they believed in the project that we're doing. We've used the sponsors' involvement to help underwrite the Web page and marketing, and to hire a green consultant to help with all of the certifications." Because the Porters aimed so high for all the green certifications available to them, they wanted a consultant to be with them through the planning and construction, to make sure none of the requirements were being overlooked. Also, the education of green technology is very important to the Porters. They wanted to use the planning and construction of their home to demonstrate all that green technology can entail, from simple everyday changes to the more difficult tasks.

Photo courtesy of Northwest Property Imaging, Inc.

In this unique application, the boreholes are underneath the garage floor to save space.

A major component of education for Going Green at the Beach is the Porters' highly accessible Web site, www.goinggreenatthebeach.com. With more than 9,000 visitors, the site is a tool for both those who have some knowledge of green technology, and for those who don't. The Web site lists everything from sponsors to plans, drawings and photos. It also provides a hand-out that shows, room-by-room, all of the green features and what "level" of green they are: light, medium or dark.

Another hands-on component was the walk-in tours that occurred for three weekends in November 2007. More than 1,150 people came to the open houses to see what the Porters had done. "When people walked through and got ideas it was really cool to hear some of the comments," Dave said. "Everything from easy changes to tell me more about the geothermal, tell me more about solar." The Web site still provides learning opportunities as the Porters write monthly updates on the performance of the home.

The Porters are now living guiltlessly green in their new home. And although Dave admits it is more expensive to build a home this energy-efficient, he is happy with his decision to do so. He has since sold both the mini-mansion and the condominium. Beyond that, the Porters have succeeded in their goals. The home not only met all the certifications that the Porters aimed for, but it also received the five-star top honor from Built Green. And it's LEED Gold, the second highest honor that LEED for Homes offers. Going green at the beach isn't an impossible task after all.

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Geothermal Provides **Easy Access** for Homeowners

By Marie Kadavy

Photo courtesy of Southern Comfort Mechanical Inc.

In frigid Steinbach, Manitoba, the snowmelt application completes the home's barrier-free design.

When injuries from a recent accident left Martha Penner with limited mobility, she and her husband, Russel, set out to design a barrier-free home. Completed in August 2007, the couple's 2,900-square-foot home was designed to be wheelchair accessible at the front door, back doors and garage.

"The most important thing was to have a level floor without any stairs, including decks and porches and garages and everything," Russel said. The house's universal design provides for easy movement throughout the home's interior as well.

"We don't have any doors less than 36 inches (wide), so all of the rooms and every nook and cranny of the house is accessible to her," Russel said.

Living in frigid Steinbach, Manitoba, a geothermal system completes the Penners' barrier-free goal. In addition to offering ease and savings, the geothermal system's snowmelt application keeps the sidewalks and driveway clear of ice and snow, and the Penners control the melting process from the comfort of their home.

The couple approached Southern Comfort Mechanical Inc. for a unique, integrated mechanical system. The system was designed and installed by Paul Neufeld, International Ground Source Heat Pump Association (IGSHPA) Accredited Installer. Mel Buhler and Mike Millard served as project managers. Millard said the Penners chose geothermal snowmelt for two reasons: mobility and luxury.

"They can actually get from their vehicle to the front door or to the garage door and enter with no steps, so they already have the convenience of being able to wheel the chair in all from one level from the garage or driveway level into the home," Millard said. "They also wanted to have the luxury of having the snow being removed for them."

The Penners elderly parents visit on a regular basis, and the couple likes to keep the driveway and sidewalks free of ice for their safety, Russel said. Russel also recognizes that his father and his mother-in-law are out and about at 85 and 90, and that someday in the future he might be their age and active. He wants to eliminate the fear of slipping on the ice, but for Russel, salt was not an attractive option.

"It's just a matter of trying to keep the ice clear without using salt or anything like that because I hate using salt," Russel said.

A Unique Application

The 2-pump Hydron Module system totals 10 tons. In the open loop system, 1 1/4-inch polyethylene pipe takes water from the 180-foot supply well to the heat pump and from the heat pump to the return well. Friesen Drillers, who served as the drilling subcontractor for the project, drilled the two wells in 2006 prior to construction.

Photo courtesy of Southern Comfort Mechanical Inc.

The Penners use custom controls operate the 10-ton geothermal system.

The 5-ton water-to-air heat pump provides air conditioning and heating via duct work throughout the home. The 5-ton water-to-water heat pump provides tempered water to the radiant floor in the foyer, washrooms, drive-

Photo courtesy of Southern Comfort Mechanical Inc.

The radiant floor can be controlled to offer maximum comfort for the homeowners.

way, basement slab and garage slab. Because the two-story home includes a basement, the main floor does not have any concrete in which to imbed floor heat pipes. Therefore, the washrooms and foyer of the home are heated with staple-up radiant floor heat, a product that heats the wood floor.

Instead of a central exhaust system, the system includes a heat recovery ventilator (HRV). Desuperheat and hot water circulation provide instant hot water at any of the homeowners' taps. "What you have happening in larger homes is it takes a long time for the hot water to get where it is going, so the circulation pump basically just gives instant gratification," Millard said.

In addition to hot water on the spot, a custom control system offers added convenience and, when necessary, diverts heat from the home to the driveway for snowmelt. Because the home is heated by two heat pumps, one can be diverted to operate the snowmelt drive. The 5-ton water-to-air unit never stops providing heat to the home via duct work, but the tempered water from the water-to-water heat pump can be redirected from the basement, garage and staple-up radiant floor to melt snow and ice on the sidewalks and driveway. The Penners can control the snowmelt process by a timer inside the home, usually set for three hours.

For this project, Southern Comfort relied on advice from Ed Lohrenz of Geo-Xergy Systems Inc., who has extensive experience with snowmelt applications. Being its first winter season in operation, the Penners' system was in need of a few adjustments to get the snowmelt drive working properly. Neufeld is working with the Penners to make the necessary modifications. Millard said he has full confidence in the system and Neufeld's work, and he is committed to ensuring the Penners are satisfied with their geothermal choice.

Another possibility for the Penner home is the incorporation of the fireplace into the house's heating system. Heat generated by the fireplace can be distributed throughout the house using the water-to-air heat pump. So far, the wood fireplace has not been added to the 100 percent geothermal system to create a hybrid system, but it remains an option for the homeowners.

A Geothermal Hotbed

In addition to the system installation, Southern Comfort Mechanical served as the full-service mechani-

Photo courtesy of Southern Comfort Mechanical Inc.

The home's radiant floor haeting is accompanied by forced air.

cal contractor. Starting its seventh year of business, the company has been installing geothermal systems for five years, and the demand for geothermal has grown. Last year, the company installed 20 systems. This year the company has sold 60, for a total of about 140 over the last five years.

"We're in a rural part of southern Manitoba," Millard said. "There is a lot of heat pump activity here. Manitoba is probably the hotbed of geothermal activity per capita in North America."

Being from southern Manitoba, Penner was aware of the increased comfort and operational cost savings associated with a geothermal system, Millard said. "Plus it is the most cost-effective, long-term solution for snowmelt."

A System of Savings and Ease

Because the Penners plan to keep the home for a very long time, Millard said their decision to go geothermal just made sense. "We tried to design a system that is as easy as possible for the customer to utilize, and, from a comfort standpoint, there is no comparison to what geothermal provides at the cost long term," Millard said.

But, there is more to a geothermal system than just comfort. "I think a big part of his decision to go geothermal besides all of the bells and the whistles and the benefits was he also understands that the operational cost is lower," Millard said.

According to Southern Comfort's calculations, the Penners' home and garage requires just under 100,000 Btus. The company calculates residential heat loss calculations in accordance with the Heating, Refrigeration and Air Conditioning Institute (HRAI) Residential Heat Loss and Heat Gain Calculation Course. Estimated heating, cooling and hot water costs for an all electric alternative is $3,800 per year. The estimated operating cost for the geothermal system is $1,100 per year, a savings of about $2,700 per year.

"I was hoping to save some money in the long run," Russel said. "With energy costs rising all the time, my thinking was it was probably prudent to have a system that would use a little less energy in the future."

Although the savings are a plus for the Penners, Millard said he thinks comfort and simplicity were the biggest priorities when the Penners chose their heating and cooling system. "There are a lot of customers where the payback number means a lot more to them, but with him, I think it was really an assembly of all the different factors: comfort, payback, price, the environment, doing the right thing, what's most comfortable, what's easy," Millard said.

An International Success Story: Palestine's First Geothermal Project

By Khaled Al Sabawi and Kelly Green

As the economy of the Palestinian Territories continues to develop, the Palestinian people find themselves in dire need of an efficient and economical source of energy that can meet their energy requirements. Due to the lack of available energy resources and the soaring global energy prices, Palestinians are paying 14 cents per kWh of electricity and $1.30 per litre of diesel fuel; energy prices among the highest in the entire Middle East and North Africa (MENA) region. Moreover, Palestine experiences one of the world's highest population growth rates: 3.66 percent per year in Gaza and 2.99 percent per year in the West Bank. In the eyes of the board of directors of Union Construction and Investment Corp. (UCI), one of the leading development companies in Palestine, renewable energy and efficient urban planning have become the most vital part of achieving sustainable and affordable living in Palestine.

Photo courtesy of Khaled Al Sabawi.

The Etihad Subdivision in Ramallah will utilize geothermal heating and cooling.

"The need for renewable energy became very clear to UCI in the early stages of developing the Etihad Subdivision," said Khaled Al Sabawi, the business development

manager for UCI. The Etihad Subdivision is the largest residential subdivision undergoing construction in Palestine. Built in the city of Ramallah, located just north of Jerusalem and Bethlehem, the subdivision includes 62 semi-detached villas and a commercial center built on an area of 24,000 square meters (5.93 acres).

In late 2006, Khaled began researching available forms of renewable energy that could be incorporated well into new residential and commercial construction. Knowing that heating and cooling account for roughly 60 percent of the total energy consumed by a typical household, Khaled conducted thorough feasibility studies on the available forms of renewable energy in the HVAC industry that could suit the local environment in Palestine. Since Ramallah is about 800 meters above sea level, it experiences relatively cold winters in addition to the hot summers of the Mediterranean. "It became clear immediately," Khaled said, "that the most efficient, economical, and environmentally friendly technology available today that can provide both heating and cooling for our climate is geothermal technology."

Since geothermal technology was not available anywhere in the MENA region, UCI was required to look outside the continent for supplies and equipment. Khaled was aware that in order for geothermal technology to succeed and thrive in a new economy, it needed to be financially feasible and replicable in local markets of the MENA region. "It became crucial for us to find the right geothermal heat pump manufacturer," Khaled said. "We were looking for a leader in the geothermal industry that has excellent international experience and can meet our expansion and demand overseas." After sig-

Photo courtesy of Khaled Al Sabawi.

After researching renewable energy, Khaled chose geothermal, which he says is the most economical and environmentally friendly technology available.

nificant research, Khaled concluded that WaterFurnace was the right partner. “Once I learned of WaterFurnace’s expansion throughout Europe and that they manufactured an entire 50Hz product line, I was sure that WaterFurnace could meet our demand. When visiting their facility in Fort Wayne, Ind., I witnessed their enthusiasm and interest in bringing geothermal to Palestine and the MENA region.”

Funding the Development

While UCI was bringing geothermal technology to Palestine, the European Union Energy Initiative (EUEI) was in the midst of launching a new project called the MED-ENEC Project on Energy Efficiency in the Construction Sector, designed to boost energy efficiency measures in the construction sectors of the Mediterranean. The MED-ENEC project included a pilot project competition that would provide funding for 10 countries that were to be selected by the MED-ENEC committee. After submitting a lengthy application in partnership with the Palestinian Energy Authority, UCI was awarded pilot project funding for the implementation of a residential geothermal system in the demo villa in the Etihad Subdivision.

“This was a great boost for our efforts and a great incentive to pursue geothermal technology,” Khaled said. “The EU clearly understands the difficulty of implementing a new technology and importance of the success of the first project. We were excited to start working.”

To jump start the project, Khaled immediately enrolled in WaterFurnace’s Geothermal Piping Design and Service and Installation training programs held in Seattle in early 2007. He received his Accredited Installer designation from the International Ground Source Heat Pump Association (IGSHPA) and the required certifications from WaterFurnace.

Getting an Efficient Start

Before getting to the geothermal system, it was necessary to first focus on improving the villa’s efficiency. It was necessary to improve the villa’s insulation thereby reducing the total heating and cooling energy requirement and the total required geothermal ground loop. In order to meet the EU insulation standards the villa’s wall

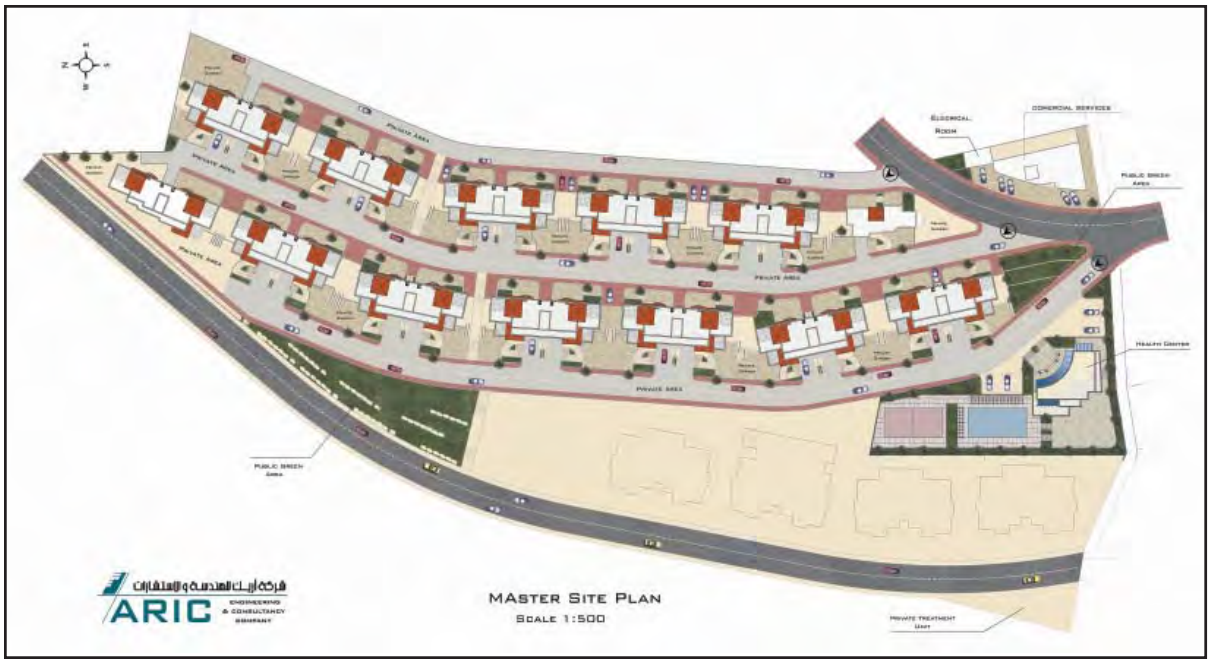


Photo courtesy of Khaled Al Sabawi.

Built on 24,000 square meters, the subdivision includes 62 semi-detached villas and a commercial center.

and windows were insulated to reach U-values of 0.87 watts per meter squared Kelvin (W/K•m^2) and 2.98 W/K•m^2 respectively. Watts per meter squared Kelvin is the unit used by Europeans instead of the R-value used in North America. "We even insulated the floor to a U-value of 0.8 W/K•m^2 to reduce heat loss and heat gain from the walk-out basement and garage below," Khaled said. "This improvement in insulation reduced our heating and cooling load requirements by 20 percent." The 300-square-meter demo villa includes three floors, a walk-out basement and a garage.

Like most countries that experience geothermal for the first time, UCI faced some obstacles when it came to the design and installation of the ground loop. "To our knowledge, there does not exist any ground thermal conductivity data in Palestine, let alone the rest of the MENA region," Khaled said. "We were required to design this system literally from the ground up." With the help of WaterFurance, UCI was able to locate and import the highly demanded thermal conductivity testing equipment, which is required to collect the necessary data from the ground. "It was the first time for this type of equipment to enter the region," Khaled said. "Once the conductivity testing unit arrived, it was held for three months by Israeli Security, which controls all borders and all imports into Palestine."

Drilling was also an issue during the project. "The most prohibitive cost that can render a geothermal project infeasible is that of drilling," Khaled said. "We spent a significant amount of time battling the issue of finding a good drilling contractor." With the limited area surrounding the villa, boreholes needed to be drilled to a depth of 70 meters (about 230 feet). Some contractors, Khaled said, drilled to a depth of 9 meters and could not continue due to insufficient drilling equipment. In addition, contractors charged high drilling prices that increased as they drilled deeper. As a result, in order to complete the project and create a sustainable and thriving industry around geothermal, Khaled was required to purchase a brand new vertical bore drilling rig. "Considering that we had no previous experience in drilling, putting together a new drilling operation was a significant investment and a challenging task," Khaled said.

Enjoying a Successful Project

After lots of hard work and patience, things finally came together. Two WaterFurnace water-to-air geothermal heat pumps were selected to provide both heating

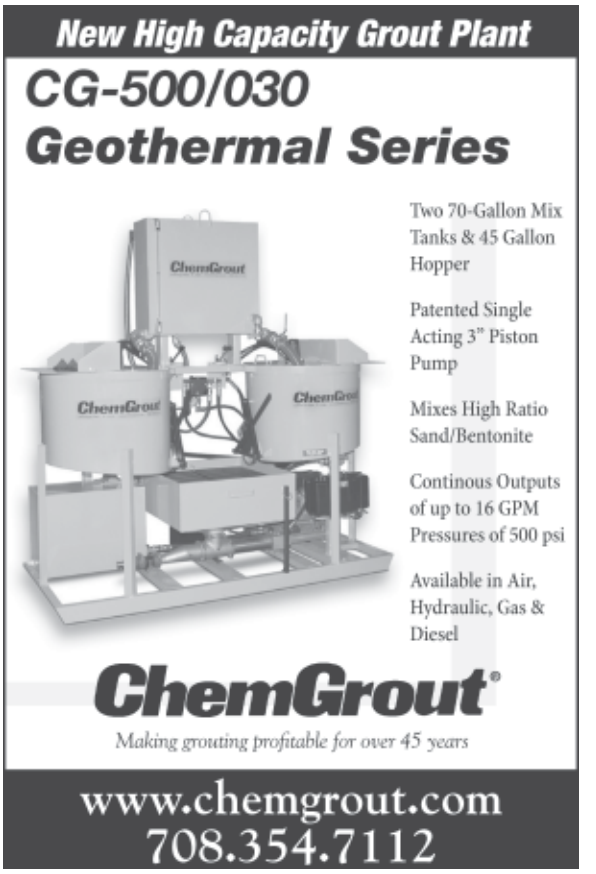
Photo courtesy of Khaled Al Sabawi.

Khaled expects the first geothermal system in Palestine to reduce operating costs by more than 70 percent.

and cooling to the demo villa through a duct distribution system. The ground heat exchanger utilizes 10 vertical boreholes, each 70 meters deep.

The most common conventional HVAC systems in Palestine use diesel-powered boilers with radiators for heating and forced-air split units for air conditioning. With the current energy prices in Palestine, operating costs for conventional systems, especially diesel-powered boilers, have become simply unbearable for most Palestinians. "We expect this geothermal system to reduce operating costs from $3,000 per year to a mere $850 per year, which is over 70 percent in savings," Khaled said. "We expect a simple payback period around 5 years."

The success of this first geothermal project has also built enormous momentum for UCI. "It was lots of hard work, and we couldn't have done it without the support of the MED-ENEC and WaterFurnace," Khaled said. "In addition to being able to offer geothermal to the remainder of our 61 villa residents in the Etihad Subdivision, we have already started implementing our first commercial geothermal system in our very own 260 kilowatt (74 ton) office building in Ramallah. We expect this system to achieve enormous savings." Furthermore, UCI is now offering geothermal to the entire Middle East and North Africa through their newly formed sister company MENA Geothermal. ◆



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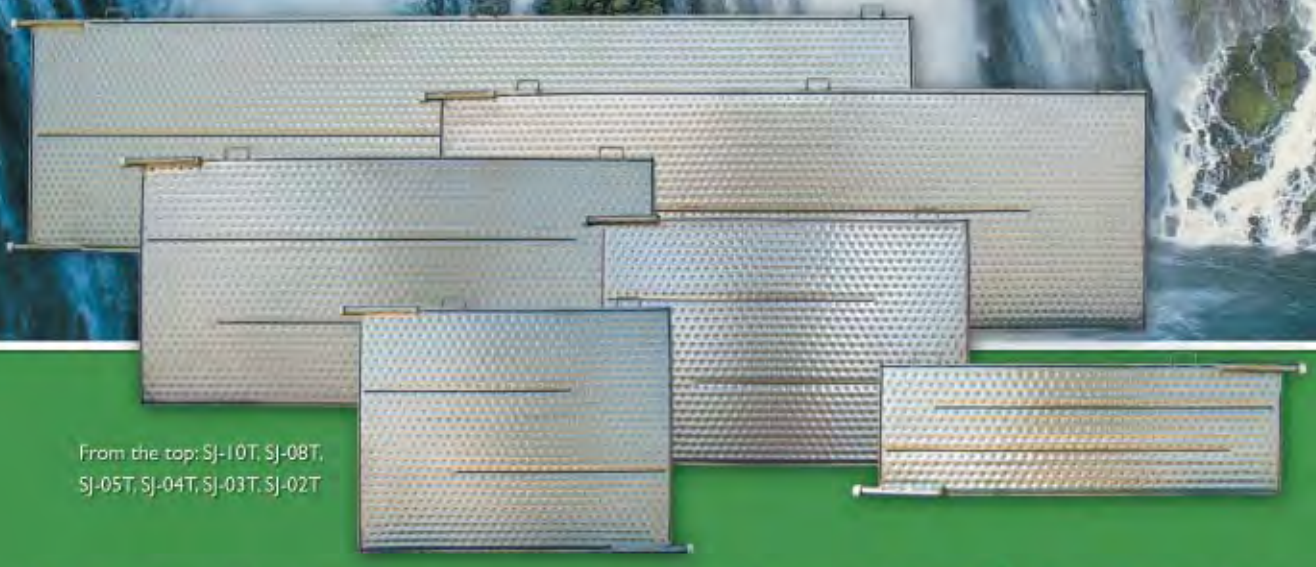

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How Homeowners Can Get More **Green:**

What Builders Need to Know

By Marie Kadavy

Illustration by Hannah McGill

Green technology is more affordable than ever, and, with assistance from a green mortgage, the average homeowner can now enjoy the comfort and savings of energy-efficient products while satisfying the desire to be environmentally friendly. With the help of Brian LeBars, a senior mortgage planner, we have compiled this information about green mortgages as a tool for homebuilders and contractors.

Interested in environmental issues for years, LeBars always came back to the same question, "What can I do to better serve my clients and take my client experience past just a mortgage?" His search for the answer led him to establish Green Mortgage Group, a division of Cirrus Financial. With socially responsible practices, Green Mortgage Group provides customers with much more than a traditional mortgage.

"A loan is a loan," LeBars said. "You pay it back with interest." But now, he and other mortgage brokers are lending more while promoting the use of green technology.

What is a green mortgage?

A green or energy-efficient mortgage allows homeowners to calculate the extra energy savings from green products as additional income, giving homeowners more buying power and allowing them to secure better loans.

Are green mortgages new?

According to The Daily Green, an online consumer's guide to all things green, President Jimmy Carter signed an executive order in 1979, establishing incentives for energy-efficient homes and creating the green mortgage. Although these mortgages are not new, they are gaining popularity and media coverage, especially with climate change woes and energy dependence concerns on the rise.

What is the outlook for green mortgages?

LeBars expects 2007 to go down as "the year of green." Although he anticipates this surge in green to have a positive effect on residential real estate, for now, most homeowners are only reaping the green benefits

Learn More About Green Mortgages

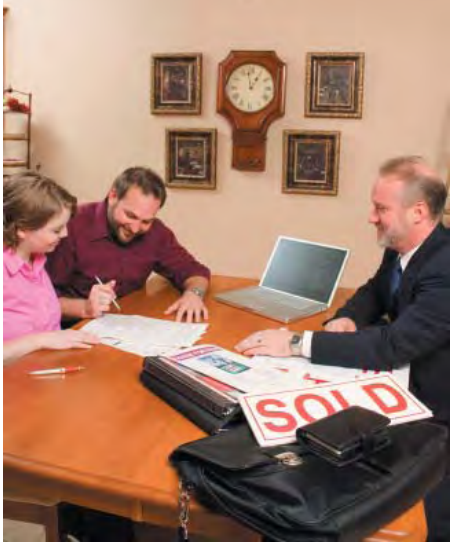
Green Mortgage Group
Greenmortgagegroup.com

'Green mortgages' taking root
Boston Globe, Nov. 15, 2007
boston.com/business/personalfinance/articles/2007/11/15/green_mortgages_taking_root/

Green mortgage – found money
The Daily Green – the consumer's guide to the green revolution
http://www.thedailygreen.com/going-green/tips/875

Or contact your local mortgage lender

on the construction side, he said. LeBars has yet to see a similar swell in green lending.



Energy savings from green products can be calculated as additional income, giving homeowners more buying power.

How could this information help me as contractor?

LeBars says builders can use this knowledge of green mortgages to help customers qualify for their desired home. "Builders should be utilizing this service and the products available as the credit tightening in the secondary mortgage market continues to affect so many loan programs," LeBars said. "Green mortgage products and tax benefits are a great way to move property."

Are other green financing options available?

A number of other green financing options and incentives are available, from rebates to discounts on closing costs and even investments in climate change funds.

- **Financing Green Products**

  Fannie Mae and Freddie Mac have a program that allows borrowers to finance energy-saving products for their home. "For example, a buyer could elect to have a GSHP installed in their new home while the cost is rolled into their mortgage," LeBars said.

- **Green Rebates**

  According to *'Green Mortgages' Taking Root*, a Nov. 15, 2007, Boston Globe article, Bank of America, another energy efficiency advocate, offers an energy credit mortgage program that gives $1,000 back to buyers whose new construction homes meet Energy Star efficiency ratings.

- **Climate Change Mortgages**

  According to their Web site, by having customers contact them directly, Vancity and Citizens Bank of Canada plan to invest money usually spent acquiring the borrowers' business into a fund to help fight climate change.

- **The Tree Planting "Green" Mortgage**

  Not to be confused with the green mortgage that grants consumers more buying power, some lenders offer a green mortgage in which they plant trees on the borrower's behalf.

- **Green Lenders**

  Some mortgages are not green themselves, but the lender is green. "The same consumer who wants to buy a geothermal system because of the long term environmental benefits, when given the choice between two sources for their mortgage – both offering competitive rates and a high level of service – would rather deal with the company or the individual who is not only creating a better experience through the use of technology, but minimizing their impact on the environment," LeBars said.

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What green products qualify for green mortgages?

Green mortgages are reserved for products and appliances that offer maximum utility cost savings, so not all green features qualify. According to *'Green Mortgages' Taking Root*, green building products that do not have a considerable impact on utility costs, such as bamboo flooring or recycled building materials, are not eligible. However, the mortgages are ideal for products such as geothermal systems, solar panels and Energy Star appliances that typically offer homeowners significant savings.

How can homeowners apply?

According to The Daily Green, to apply for a green mortgage, homeowners need to provide their lender with a Home Energy Rating System (HERS) report to verify the home meets efficiency guidelines. For retrofits or when refinancing, a trained energy rater can estimate savings. For new construction, the builder can supply proof.

◆

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New Orleans
Rebuilds with GSHPs

By Kelly Green

Hurricane Katrina, which hit the Gulf Coast on Aug. 29, 2005, was by far one of the worst natural disasters in American history. The 125 mph winds and extreme flooding destroyed thousands of homes. Even two and a half years later, many of those homes are still being put back together. As the process continues, Global Green USA, a national non-profit organization, is making great strides to put sustainability in the forefront of the rebuilding effort.

In April 2006, Global Green announced an international design competition with actor Brad Pitt as the jury chairman. They asked architects from around the world to submit a net-zero energy, LEED Platinum design for affordable housing including five single-family homes, an 18-unit apartment complex and a community center for Holy Cross, a low-income neighborhood in New Orleans' Lower 9th Ward. The 9th Ward was hit hard during Katrina. Bounded on the south side by the Mississippi River, the area was left almost completely underwater when the levees collapsed.

"In the week after the storm and watching the horror of not just the storm but the complete failure of our government to respond to the tragedy, I was moved to act and we put together a plan to advance the green rebuilding of New Orleans," said Matt Petersen, president and CEO of Global Green USA. "Within a few weeks after the storm, we hired a New

Brad Pitt served as chairman for the Global Green design competition. Pitt is pictured here with Matt Petersen, president and CEO of Global Green USA.

Photo courtesy of Global Green USA.

Orleans resident displaced by the storm to help us part time, and had visited New Orleans to survey the damage – the design competition with Brad the next year took this all to another level."

Global Green received more than 125 design entries. "The sustainable design competition not only linked to our goal of adopting a neighborhood, it helped capture the passion and talent of as many people as we could to focus on solving the problem of sustainable building in New Orleans," Beth Galante, Global Green USA's New Orleans office director, said.

Andrew Kotchen and Matthew Berman of workshop/apd (New York, N.Y.) won the competition with their design, "GREEN.O.L.A." In addition to solar panels, a rainwater harvesting system and many other sustainable systems, the design incorporated geothermal technology to provide heating, cooling and hot water for the project. "Although it is a modern design, it resembles the traditional New Orleans shotgun-style homes," Galante said. "We felt it captured the best ideas for sustainable design."

The first home, complteted in February 2008, will utilize a 2-ton WaterFurnace heat pump. "In wanting to better understand how we can incorporate efficiency into all the mechanical components in the house and utilize natural conditions that exist, geothermal is the best opportunity out there," Kotchen said.

Is Geothermal a Viable Option?

As part of the competition Petersen said "GREEN.O.L.A." and the five other top designs were reviewed and refined by a team of local and national sustainability consultants led by Global Green USA and involving the U.S. Green Building Council and American Institute of Architects. The consultants helped Kotchen and the others determine the feasibility of the technologies proposed in the designs. "The team of people that's been assembled for the project are a very intelligent bunch that raise interesting debate about certain issues including geothermal cooling and its viability in affordable housing," Kotchen said. "All of these things have been explored and carefully considered in the project."

Photo courtesy of Global Green USA.

Geothermal was chosen for Holy Cross, a low-income neighborhood, because of its energy efficiency.

While geothermal technology had been used in selected commercial projects, it had not been widely used in the area for residential applications. "Global Green was committed to piloting a geothermal system in New Orleans, of which there are limited examples in the region," Petersen said. "Through our entire project, we hope to build capacity in the professional community and reduce barriers in New Orleans to pursue many technologies, including geothermal which could greatly help reduce energy use."

The team explored all options and alternatives, however, including air-source heat pumps. Ronald Perkins, who served as a mechanical systems consultant for the project, said geothermal was ultimately chosen for Holy Cross because of its efficiency. "The air-cooled systems were promoting a SEER (seasonal energy efficiency ratio) of 15," Perkins said. "With the hot water component, the geothermal system will have a SEER of over 20." Perkins' company, Supersymmetry USA, specializes in efficient air conditioning systems. "There's about a 30 percent improvement in efficiency when you go from air-cooled to water-cooled," Perkins said. "I think that's pretty much the future of efficient air conditioning."

Installing the System

Workshop/apd's original design called for a vertical ground heat exchanger. "We thought that (a vertical installation) would be the easiest and most efficient way to implement it," Kotchen said. During the revision phase of the competition, however, concerns from the Army Corps of Engineers and Louisiana Department of Transportation and Development (LADOTD) about the boreholes' effect on the earthen levee, which sits adjacent to the site, dictated a change to a horizontal slinky installation. "They (the Army Corps of Engineers and LADOTD) worry it would begin to undermine the structural integrity of the earthen levee if there was vertical loops," Kotchen said.

Now, about 1,200 linear feet of 3/4 inch slinky pipe buried beside and behind the home serve as a ground heat exchanger. The ground loop also was integrated with the rainwater harvesting system to increase the cooling capacity and offer some thermal storage. A cooling tower on the harvesting system's main storage tank helps cool the loop water during peak summer months. Perkins said the cooling tower was added to the design

For the competition, architects submitted net-zero energy, LEED Platinum designs for five single-family homes, an 18-unit apartment complex and a community center.

to maintain the high efficiency of the heat pump by supplying lower condenser water temperatures. "We didn't know whether we had enough ground loop contact to dissipate the heat," he said. "In hindsight, I see that we have more than enough."

The switch to a slinky installation only left the consultants with one problem. Now, they are not sure they have enough land to give each home its own ground heat exchanger. "We are going to monitor the performance of the horizontal loop system and determine if we can use it throughout the project, but we are constrained by land space," said Petersen. "Our team is also exploring a communal loop system or a vertical system farther away from the river."

Galante said the entire project – the homes, the apartment complex and the community center – should

Photo courtesy of Global Green USA.

Due to limited space, the project team is exploring several options, including a communal loop system.

be completed within 16 months. The final homes will range in size from 900 square feet to 1,100 square feet. The 18-unit apartment complex will be about 180,000 square feet.

Educating New Orleans and Beyond About Sustainability

In addition to housing a retail component, such as a coffee shop or grocery store, Petersen said the community center will also serve as Global Green's permanent home in New Orleans and a sustainability education center to help inform Holy Cross' residents and others about the benefits and advantages of sustainable building practices. Global Green and the others involved with the project hope it will spur sustainability in the area.

When it comes to the widespread acceptance of more sustainable building practices, Daniel Winkert, of John C. Williams Architects, LLC, architect of record for the project, believes the education process will be the biggest obstacle to overcome. "The challenge is getting the sustainable material suppliers focused more regionally here and getting more and more contractors and consultants up to speed in these methods and materials," Winkert said. "It seems like everything is an education process, which it always is, but it seems even more so in this case."

Winkert said he hopes Holy Cross' future homeowners and tenants experience an increased level of comfort while using less energy in their new residences. "That's what our goal is," he said. Winkert said he also hopes the use of geothermal technology will continue to increase in the New Orleans area. He said Global Green is even exploring using the Mississippi River for pond loop geothermal applications.

Kotchen thinks it is important to remember that sustainable building can be available to everyone. Whether or not more advanced systems like solar and geothermal are implemented, homes can be more efficient by considering things like the building envelope and the types of materials used, he said. He believes it all starts with intelligent design. "If you start with a base model, well-designed, efficient home where there isn't excess square footage and excess materials then I think absolutely there's no reason why every home in the country can't be built with a more sustainable approach," Kotchen said.

In the end, Holy Cross will stand as a testament to the range of opportunities now available in sustainable building. "The first home will serve as a showcase – educating not just residents but the multitude of visitors that come to our project – of incorporating sustainability strategies that make any home more affordable and healthier to live in," said Petersen. Whether in ways big or small it shows that sustainability is available and achievable for homes of any size.

Photo courtesy of Sally Asher

A Homeowner's Perspective of Going Geo

By Megan Wible

With talk of global warming regularly on the evening news, many homeowners are starting to look for ways to be more energy efficient. Some buy compact fluorescent light bulbs to save on utility costs; others upgrade doors, windows and insulation. George Dugan has recently made the decision to be more energy efficient by installing a ground source heat pump (GSHP) in his new home. Dugan is the southeast regional manager for CETCO, a manufacturer of drilling fluids for horizontal and water well drilling applications.

Photo courtesy of George Dugan.

The 2,400-square foot home sits on a golf course in huffman, Texas.

Dugan writes many trade magazine articles and tries to promote the GSHP industry in any way possible because he feels it is the most energy-efficient system available. "Ground source heating and cooling is an effective and available technology that can help reduce our dependence on foreign oil and reduce greenhouse gas emissions," Dugan said.

Since starting with CETCO in 2000, Dugan has been waiting for the opportunity to have his own GSHP and was glad when the time finally arrived. His new 2,400-square-foot home is just northeast of Houston in Huffman, Texas.

Photo courtesy of George Dugan.

Dugan wanted his own ground source heat pump since he started working for CETCO in 2000.

With three bedrooms, two bathrooms, and an office, the home sits elegantly on a golf course. "We are enjoying the comfort of our new home," Dugan said. "I am pleasantly surprised at how quiet the ground source heating and cooling system operates and the indoor temperature seems to fluctuate less than in my previous house."

Obstacles in Going Geo

Before the construction started on his new home, Dugan researched numerous builders. Because of Dugan's experience in the industry, he felt he had an advantage over the average consumer when it came to the geothermal portion of the project. "I knew exactly what type of system I wanted as well as how I wanted it installed," Dugan said. Even with his advantage, Dugan still encountered some difficulties while getting started on his home. His main obstacle was finding a builder that knew about geothermal. Dugan settled on Mike Adamek of Adamek Homes. Even though Adamek had never done a geothermal home before, Dugan said he was very eager to learn more about it. "I was fortunate that I had a builder who was open-minded and flexible about incorporating the GSHP into his build," Dugan said. Having Adamek build his home proved to provide positive feedback for GSHPs. "When I started talking about the GSHP system and showed Mike the information I downloaded from the Internet from WaterFurnace and IGSHPA's Web sites, Mike said that he wished he would have already known about GSHPs," Dugan said.

Efficiency at Work

Dugan purchased a 4-ton GSHP unit through a CETCO distributor, ReBearth Products. A local air-conditioning and heating contractor, Tracy Bounds, installed the unit and the loops were installed by William McPike of Geothermal Drilling. "I worked with William and his crew during the drilling and loop installation process using fluid products and thermally enhanced grout provided by CETCO," Dugan said. The WaterFurnace system utilizes four vertical loops drilled 265 feet deep. Grouted with Geothermal Grout mixed with 350 pounds of sand per batch provided a thermal conductivity of 1.0 Btu/hr-ft-°F.

Photo courtesy of George Dugan.

The Dugans' 4-ton ground source heat pump utilizes four vertical loops drilled 265 feet deep.

Dugan's home contains other green features to help his system work more effectively. The walls are 6 inches thick, instead of the standard four, to allow for additional insulation. There is also extra insulation in the attic along with a radiant barrier and extra ventilation. The house has R-19 insulated ductwork throughout. The windows and doors are energy-efficient models and the Dugans have a tank-less hot water system that has the option of tying into the geothermal system. Also, most of the lighting will be fluorescent and there are numerous ceiling fans in the house.

Photo courtesy of George Dugan.

The loops were grouted with Geothermal Grout mixed with 350 pounds of sand per batch.

Advice for Others

"The best advice I can offer for homeowners considering a geothermal heating and cooling system is to do some research and learn as much as they can before they make any decisions," Dugan said. Dugan and the International Ground Source Heat Pump Association (IGSHPA) also recommend consumers make sure the contractor installing the unit is knowledgeable and qualified. IGSHPA's Web site gives consumers access to a business directory, where they can search for accredited installers, Certified GeoExchange Designers and trainers. IGSHPA pioneered installation accreditation and still serves as the industry standard.

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In the News

Practice What You Teach

From the Boston Globe

www.bostonglobe.com

A professor of international environmental policy at Tufts University and senior director of the Tufts Institute of the Environment has gone green. William Moomaw and his wife completed their environmentally friendly retirement home last July. The house has solar panels, a ground-source heat pump, and other energy-saving features. "One of our goals is to provide an example, though people can do a lot less than we've done and still make a big difference," Moomaw told the Globe.

Green with Envy

From the Kansas City Star

www.kansascity.com

The Unity Village Hotel and Conference Center near Kansas City, Mo., became the fourth hotel in the United States to be certified as completely green by the U.S. Green Building Council. The 50-room lodge features 37 geothermal heat pumps which use the earth's constant temperature to heat and cool the facility. Gary Rodgers, Unity's director of hospitality, thinks the green-factor attracts guests. "We've attracted like-minded organizations who not only practice being green but have green meetings," Rodgers told the Star.

Living the Green Life

From the Cornish Guardian

www.cornishguardian.co.uk

A new, 10-home housing project in the United Kingdom is now complete. The homes were built with environmental savvy in mind and all include ground source heat pumps. The land was donated by the North Cornwall District Council and a governing body provided a grant to build the homes. Peter Moore, director of Cornwall Rural Housing Association, said the homes could have been leased many times over. "We are a very small organization and we do about one scheme a year on average but we could build houses anywhere in Cornwall and be able to fill them," Moore told the Guardian.

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 igshpa.news@okstate.edu.

Let's Get All Residential!

Over 30 years ago, a professor at Oklahoma State University installed one of the first closed-loop, earth-coupled ground heat exchanger systems for his new home. Since then, tens of thousands of closed-loop geothermal heat pump applications have been installed throughout North America using horizontal, vertical, or pond loop ground heat exchangers. The proven efficiency of this renewable green technology is well known. Homeowners enjoy the quiet surroundings offered by a geothermal system because there is no outdoor equipment. They also appreciate a quick payback for the additional first cost, and utilize the reduced-cost hot water provided by the desuperheater.

However, many contractors ignore the average and smaller home markets. ANY home can use geothermal and benefit from the improved comfort, quiet outdoors, and reduced-cost hot water while realizing unbeatable heating and cooling energy cost savings. Typically, if you add the difference between the first cost of a geothermal system and the cost of a conventional system to a new home loan, the increase in the house payment is offset by utility savings and creates a positive cash flow from the beginning. Note that I didn't say trophy homes, half or quarter million dollar homes, or anything of the like – just a new home loan.

Our society is reminded of energy costs every time we fill up the car. We need to conserve energy, and nothing conserves energy better than a geothermal heat pump. Compare the overall benefits of geothermal with any other energy-saving technology a family might use: Solar hot water? Compare its benefits to saving 30 percent to 40 percent on heating, cooling and hot water with geothermal. High fuel efficiency or hybrid cars? Compare how much you use your car to a system working 24 hours a day, 365 days a year to provide heating, cooling, and hot water for your house. Work the math – the choice is simple.

Finally, when comparing geothermal and conventional systems, remember that an air conditioner or air source heat pump with an SEER of 15 is not equal to a geothermal heat pump with an EER 15 – it is much less efficient. SEER and EER are not the same!

Mr. Rawlings has more than 30 years experience in the geothermal industry. He is a Certified GeoExchange Designer (CGD) and an IGSHPA Accredited Installer and Trainer.

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THE POWER OF NATURE

has never been so efficient

coming soon from FHP

AQUARIUS II

PREMIER SERIES

Our second generation AQUARIUS II Series brings you the highest efficiency geothermal heat pumps available on the market today.

The AQUARIUS II Series features a state of the art two stage unloading scroll compressor which, when controlled by a multistage thermostat, stages the unit to match the demand for heating and cooling. The result, up to 70% lower energy bills, increased comfort and better humidity control.

All FHP's AQUARIUS II Series units come ready for operation in a geothermal application. Using the earth's energy to heat and cool your home not only makes economic sense but is good for the environment. No oil, natural gas or propane is used in the operation of a geothermal unit meaning no carbon dioxide emissions that may harm our environment.
Increase your energy savings with an internally mounted heat recovery system providing much of your hot water needs at virtually no additional operaing cost.

- **Efficiency**
  The industries highest rated series for efficiency. Two stage compressor operation together with ECM motor technology mean lower utility bills year round.

- **Quiet Operation**
  Designed for quiet operation with a floating base pan together with ECM fan motors and the UltraTech™ unloading scroll compressor give you truly quiet operation. No noisy outdoor unit to disturb you and your neighbors.

- **Environmentally Friendly**
  Geothermal systems are the most environmentally friendly way to heat and cool your home. No fossil fuels are consumed in the operation of the unit meaning no carbon dioxide or other emissions that could increase greenhouse gasses that contribute to global warming. FHP's AQUARIUS II systems use refrigerant R-410A, the industries answer to R-22 helping to preserve the earth's ozone layer.

- **FHP Quality and Reliability**
  Since 1970 FHP has been the industry leader in the manufacture of geothermal and water source heat pumps. Our entire focus at FHP is to bring you a state of the art product with the assurance of a quality unit that will provide years of trouble free service.
  FHP's AQUARIUS II Series feature coated evaporator coils and stainless steel drain pans for durability. Vinyl coated steel cabinets with a gold anodized front panel lend a touch of elegance to the unit .

Units will be available February 2008.

FHP MANUFACTURING

www.fhp-mfg.com