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notes from IGSHPA

By Jim Bose
Executive Director: IGSHPA

Agricultural Applications

During the past months, IGSHPA has had requests for information about agriculture applications. These range from turkey brooder houses, heating of cucumber roots to increase productions, etc. In these applications, significant energy efficiencies have been demonstrated and novel approaches to what appeared to be difficult at first have become overcome. Past agricultural applications have included greenhouse and tomato production in hydronic and forced air applications.

If you do a web search on hydronic applications you will be amazed at the range of applications and the magnitude of this market. Heat pumpers should look at this market since the efficiencies are highest when using GSHP technology.

Cucumber production increases in the range of 50% were reported by root cooling in the summer and root heating in the winter. The temperature changes required were small.

IGSHPA has an opportunity to help promote this industry by working with the radiant professional organizations. Our plan is to start a marketing effort by exhibiting at their annual shows and inviting them to participate at our annual conference.

We should not overlook the apparent advantage of hydronic applications and start a discussion about the opportunities in hydronics in both space conditioning and agriculture applications.
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The Holliday Farm, where Chris Holliday contracts with Cargill to raise turkeys, will be less dependent on propane for one of their brooder houses, thanks to a recent ground-source heat pump installation.

(Photo by Jan Wiese-Fales, University of Missouri College of Engineering)
Hybrid Geo Prototype for Turkey Farm Tested

By Janet F. Reeder
University of Missouri Engineer Shawn Xu has always been a problem solver. Xu’s recent efforts to design and help install the first prototype of a ground-source heat pump system in a commercial turkey production farm has potential for solving problems on a giant scale. Obviously, if his project shows the predicted 50 to 60 percent savings in heating costs, it will be a boon to poultry producers.

Xu says when he approaches a project he thinks about what he can do that will help people. Xu has spent nearly two decades coming up with engineered solutions. He says as a young engineer he worked on a research project that involved thermal technology in outer space. The experience caused him to realize he had a personal preference for working on projects that more directly involved people.

“I found that I needed to work on things that could really change people’s lives,” Xu says. He has that opportunity in his work as an associate research professor in MU’s College of Engineering at Columbia, Missouri.

Xu’s work on renewable energy and energy efficiency in the Civil and Environmental Engineering Department has allowed him to work on a number of high profile projects that have included consulting on the use of GSHP technology for the 2008 Beijing Olympic Games, and many other large commercial projects in America and China.

Xu and a Missouri turkey producer have partnered in a prototype project that could potentially slash production costs by introducing geothermal. The project at the Holliday Farm was partially funded by the U.S. Department of Energy under the American Recovery and Reinvestment Act. Xu partnered with Chris Holliday, a Cargill contractor.

Xu visited Holliday’s operation and immediately noticed six huge propane tanks and listened as Holliday told him he usually had to have them refilled during the winter. Heating the farm’s two 122,000 square-feet turkey brooder houses and two grow-out houses, Holliday can spend more than $50,000 a year for propane.

“Propane use is typical for poultry growers,” Holliday says. “You can have natural gas if you are on the pipeline, or you have propane.”

Barns for poultry are usually built on land that is undesirable for other development or even farming, he adds. “It wasn’t

Shawn Xu looks over plans with Chris Holliday while Scott Keller looks on.

(Photo by Jan Wiese-Fales, University of Missouri College of Engineering)
The innovative brooder heat lamps Xu designed using PEX pipe can be lowered to the ground for young turkeys who need the heat.

(Photo by Shawn Xu)
a problem until propane got to $2 a gallon a couple, maybe three years ago,” Holliday said. “When it goes for 60 cents a gallon like it was when I started, to $2, that is a lot.”

Holliday says he used to build homes with his father. When the housing market changed, he decided to follow a long-time desire to farm. “I didn’t study agriculture and didn’t know anything until about 1992 when I bought my first piece of ground. I always wanted to be a farmer,” he says. His interest in home building got him acquainted with Xu in a round about way, he says.

“I met him at the university. I heard about him from another professor there that was doing some drawings for me for house plans.” Holliday was talking about building a subdivision on some land he has, when Xu’s name came up. The idea of using a district geothermal system for the homes he plans to build when the market improves solidified with Holliday after he met Xu.

Xu quickly connected the idea of heating Holliday’s turkey brooder houses with geothermal. Xu designed a hybrid system configured for 50 tons that provides 600,000 Btu/hour to test in one house.
The brooder heaters Xu designed radiate the heat from coiled PEX piping. Holliday added LED lights to the bottom of the brooder heaters to attract the birds to them. Xu’s research on the innovative product and approach has been written about in local media, and is being watched closely by other poultry growers. MU is pursuing patents.

“Birds need precise temperature control,” Holliday says. “They come straight from a hatchery in Minnesota. They go from the incubator to loading on the truck. We start them at around 91 degrees,” Holliday said.

“Early on the heat requirement can really take a toll on the propane usage. The first two weeks to heat up the barn to 90 degrees is pretty tough,” he says. The typical turkey barn just has curtains on the outside walls.

“It is all in the computer already. And every day they get older, the temp drops just a little,” he says. By the time the birds weigh around 10 pounds, usually when they are close to 8-weeks-old, they are moved to the grow-out barn.

“Y ou are down to around 60-degrees or so by the time they are older,” Holliday said.

Shawn Xu, Chris Holliday and Kirby McKenzie watch as Scott Keller begins exploratory excavation for the horizontal heat exchange system.

(Photograph by Jan Wiese-Fales, University of Missouri College of Engineering)

Piping is being unrolled to check initial placement in the trenches dug for the geothermal system.

(Photograph by Shawn Xu)
Holliday says he has seen real improvement in air quality in the brooder house with geothermal. The technology produces a dry heat that eliminates the moisture produced by the use of propane for heating, he says.

“When you burn propane, propane produces water. It makes your barn humid,” he said. “And when you do that, you ruin the quality of air in your barn. So you ventilate. You suck in cold air. You blow out your hot air with the moisture and the carbon monoxide. When you suck in the cold air, you have to warm it back up. And then when you get it warm, you have ruined it with the water and the carbon monoxide, so you suck it back out again. Do you see the cycle?” Holliday asks.

“When you have the moisture, you are introducing all of the bacteria, the disease, the pneumonia and all kinds of stuff,” Holliday says. “I think when you burn a gallon of propane, it

Holliday had plenty of ground around his turkey operation for the horizontal trenching needed for the geothermal system.

(Photo by Jan Wiese-Fales, University of Missouri College of Engineering)
makes more than 0.8 gallon of water. So if you burn 100 gallons, that is 80 gallons of water you have put in.” Not having to ventilate as often to maintain air quality standards would provide obvious savings.

“If you can save the ventilation time, that saves money on the heating costs. If your air quality is better, then your bird health will be better,” Holliday says. Cargill producers are bound by contract to procedures regarding the care of the turkeys that include ventilation rates and air quality. Holliday says they have also required him to keep the propane as a back-up system.

“Cargill was good enough to let us try this,” Holliday says. “I think we are learning a lot.” Holliday did much of the work himself to trench and lay out the ground heat exchange part of the geothermal system. “I did all I could,” he says.

Xu worked with Holliday to oversee the installation of the geothermal system for Holliday Farms. He says it was a real bonus that Holliday had equipment and experience from his home building business. The heat exchange system is comprised of a horizontal loop in straight, double layers buried at 6 feet and 4 feet. Xu set the system with five zones served by five high temperature heat pump units. They have placed 50 brooder heaters in the house. The heaters can also be washed between broods.

Xu designed the GSHP system with around 50 percent of the total peak heat load for the best pay back. The system will cover 70-80 percent of the annual total heat demand. He has plans to also incorporate an air heat exchange system. Xu is researching a way to recover waste heat from the ventilation process. Xu believes the same hybrid system would work as a retrofit for other types of farms and processing facilities that are using propane. The next step Xu says is finding a way to reduce the loop size to make installation more economical.

He is getting inquiries from poultry and hog farmers all over the country and as far away as Australia. Xu plans to publish his research findings. Holliday and Xu are both encouraged by the data coming in and the savings from the first winter of using the system.

The horizontal lines are laid out the way they will be buried.

(Photo by Shawn Xu)
Touchstone Energy Contest Succeeds, Challenging Students Takes Geo Social

By BreAnna Morris
What do Dorothy Goes Geo, The Fresh Prince of Geo and Go Go Geo Girls have in common? As confusing as the titles may seem, the answer is simple.

All of the titles come from a video scholarship contest for high school students called Go Go Geo Scholarship Video Challenge. The Go Go Geo event was designed for the promotion of geothermal technology through the creative use of video and social media.

The competition, consisting of a regional round and a state round, was carried out by Western Farmers Electric Cooperative and was sponsored by Touchstone Energy® Cooperatives, along with geothermal manufacturer co-sponsors, ClimateMaster, Bosch and WaterFurnace. WFEC is a Touchstone Energy® Cooperative that provides generation and transmission to 22 member cooperatives in Oklahoma and New Mexico.

Students who entered had an opportunity to showcase their wit and talent by creating videos about geothermal technology. The titles listed are only three of about 60 entries that were up on gogogeochallenge.com for preliminary voting during the month of March.

WFEC Manager of Marketing and Communications, Mark Faulkenberry, used his creative marketing skills to come up with the contest idea to help promote the benefits of geothermal technology in Oklahoma and New Mexico.

“We could have gone out and produced a professional video ourselves,” Faulkenberry said. “Our contest rules gave seven topics that contestants could include in their video. The topics to choose from were, understanding how geothermal technology works, savings achievable for going GEO, other benefits for going GEO, everybody wins when you go GEO, getting over traditional cost hurdles of going GEO, dealing with urgency issues when HVAC systems problem is trying to get people to see it and to listen to it. The students have the online social networks that we don’t.”

Contest leaders co-sponsorship with Touchstone Energy assured the success of the scholarship program.

(Photograph courtesy of Sondra Boykin, Communication Coordinator Western Farmers Electric)
fail and need replaced and going GEO is going green. The students were provided with all the information, research and references they would need to use actual facts and statistics in their videos.

“There were seven message themes. The kids were told up front to incorporate a minimum of three, but for each one they did incorporate creatively, we gave them an additional five points,” Faulkenberry explained.

Faulkenberry’s idea was for students to use their own creativity to include key messages about geothermal, so the contestants could use their own social media networks to get the videos circulating.

“Although it’s costly, it wouldn’t be anything like what we would have to do for other major programs and promotions, and it’s totally worth it to get kids talking about geothermal,” Faulkenberry said.

The challenge had $60,000 in scholarship and grant money up for grabs, $10,000 being the highest prize, so the students were motivated to produce strong entries.

“It couldn’t have happened unless we did it collectively because with this type of a program, you have to offer enough scholarship dollars to get someone’s attention, and $10,000 seemed like the number we thought would work,” Faulkenberry said.

The winning videos will potentially be used in promotional materials and different online marketing endeavors through Touchstone Energy Cooperative.

“When the students signed up, they gave us the rights to use their video,” Faulkenberry said. “They agreed to that when they submitted, so we can use their videos as promotional material for the co-op. If they win their regional, they win $3000, second place is $2000, third is $1000.”

The videos were up for preliminary voting online, and the students promoted their own videos to solicit votes from their friends and family through their social networks. The videos of the regional winners were judged at the state level, and a final winner was decided then.

George Plummer, Kool 105.5 Radio interviews Will Lange, director, utility market development and hyper sales at WaterFurnace, regarding their co-sponsorship in the Go Go GEO Scholarship Video Challenge.

(Photo courtesy of Sondra Boykin, Communication Coordinator Western Farmers Electric)
“There are four regions in Oklahoma, and then New Mexico is their own region,” Faulkenberry said. “The top five vote-getters from each region moved to the judging round, and then the judges determined a winner in each region. Those five moved to the statewide competition.”

Regional winners were Austin Branch from Norman High School North, Kailey Kelley from Hinton High School, Casee Cole from Pond Creek-Hunter Junior-Senior High School, Ean Bonjour from Stillwater High School, and Hayley Madden from Portales High School in New Mexico.

These regional winners went through an interview round with judges, and the winners were announced at the awards banquet on April 22 in Oklahoma City, Oklahoma.

Ean Bonjour, a senior at Stillwater High School, was awarded a total of $10,000 in scholarships by taking first place honors in the video challenge.

Bonjour’s award included a $3,000 scholarship from the regional round and $7,000 for the top finish at the state level. For his first place finish, Stillwater High School will also receive a total of $5,000 in educational grant money from the two rounds of competition.

Second place went to Casee Cole, a junior at Pond Creek-Hunter Junior-Senior High School, which included a $3,000 scholarship from the regional contest and $3,500 for the state finish.

Austin Branch, a senior at Norman High School North, received third place and received a total of $5,000, including $3,000 for the regional finish and $2,000 for the state finals.

The other finalists, Kelley and Madden, each received $3,000 in scholarship money from the regional round of the contest and an additional $1,000 from the state finals.

“We trained the judges for the GoGo GEO competition,” Faulkenberry said. “There were three judges. We had the Oklahoma Secretary of Energy, Michael Ming; the Oklahoma Secretary for Science and Technology, Stephen McKeever; and Miss Oklahoma 2012, Betty Thompson. We met to go through and look at how they would go online and judge the videos. We talked about judging criteria and gave them a very rounded understanding of the technology.”

Industry leaders involved with the Touchstone Energy Cooperative,
including Director of Marketing at Caddo Electric, Boyd Lee, and Director of Residential Market Development for Climate Master, Paul Bony, gathered at a reception on March 2, on the Oklahoma State University campus with the judges to organize the final phase of the contest.

“The scholarship challenge idea—that was Mark,” Lee said. “He comes up with some really crazy ideas sometimes that work out pretty well, and this was one of them.”

Lee and Bony both said geothermal systems are becoming increasingly popular, especially now that energy companies are forming cooperatives in several different states.

“Within another year, it is really just going to go nuts,” Lee said. “A lot of co-ops are taking a long time to get rolling, but once they do, it’s going to go crazy.”

At the end of the contest, both judges and sponsors were impressed with the contest results and with the students themselves. Ming thought the students’ ideas were both creative and innovative. Miss Oklahoma, Betty Thompson, said, “These students are very accomplished.”

Mark Sullivan, national dealer development coordinator with Bosch, thought that the contest was great. And Dan Ellis, president of ClimateMaster, said the Go Go Geo Challenge created a positive opportunity for distributors to work together. Will Lange, director, utility market development and hyper sales with WaterFurnace agreed that the effort was well done and would have an impact for years to come.

“Some may not realize the magnitude of taking this important step that represents the innovative progression of cooperatives towards the heating and air conditioning of homes,” Faulkenberry says. “The advancement of geothermal technology is quickly making this option very viable for many homeowners, who may be interested in making a change.”

The scholarship challenge was a way for Western Farmers Electric Cooperative to spread ground-source heat pump systems through word-of-mouth. By getting high school students to compete for the scholarship money and promote their videos online, talk about geothermal systems was really buzzing.

Finalists and winners of the Go Go Geo Scholarship Video Challenge are pictured following a luncheon awards banquet on April 22. Austin Branch, Norman High School North took third place honors; Kailey Kelley, Hinton High School; Ean Bonjour, Stillwater High School, who won first place in the contest; Casee Cale, Pond Creek-Hunter Junior-Senior High School, the second place winner; and Haley Madden, Portales (NM) High School.

(Photo courtesy of Sondra Boykin, Communication Coordinator Western Farmers Electric)
“What these guys are doing here in Oklahoma is absolutely huge,” Bony said, “because it’s the first time multiple co-ops, with the support of a power supplier, have worked together and taken it as a statewide initiative.”

Faulkenberry explained the importance of the relationship between the energy cooperatives, the ground-source heat pump industry and the students in Oklahoma. “It’s really exciting,” Faulkenberry said. “We couldn’t advance this technology through the co-op as much as we have without the industry supporting the effort. What I love about it is that they’ve put competition behind as much as possible for the benefit of the industry, and that’s what we have to do to grow the industry,” he said.

“In addition,” Faulkenberry says, “Western Farmers has great ties with the schools. Co-ops are very entrenched in the rural communities, so we knew if we got the Go Go GEO scholarship challenge information to the schools, they would deliver. We were very pleased with the turnout in the video competition.”

All in all, everyone has been pleased with the participation and the results of the contest. And it is obvious the students’ efforts will continue promoting the benefits of ground-source heat pumps exactly the way Faulkenberry had predicted.

“I have to admit, we’re just really fired up about the quality of the videos,” Faulkenberry said. “Kids never cease to amaze me with what they’ll put together.”

Stillwater High School’s Ean Bonjour took first place for his video Dorothy Goes Geo. In addition to his scholarship award, his school will also receive $5,000.

(Photo courtesy of Sondra Boykin, Communication Coordinator Western Farmers Electric)
National Park Service Ahead of Net Zero Schedule

By Linda Allen
The National Park Service’s first net zero facility, although located in the world’s largest urban national park, is an isolated and unpretentious structure. The new Santa Monica Mountain NRA Intern Center replaces the original facility that was destroyed by wildfire in 2007.

(Photo courtesy of Tara Moore, Tara Moore and Associates, Inc.)
Santa Monica Mountain National Recreation Area (NRA) sprawls over 153,075 diverse acres of local, state and federal parks between Los Angeles and Ventura, California. Interspersed with private lands and communities, it is the world’s largest urban national park.

The park boasts a rich history of human progress and settlement, including the Chumash and Tongva tribes, Spanish explorers, ranchers and homesteaders. One of only five Mediterranean ecosystems in the world, Santa Monica Mountain NRA is home to over 1,000 plant species, approximately 400 species of birds, 35 species of reptiles and amphibians and 50 threatened or endangered species.

Santa Monica Mountain NRA is an evolving story of how the land has shaped the people and the people have shaped the land. The story continues with the National Park Service’s (NPS) Green Parks Plan, which makes climate friendly behavior a priority in sustainable planning and daily operations. The plan’s comprehensive vision encourages NPS staff and visitors to consider the impact of all decisions on the long-term sustainability of the park’s biodiversity.

Goals of the plan include water conservation, reducing reliance on fossil fuels, limiting waste generated by the NPS, and changes in transportation and purchasing policies and procedures. Reduction of its greenhouse gas emissions by 50 percent by 2020 is one of the goals for Santa Monica Mountain NRA.
When the Santa Monica Mountain NRA Student Intern Center was destroyed by a wildfire in November 2007, the disaster presented an opportunity to implement the Green Parks Plan with the design and construction of a net-zero building. Net zero buildings produce renewable energy equal to or greater than the amount consumed. All new federal government buildings will be required to comply with the net-zero standard beginning in 2020. The Santa Monica Mountain NRA building is the first new construction, net-zero project in the NPS system, placing it ten years ahead of the mandate.

The new center, now named Diamond X Intern Center, was relocated to the Diamond X Ranch in a safer, less remote area of the park. Fire-resistant concrete block walls and a metal roof provide protection from fire hazards.

Originally a 5,651 square-foot building, the footprint of the new center was downsized to a more efficient 3,373 square feet. The building accommodates up to 16 people in eight, two-bed units. Two units share one bath, creating four dorm-like pods. The center includes a common kitchen, dining, recreation room and laundry facility. A separate conference room is available for presentations and meetings.

College students participating in NPS internships are primary occupants of the center, which is usually full. Visiting researchers and NPS employees also use the center for stays varying from a few weeks to several months.

Tara Moore and Associates, Inc., Sherman Oaks, California, which specializes in projects in environmentally sensitive areas, was the project architect. For the past ten years, Moore has chosen to live a sustainable lifestyle by developing and maintaining her personal residence entirely off the grid. Her experience has proved invaluable in the practical application of green building techniques in the firm’s projects from Alaska to southern California.

Sustainable features of the Diamond X Center include site location, building orientation, roof design, a 36 kW photovoltaic system, Light Emitting Diode (LED) lamps, a geothermal heat pump (GHP) system, solar hot water heating, extensive day lighting, natural ventilation, window shading, minimal outdoor lighting and landscape features using native plants and grasses. Additional energy-saving strategies include clotheslines and patios located in the afternoon shade zones to take advantage of the mild climate. The design meets LEED gold standards.

“The building was also tied into a joint electric meter at an existing building so that excess photovoltaic energy could be used to offset electrical use for that second structure,” said Ric Alesch, Manager at the Denver Service Center. Alesch has installed four geothermal systems at NPS parks in California and other sites. The combination and interaction of the

(Photo courtesy of Harold Moss, National Park Service)
The geothermal system’s Econar tanks, the domestic heater, electric panel, solar heater and low voltage system and other needed mechanical systems all fit in a 7 foot by 9 foot mechanical room. The organizational effort is an “amazing accomplishment,” Meline says.

(Photo courtesy of Lisa Meline, Meline Engineering Corporation)
green features reduces the operation and maintenance costs of the facility.

“One-hundred percent of the facility’s energy requirement is produced onsite. In fact, we are producing over two times the energy used at the center. Assuming a 20-year life cycle, this will result in a total renewable energy production of 2,184.2 MMBtu,” said Alesch.

Geothermal was chosen as the most efficient system for heating and cooling the center. When cooling demand exceeds the heating demand, which is common in southern California where Santa Monica Mountain NRA is located, geothermal is the best choice, said Alesch. Moore agreed that the use of the ground as a heat exchanger is ideally suited for the coastal climate of southern California that often experiences extreme spells of hot and cold temperatures.

“Geo makes a benign backup plan for the facility,” said Moore.

Meline Engineering Corporation (MEC), Sacramento, California, became the Engineer of Record on the project at the 90 percent design phase. MEC owner and principal engineer, Lisa Meline has devoted her career to renewable energy systems, in particular GHP systems. She has been involved in more than 129 geothermal installations and speaks and teaches regularly on sustainable energy systems. Meline also serves as chair for IGHPA’s Standards Committee.

MEC reviewed the mechanical and plumbing design and made minor required adjustments. An energy analysis and Life Cycle Cost required during the early design phase determined that geothermal and photovoltaic systems were the best renewable energy solutions for the project.

The ground heat exchanger is a closed-loop horizontal slinky system buried ten feet deep. Ten loops snake across the 93- by 73-foot-field behind the facility.

“This location was unique in that there was a requirement for site work...
that allowed the slinky to be buried and then backfilled from other locations to a depth of ten feet,” said Meline. The loop system uses water as the circulating fluid in one-inch, high-density polyethylene pipes. One 8-ton GHP unit powers the system.

“The small footprint for the mechanical systems, two-pipe changeover system using one water-to-water Econar GHP and one storage tank, plus simple controls, benefits this type of building,” said Meline.

The facility’s septic system is a unique feature that delivers tertiary-treated effluent over the ground loop system and increases its efficiency in thermal transfer.

“To our knowledge, this is the first application of this concept in the United States. It provides a benefit from what otherwise is a wasted resource,” said Alesch.

The NPS used American Recovery and Reinvestment Act funds to design and construct the $2.1 million net-zero building. The project received the Federal Energy and Water Management Award from the U.S. Department of Energy in October 2012.

The daily experience of the facility tells the true story of net zero and its efficiency and effectiveness. The off-grid data confirms the building has exceeded the net-zero standard while both students and NPS staff can enjoy a comfortable experience in the center.

As a result of the maintenance and operations cost reduction and efficiency of the Diamond X Center, a second net-zero building has been built in Santa Monica Mountain NRA. The Anthony C. Beilenson Visitor Center opened on June 9, 2012. The new center includes a geothermal system that uses a pond coolant feature.

With the reduction of its carbon footprint, the Diamond X Center is a model for sustainable management of public lands and continues the National Park Service’s history of leadership in environmental stewardship and responsibility.

Santa Monica Mountain NRA’s story of the land and the people sustaining it will continue to be told long into the future.
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Early IGSHPA Advocate Lynn Vick

By BreAnna Morris
The ground-source heat pump industry has made huge strides since Lynn Vick, owner and president of Air-O Heat & Air Conditioning Inc., in Stillwater, Oklahoma, first installed a system. Since then Vick has installed a variety of geothermal systems in Oklahoma and has seen the industry grow from its first experimental stages to the present.

“I got started in geothermal because of demand from other people,” Vick said. “I used to work for a guy here in town, and we used to build the systems here. I worked for him, and then when he left, I opened up my own business. People just needed someone to work on the geothermal systems, and no one knew anything about them except for me and the guys that worked for me 30-years ago.”

Vick’s involvement with IGSHPA’s Executive Director Dr. Jim Bose was integral in his incorporating ground-source heat pump systems into his repertoire of HVAC installations.

“I was the guinea pig. They came up with the ideas, and I tried them,” Vick said. “There were no books to pick up like they have today. Now, you can virtually find out anything you want to about ground-source systems. Thirty years ago, there was no information out there. The only information available was in Jim’s head or out at IGSHPA. That’s where all the research was taking place. It has evolved from the experiment that it was. Now you can put these systems in and walk away, knowing they will operate almost perfectly.”

Bose and Vick have known each other since IGSHPA started in 1987.

“I got involved with IGSHPA because they were here in Stillwater,” Vick said. “I grew up with IGSHPA. They were the go-to people. They were doing all the research, so if you wanted to know something, you came to them.”

In three decades, Vick has watched engineers, drillers and installers all become significantly more knowledgeable about geothermal systems.

“A long time ago, when you went to do a job, there were no engineers to lay out a ground-source system design,” Vick said. “The engineers didn’t know anything about it, and they weren’t trained to do it. So when we did a job, we pretty much had to rely on IGSHPA or someone in that organization to tell us what they thought was the best way to design and install geo systems.”

Industry professionals have grown more knowledgeable, and the technology has made major advancements from those early days.

“Now days, you can buy units with the pumps built in,” Vick said. “You used to have to calculate how many pumps you would need and put everything together yourself. And they work. They have come a long way. You can virtually get any design you want in a geothermal.

Vick installed the geothermal system for IGSHPA’s headquarter building located in Stillwater, Oklahoma. “I don’t do much design unless it’s little.
stuff, so this particular building, the design was sent out to an engineer, and all the wells are in the parking lot. Now days, when you do one of these systems, any building like this is engineered out. They’ve learned how to do it.”

Geothermal has improved not only on the technological side with innovation and knowledge but also has become more commonplace in HVAC installations. People are talking about it, and it shows in the increased number of ground-source heat pump systems Vick is installing.

“When the industry started, we used to have to beg people to put geothermal in because it was just an experiment,” Vick said. “Now they beg you to put it in because more people know about it and its benefits. The industry has gone from an experiment to an engineered practice that works. It’s gone full circle.”

Engineers play a significant part in determining what kind of system will go in on new construction, and Vick says they have played a pivotal role in the growth of the industry. Getting good information to engineers to help educate them about the technology has been important, he says.

“The engineers are the people who, if you convince them, and they know it is going to work, then they are going to lay the construction out for geothermal design,” Vick said. “Once you get them on board and they lay these buildings out this way, that has helped more than anything. If the engineer is against it, it is probably not going to happen.”

Vick and his company have installed a variety of systems in many different kinds of buildings throughout Oklahoma. “I try to stay within a hundred-mile radius of Stillwater,” Vick said. In Stillwater, Vick also installed the GSHP system for the Central Rural Electric Cooperative.

“We’ve done 20 convenience stores so far. We’ve got five convenience installations going right now, and they’re all geothermal. They must like it. If it wasn’t working for them, they wouldn’t do it.”

Bose points out that Vick has had to help convenience store owners to see Adding geothermal for the new addition to the First Presbyterian Church in Stillwater also allowed the church to switch their daycare area to a zoned system for energy and utility bill savings.

(Photo by Janet F. Reeder)
the design possibilities for the systems. He also has worked with them to help them to understand that the system does not have to be installed overhead in their stores the way other systems have been. Vick is also good at telling his clients that the low maintenance and dependability will also be a real benefit.

“Here in town, I’ve done most of the big businesses with geothermal. But it has taken a long time. It wasn’t easy. It took a long, long time to get people on board. I’ve done pretty much all the geothermal banks in town and pretty much all the churches in town that are geothermal,” Vick says.

“All these churches now have daycare centers,” Vick said. And the ones with daycare centers present a great opportunity for geothermal. Churches can obviously benefit from lower monthly bills. Churches usually have at least one large space that takes a lot of energy to heat and cool. He said Stillwater’s First Presbyterian Church was one of the most innovative projects he’s seen.

Mechanical systems for the geothermal at Central Rural Electric Cooperative are set in accessible areas in the shop.

(Photo by Janet F. Reeder)
“The Presbyterian Church was running a 200-ton chiller at the daycare, for only 30 kids. All they needed was a 20-ton chiller. We put geothermal in, and that way, they just use what they need when they need it. And they paid for that system in three years. In churches with daycares, geothermal saves a lot of money.”

Vick said he always presents ground source as an option when discussing projects with potential clients. His home is geothermal, and he is a big proponent of its benefits and cost savings.

“The maintenance and the energy savings are the best things about geothermal. There’s virtually no maintenance, and you will cut your energy bills in half. It’s that simple. The monthly bills are five times cheaper than an electric furnace and three times cheaper than the best air-source,” Vick said.

“Plus the comfort is a lot better in a geothermal building,” he said.
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Oct. 7-10; Includes workshop & conference

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Building Load Analysis and Pumping Workshop
Oct. 7-8; Includes workshop & conference

www.igshpa.okstate.edu
IGSHPA and NATE
Strengthen the GSHP Industry

By Janet F. Reeder
Every industry works to provide and uphold integrity and authority to their particular trade practices.

Major trade groups pay attention to the licensing, quality standards and ethics of contractors to assure that their work consistently stands up to the trade’s standards. IGSPHA’s training regiment for installers in the ground-source heat pump industry has always led the industry. And now IGSPHA has taken that practice to a higher level through their affiliation with the North American Technician Excellence (NATE).

NATE’s Director of Marketing and Business Development, Valerie Briggs, says NATE partners are found throughout the HVAC/R industry and represent a variety of stakeholders including industry associations, utilities and manufacturers.

“All in the industry, including consumers, benefit from NATE’s program of HVAC/R technician certification,” Briggs says.

In fact, Briggs says industry research has found that NATE certified technicians are preferred among consumers, require fewer callbacks, and generate more income for their employers, thus earning higher wages on average and demonstrating greater value to employers than non-certified technicians. Contractors, manufacturers and utility companies know that certification by NATE encourages proper installation and service of HVAC/R equipment, resulting in fewer warranty returns, and energy savings as products operate at peak-efficiency year round.

“As consumers seek more environmental and wallet-friendly options for heating and cooling, such as ground-source heat pump systems, IGSPHA accredited installers can benefit from the brand recognition of NATE certification to compliment their efforts,” Briggs says.

“NATE is the only certification organization developed and supported by the entire HVAC/R industry,” she says. “NATE credibility is due to the support of the entire HVACR industry, not just one segment.”

For more than 15 years, NATE has served as the nation’s largest non-profit certification organization for heating, ventilation, air conditioning and refrigeration technicians. According to NATE records, more than 30,000 technicians hold NATE installation, service or senior certifications in 11 specialties.

“NATE offers organizations such as IGSPHA, the opportunity to promote services to those technicians and
to the thousands of contractors who employ them,” Briggs says.

NATE and IGSHPA announced an agreement in early 2010 to allow IGSHPA’s Accredited Installer exam to be administered and processed by NATE. The change, according to IGSHPA documentation, creates more stringent guidelines to ensure the highest quality installations, repairs, and service in the industry.

Briggs explains the joint goal of NATE and IGSHPA is to work to develop rigorous, knowledge-based tests to validate a technician’s knowledge in ground-source heat pump technology. She says the two organizations plans were established to analyze existing credentials, set exam specifications, review existing questions for conformity to psychometric question development requirements, and to develop new questions as the geothermal industry evolves.

After a period of extensive development work between the two organizations, NATE began to administer all of the IGSHPA Accredited Installer tests and provide testing services, print and computer testing, grading, and certification. The agreement allows IGPHA to serve as an approved NATE testing organization and to also be the only authorized testing organization to order IGSHPA exams.

“This allows IGSHPA to continue its leadership role in the industry and set requirements for the installer candidates,” Briggs says.

The change, according to IGSHPA documentation, creates more stringent guidelines to ensure the highest quality installations, repairs, and service in the industry. The partnership applies only to testing and accreditation of installers and does not include any other testing services by IGSHPA. The agreement alters the way IGSHPA’s trainers order, proctor, and submit exams and is designed to increase consistency and tighten exam administration practices.

In an announcement in ACHR News in 2010, Terry Proffer, GSHP Designer, CGD Trainer and IGSHPA/NATE certified installation instructor hailed the agreement as positive. “The association of IGSHPA with a respected organization such as NATE, strengthens the ground-source heat pump profession,” Proffer said. Proffer is with Major Geothermal out of Colorado.
NATE and IGSHPA both see the relationship as a way to keep technicians up-to-date on new technologies and innovations in the HVACR industry. Both professional organizations understand the importance of testing and accreditations that in the end allows consumers to ask for certified technicians who have proven knowledge and a track record for producing quality work.

NATE, the nation’s largest non-profit certification organization for HVACR technicians, offers installation and/or service certification in nine specialty areas including air conditioning, air distribution, heat pumps, gas heating, oil heating, hydronic gas, hydronic oil, light commercial refrigeration, commercial refrigeration and senior efficiency analyst.

In the 2013 annual edition of The NATE Magazine, NATE Director of Certification, Denny Smith sets out an extensive chart reviewing the top NATE testing and training organizations in the country. IGSHPA is at the top of the list with the most total tests administered through NATE, at 939, updated to December 14, 2012.

At IGSHPA, Training Program Manager Roshan Revankar discusses the importance to IGSHPA of the relationship between the two organizations.

“The NATE name adds value to our certification program. It adds value to the person who is working with NATE,” Revankar says. “It adds value to the person who is working with IGSHPA.”

Revankar hopes that the two groups will expand together in the future.

“We have talks going on with NATE about expanding. Due to our good relations with NATE and the growing numbers with the installers course, we want to expand,” Revankar said. He says that IGSHPA plans to add a mechanical installer course and an inspector course to the training curriculum in the immediate future.

“We want NATE to grow with us. It is a combined effort for both organizations,” Revankar says. Revankar says that IGSHPA is growing internationally with added chapters.

The cooperative relationship between IGSHPA and NATE is ongoing and is designed to keep both groups abreast of the changes in the GSHP industry that will then be reflected in testing and certification measures. Both contractors and installers will continue to benefit from this relationship, as ground-source heat pump systems continue to create markets with stable business growth opportunities.

For more information on IGSHPA, visit www.igshpa.org For more information about NATE, visit www.natex.org.
Hybrid Solutions for Two Extremes Succeed
By Phil Rawlings
Buck’s master plan included a new wing, shown in white, and two future wings, shown in grey. The installation of the new geothermal system not only addressed water restriction and allocation concerns, but saves nearly 7 million gallons of water annually. The future expansion will be able to proceed without the increased capacity sewer connection line needed before the GSHP system was installed.

(Photo illustration courtesy of Buck Institute for Age Research)
Two recent ground source heat pump (GSHP) system applications presented unique challenges for Trison Construction, the nation-wide design/build contractor that designed and constructed both projects. The challenge was to design and construct the most cost effective, energy efficient HVAC systems, one being cooling dominant and the other being heating dominant.

The cooling dominant site, the Buck Institute for Age Research in Novato, California, had originally used a boiler/chiller system with cooling towers. The heating dominant site, Flynn Manor, a high-rise multi-family facility in Yonkers, New York used a steam system for heating and occupant furnished window units for cooling.

Both wanted GSHP systems to take advantage of the energy, maintenance, and long-term capital replacement cost savings benefits GSHP systems deliver. As these projects developed, Trison’s on site evaluations and design review assisted each client by presenting a hybrid GSHP system as the most beneficial and cost effective approach.

Buck’s master plan included a new wing and two other future wings. The new wing created the need for additional chiller/cooling tower capacity and the related water usage the towers would have required.

However, the Buck Institute’s near and long-term campus plans were being restricted by water usage allocations and an eventual requirement to install an increased capacity sewer
The ground heat exchanger and boilers serve various heat pumps throughout the Flynn Manor facility. Horizontal units were set above the ceiling in the common areas of the first floor, and console units were placed in the apartments.

(Photo courtesy of Phil Rawlings, Trison Construction Geothermal Services)

connection line.

With the installation of the new geothermal system, the Buck Institute has an approximate seven year simple payback from lower energy costs, but more importantly, is saving almost 7-million-gallons of water annually which will allow the planned future expansion to proceed without the new, costly sewer line.

Trison’s approach to avoid these water usage allocation issues was to utilize Clima-Cool simultaneous heat/cool water-to-water GSHP units served by ground heat exchangers with one cooling tower and chiller retained for back-up and peak demand.

The system was completed in 2012 and has delivered the desired results. The three current buildings are now operating with lower space conditioning energy costs than the original two buildings.

A long view of the Buck Institute shows the remote yet pastoral setting for the California facility.

(Photo courtesy of Phil Rawlings, Trison Construction Geothermal Services)
Utilizing the ground heat exchanger and peak demand cooling tower approach eliminates cooling tower evaporative water usage roughly 90 percent of the time, saving approximately 7-million-gallons of water usage annually. The facility’s carbon emissions were reduced in excess of 50 percent, or the equivalent of taking almost 10,000 cars off the road.

On the other side of the country in Yonkers, New York, Trison’s evaluation revealed the issue was limited available space for the ground heat exchanger and space temperature control. A hybrid system was the solution there for Flynn Manor as well.

**In Yonkers, New York, Trison’s solution for Flynn Manor involved replacing existing equipment, including two steam boilers, in the mechanical area with a hybrid system that would be supplemented on peak design conditions by high efficiency condensing boilers working in tandem with the ground heat exchanger under the parking lot.**

*(Photo courtesy of Phil Rawlings, Trison Construction Geothermal Services)*
Trison’s approach to avoid the water usage allocation issues Buck Institute faced, was to utilize Clima-Cool simultaneous heat/cool water-to-water ground-source heat pump units that are served by ground heat exchangers with one cooling tower and chiller that was retained for back-up and peak demand.

(Photo courtesy of Phil Rawlings, Trison Construction Geothermal Services)
Originally, the building was served by two steam boilers in the mechanical room. Occupants could furnish window units and have them installed if they wanted cooling. Comfort control in heating was a significant issue, with many occupants controlling temperature by opening windows because the steam heating units were running at full capacity and could not be controlled.

The existing equipment was replaced by a hybrid system that would be supplemented on peak design conditions by high efficiency condensing boilers working in tandem with the ground heat exchanger under the Flynn Manor parking lot.

The ground heat exchanger handles all building cooling loads and a significant portion of the heating load. During the peak of the winter season, the boilers augment the ground heat exchanger water temperature to the heat pumps as necessary.

The ground heat exchanger and boilers serve various heat pumps throughout the facility including horizontal units above the ceiling in common areas of the first floor, and console units in the apartments.

The system has been in service since early 2012, and is performing to expectations. Occupants now have individual control of heating and cooling in their apartments, creating a comfortable living environment year around.

Energy savings are as expected. Maintenance costs are reduced, and Flynn Manor's previously pending facility capital upgrade and replacement expenditures are avoided.

Geothermal Carbon Reductions

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<th>KWHrs</th>
<th>C02/KW/Hr</th>
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Annual Metric Tons C02 = 4,638.66
Equivalent Miles Drive = 10,494,184.97
Equivalent Cars/Year = 18,183.56

-33% Reduction

Buck Institute 2009 Carbon Emissions

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<th>C02/KW/Hr</th>
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Annual Metric Tons C02 = 2,484.24
Equivalent Miles Drive = 5,620,159.89
Equivalent Cars/Year = 9,738.20

53.55% Reduction

Daily Water Savings for Replacing Cooling Towers with Geothermal Exchange

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<tr>
<th>System</th>
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<th>CT Evap (GPM)</th>
<th>CT Makeup (GPM)</th>
<th>Total Water Loss (gals)</th>
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<td>2.3</td>
<td>6,126</td>
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<td>7.8</td>
<td>18,242</td>
<td>.30</td>
<td>$19,975</td>
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Nearly 7 Million Gallons of Water Saved Annually
As the rush to “green”, renewable, and sustainable technologies and buildings continues, geothermal market penetration is growing. The operating, maintaining, and long term capital replacement cost savings benefits are obvious and well defined selling points. However, the first cost elephant is still in the room.

I look at the decisions owners, their agents, or privatization contractors make and wonder what they were thinking, or if they are thinking of the true installation and ownership costs of the systems they select. Just a few thoughts to ponder:

• Why do a 10-20 year HVAC system Life Cycle Cost Analysis (LCCA) on a new or renovated building with a planned 50 year life?
• Why install outdoor condensers or air cooled chillers in the salt laden air of near or on the water applications so the salt can begin degrading equipment performance immediately and significantly shorten equipment life?
• Why install outdoor condensers or air cooled chillers in the particle laden air of desert or arid area applications so the dust and sand particles can begin degrading equipment performance immediately and significantly shorten equipment life?
• Why have rooftop equipment locations or penthouses with their related structural, construction, utility, access, and maintenance/repair issues? Did you consider these added costs as a part of the cost of the HVAC system?
• Why build low and mid rise buildings with outdoor condensers concealed on the roof, multiple line sets with roof penetrations, multiple utilities with roof penetrations, accessibility and maintenance issues, and the facades (if used) that conceal them? Did you consider these added costs as a part of the cost of the HVAC system? Did you consider roof leak repair costs?
• Why build apartment buildings with dozens of outdoor condensers, mounting pads, line sets and utilities side by side that can be damaged, vandalized, stolen, etc.? Also, do they require a safety enclosure, make excessive noise, or otherwise create safety or litigation issues?
• Why build large mechanical rooms with the area to accommodate installed boiler/chiller system equipment and the service space allowances they require?
• Why install cooling towers with their associated space, structural, utility, maintenance/repair, and water usage issues?
• Why these questions? Because a very important question is are your clients just looking at mechanical costs or also considering the items above as a part of mechanical system costs? Consider these:
  • Do an LCCA for the expected useful life of the building (50 years max) as well as the unrealistic shorter term the client requests.
  • GSHP have no outdoor equipment to expose to salt laden air.
  • GSHP have no outdoor equipment to expose to blown dust and sand in the air.
  • GSHP require no mechanical penthouse and related utilities, etc.
  • GSHP require no roof mounted outdoor condensers or air cooled chillers and related roof penetrations, line sets, utilities, etc.
  • GSHP require no ground level outdoor condensers and related line sets, utilities, etc.
  • GSHP systems require significantly less space in the mechanical room.
  • GSHP systems require no cooling tower and related utility and piping.

So, ask the right questions and expand your GSHP business. When other than mechanical system costs are incurred for the mechanical system application, those costs should be considered in system cost comparisons. And yes, if a hybrid system is used, either a boiler or tower is required – and – that results in a limited increase in mechanical room (boiler) or installation of a cooling tower.

Mr. Rawlings has more than 35 years experience in the geothermal industry. He is the Director of Geothermal Services for Trison Construction, a Certified GeoExchange Designer (CGD) and an IGSHPA Accredited Installer and Trainer.
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