Tulsa’s Guthrie Green Showcases New Geo Technology
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Tulsa’s Guthrie Green Showcases New Geo Technology
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Why do refrigerant-based geothermal systems feature such compact ground loop systems?

A refrigerant-based geothermal heat pump is a closed-loop geothermal system in which refrigerant, typically R-410A, flows through copper tubing buried in the ground. These systems feature an uninterrupted flow of refrigerant and do not rely on an intermediate pump or heat exchanger.

Thanks to the combination of R-410A refrigerant and copper, refrigerant-based geothermal systems rely on a compact ground loop system and allow for a smaller heat exchanger in residential applications. The simplicity of refrigerant-based geothermal heat pumps – relying on a one-step heat exchange process, and combining R-410A refrigerant and a highly conductive material like copper – not only translates into higher efficiencies, but also to lower installation cost, due to the smaller loop requirement per ton of nominal capacity.

This can be explained by Fourier’s Law for conductive heat transfer:

\[
Q = -k \star A \star \frac{dT}{dx}
\]

Fourier’s Law describes all conductive heat transfer processes, including the one that takes place in refrigerant-based geothermal, where heat travels through the earth, the grout (for drilled-in systems) and the copper loop to reach the refrigerant inside the tubing. The conductive heat transfer \(Q\) will be positive in heating mode (the loops gain heat) and negative in cooling mode (the loops lose heat). Fourier’s Law shows that the heat transfer rate is directly proportional to the magnitude of the temperature difference across the layer, the heat transfer area and the thermal conductivity of the material it is traveling through, and is inversely proportional to the thickness of the layer.

Copper ground loops have a very high thermal conductivity \((k)\), meaning the overall thermal conductivity of the ground loops is slightly higher than that of plastic or other materials. Most importantly, the combination of copper and R-410A refrigerant allows for a larger temperature gradient \(\left(-\frac{dT}{dx}\right)\) than HDPE and an antifreeze solution would.

Fourier’s Law also underlines the importance of proper sizing and proper installation in any and all geothermal systems: once an installation is completed, all of the parameters of the equations are set by the field conditions and the loops installed. This means that the maximum conductive heat transfer \(Q\) that the loop field can receive is set. If the system was improperly sized or improperly installed, one may end up with a heat transfer too small to generate the system capacity necessary to meet the house heating and cooling loads, thus resulting in unsatisfactory temperatures in the home.

For more information on refrigerant-based geothermal systems, as well as compact ground loop systems, please contact Gregor Vialette at gviallette@earthlinked.com or by phone at 863-701-0096 ext. 225.
IGSHPA needs to provide the best possible solution to the challenge of EPA 111d. IGSHPA needs to define and promote the impact on GSHP technology on fossil fuel and CO2 reduction.

In this issue of Geo Outlook, you will see articles on installations with benefits that you have become familiar with. You will also see some new innovations utilizing new materials. You will also see that GSHP technology is starting to become a part of the environmental argument.

This will be the last issue of the magazine that our Technical Writer, Janet Reeder, will be contributing to, as she is retiring from Oklahoma State University in January 2016. We thank her for her service and wish her well in retirement.

The “When” for IGSHPA and Geo Industry

The overarching goal of IGSHPA is to cause and support the growth of GSHP technology from niche market levels (2-percent in the U.S.) to mainstream levels. We know the physics works in climates from the equator to the Arctic Circle. We know that when properly trained professionals design systems utilizing research proven standards and when professional installers implement that design, ensuring quality results, great things happen. Great things are increased comfort, reduced energy usage, longer lifetime reliability, pleasing visual and sound esthetics, and a reduction of carbon footprint. Whether you believe the long-term impact of CO2 on the environment, as some have defined it, or do not; fossil fuel is not renewable and CO2 reduction has proven health and environmental benefits. EPA rule 111d—the clean power plan—will place new challenges on power generation utilities that GSHP technology has the answer for.

Now I have just stated what you already know so what’s the point.

IGSHPA has to take the “when” mentioned above and take it from a less than 100-percent reality to a virtually 100-percent future. The impact of improper design and installation is a huge deterrent to the challenge of getting our story out. Our new Inspectors Course is aimed at making significant strides in improving overall system quality.

IGSHPA has to look creatively in to solving the embedded issue of “first costs” that are present when a customer takes a short-term view of a system. Our work with utilities for creative financing and rate-based tariffs is addressing this in a major way.

NOTES FROM IGSHPA

By Robert Ingersoll
Director: IGSHPA

Since 1999, HomeAdvisor has connected millions of project-ready homeowners to the nation’s largest network of pre-screened home service pros. Over 95,000 pros rely on HomeAdvisor to grow their business.

New! HomeAdvisor will offer exclusive membership benefits to IGSHPA professionals starting in January.

To learn how you can win more jobs with HomeAdvisor visit homeadvisor.com/igshpa or call 877-800-3177.
Upcoming 2016 IGSHPA workshops and courses

- Accredited Drillers Workshop: January 27 - 29 | $750
- Accredited Installers Workshop: February 24 - 26 | $850
- CGD Plus Course: March 16 - 18 | $1995
RYGAN’s Innovation Changes Industry Possibilities

By Janet F. Reeder

Lane Lawless says he came into the geothermal industry by accident. After finishing a degree in Business from Oklahoma State University in 1994, Lawless ended up in the Dallas area as a researcher and analyst with Executive Services International. A research project for a telecom client introduced him to the technology.

His work at ESI involved him in competitive and technical analysis with optical networking switches and transmission equipment used in fiber optics. “The biggest hardware manufacturers in the industry were our clients,” Lawless says.

By 2000, the industry was at its peak, he said. Lawless says he is still amazed at the speed of the boom to bust cycle in that industry. In a four-year period over 300,000 jobs were created. When the industry went bust, there were half a million jobs lost, he says. “I think it is unprecedented in American industry,” Lawless said.

Lawless learned some lifelong lessons that he says apply to what he does at RYGAN Corporation today, where he says the company’s business strategy is driven by the partners’ capabilities.

Lawless is co-founder of RYGAN Corporation along with Brandon Larson and Mike Fraim. Fraim has a PhD in petroleum engineering with a specialty in thermal dynamics. Larson has a chemical engineering degree from Rutgers. He also has a nuclear engineering degree from the U.S. Navy, where he was a nuclear officer on board an aircraft carrier. Lawless says if you know how to operate a nuclear reactor, you have an in depth understanding about heat transfer inside of a closed loop.

“You focus on the things you are good at,” Lawless said. “And we have some very specific and very critical abilities, particularly in research and development and production.” Since 2007, Lawless has provided both product and project management for RYGAN.

RYGAN’s High Performance Geo Xchange pipe utilizes proprietary high strength, low weight, and low thermal...
resistance composite materials that yield unsurpassed performance in a multitude of applications. HPGX heat exchange fields require less than half the land space and drilling of older generation u-tube fields while delivering superior efficiency.

“RYGAN uses specifically engineered piping that is stronger with a thinner wall that lowers thermal resistance and lowers thermal mass,” Lawless says. He says that special resins incorporated into the body of the pipe create better heat exchange than anything else currently used.

“It is also a bigger vessel, so we can go deeper without the penalty of pressure drop,” he said. “We give the end user the ability to change design and reduce the footprint of the geo-exchange field.”

Lawless says.

“When you only have to put 10 holes in the ground instead of 20 to 25, your design flexibility increases exponentially,” Lawless said. “This creates an entire new market of sites now eligible for a geo solution, because you’ve reduced the required footprint.”

Lawless says RYGAN’s material is being chosen for federal, commercial and residential projects because they deliver the highest rate of heat transfer per linear foot compared to any other closed system.

RYGAN Corporation has completed projects all around the country specifically in the Chicago, Dallas, Atlanta and Tulsa markets. Besides the Guthrie Green project in Tulsa, Lawless says they have recently worked on the National Park Service’s Longfellow House in Cambridge, Massachusetts. RYGAN has also provided geothermal to Frank Lloyd Wright’s Unity Temple in Oak Park, Illinois.

“We are now taking the geo solution where it has never gone before, into the condensed metropolitan and urban areas,” Lawless says. “We are giving more people the ability to choose geothermal.”

RYGAN’s pipe is made to specification in Little Rock, Arkansas. Other components of the RYGAN system are made in Tulsa, Oklahoma.
Tulsa's Guthrie Green Showcases New Geo Technology

By Janet F. Reeder
The Pavilion at Guthrie Green provides outdoor and indoor dining space for Lucky’s Cafe, and open gathering space as well as park restrooms.

(Photo by Janet F. Reeder/IGSHPA)
The George Kaiser Family Foundation saw a diamond in the rough in 2008 when they purchased a property in downtown Tulsa, Oklahoma. Once the Central Freight trucking company’s parking lot, the square block area was classified as a brownfield and was more a blight than an asset in the historic Brady District of Tulsa.

Through Kaiser’s vision, that location has become a crown jewel in the rapidly

(Right) WaterFurnace heat pumps are installed in a mechanical area under the Henry Zarrow Center for Art and Education for the Pavilion and the entire former Tulsa Paper Warehouse now housing art venues. The later construction of the Hardesty building used ClimateMaster heat pumps and tied into the original heat exchange field.
(Photo by Janet F. Reeder/IGSHPA)

(Below) Caleb Stephen Coye, from Broken Arrow, Oklahoma, is absorbed in the jet fountain that operates with warm water from the park’s geothermal system.
(Photo by Janet F. Reeder/IGSHPA)
revitalizing downtown Tulsa area. Kaiser’s $8 million investment allowed the conversion of the 2.7-acre former truck loading area into a nationally recognized green space and magnet for public activity.

But it is what lies under the award winning green space that makes Guthrie Green truly green. A RYGAN High Performance Geo Exchange (HPGX) system comprised of 120 geothermal boreholes beneath the park provides 600 tons of low cost, low emission heating and cooling for the former Tulsa Paper Company’s more than 80,000-square-feet.

The skyline of Tulsa is framed in nearly every sight angle from the Guthrie Green, creating a blending of the new and the old in the city. (Photo by Janet F. Reeder/IGSHPA)
A special stage at the Guthrie Green is used for theatrical productions as well as concerts and a movie screen is dropped down for popular weekly films during the summer.

*(Photo by Janet F. Reeder/IGSHA)*
The downtown location came with extreme space restrictions for a geothermal exchange borefield. The HPGX system was selected for its ability to provide superior heat exchange and borefield performance from limited space. A traditional polyethylene pipe (HDPE) u-bend system would have required more than double the drilling and land space and pumping watts for comparable thermal performance to the HPGX system used.

“The real story is about the high performance heat exchangers used by RYGAN,” IGSHPA Board President John Turley said. Turley, who worked with Jackson Geothermal at the time, handled the trench, manifolding and vault connections on the project. Now with Middleton Geothermal Services, LLC, he says, “The project could not

Drilling for the heat exchange field started off the project, with Jackson Drilling contracted for the drilling and all HDPE connecting piping. Several times when old fuel tanks were found, work stopped until appropriate remediation could take place on the Brownfield site.

(Photo by Janet F. Reeder/IGSHPA)

The park has quickly become one of Tulsa’s places to be, with scheduled activities for both children and adults throughout the year.

(Photo by Janet F. Reeder/IGSHPA)
feasibly have been done on such a small footprint with HDPE loops.”

The state-of-the-art geothermal technology supplied by RYGAN Corporation, a Tulsa company specializing in high performance GeoXchange products and technology uses high strength, low weight, and low thermal resistance composite material. RYGAN products claim to provide the most efficient heat transfer of any closed system available. Pipe and chemically fused joints are three times stronger than traditional poly-pipe, have less flow restriction and pressure drop that equates to lower pump energy use. The smaller ground exchange field requirement and less site disruption also reduce installation time.

The geothermal field was developed with a $2.5 million American Recovery and Reinvestment Act (ARRA) Energy Demand Reduction grant and a $200,000 Oklahoma Department of Environmental Quality Brownfield Development grant.

The Tulsa based George Kaiser Family Foundation spearheaded the $8 million park project as part of a $113.5 million public-private investment in the Brady-Greenwood downtown districts. Along with Guthrie Green, GKFF also oversaw the rehab of the historic Tulsa Paper Company warehouse that now houses the Woody Guthrie Center, a museum and repository of the musician’s archives brought to Tulsa by GKFF, and the Philbrook Museum of Art satellite location. The space is also utilized by the Henry Zarrow Center for Art and Education and the 108 Gallery. “We wanted to establish the historical Brady Village as a model for the effective use of sustainable energy alternatives in Tulsa, and this was undoubtedly achieved through the installation of the geothermal field,” GKFF Senior Program Officer Stanton Doyle said.

Doyle shared that the project is meant to foster ground-source heat pump system installation at large in Oklahoma and to support businesses in the state that provide expertise in the design, installation, and manufacturing of this equipment.

“Geothermal is a cost-effective way to heat and cool a space, and it makes sense, particularly in this blighted urban

Some of the piping and connections that bring borefield water into and out of the mechanical area under the Zarrow Center, supplying heat exchange and cooling for all but the Hardesty Building. (Photo by Janet F. Reeder/IGSHPA)
district, as it can substantially reduce costs for local residents and business owners,” Doyle said.

“There are a lot of positives about this project,” RYGAN’s Lane Lawless says. “The technology enabled a geo based solution for a metropolitan venue which would have otherwise been off limits due to space constraints. Without this technology the jobs associated with the installation and the efficiency benefits for the ownership would never have been realized,” he said.

“Even design engineers who are required to stamp projects can lose sight of the fact that a well field’s singular purpose is to deliver a process temperature. This process temperature is what actually establishes the heat pump efficiency. Our technology simply makes delivering that efficient process temperature more obtainable,” Lawless says.

“While more heat pumps are sold today than twenty years ago, the inconvenient truth is that geo’s overall HVAC market share has actually decreased. Poor well field performance attributed to poor overall design practice certainly doesn’t help our industry reach its full potential,” he said.

“Fair or not, everyone in our industry gets a proxy black eye when a heat exchange field can’t deliver the goods. That under achievement can’t hide from the utility bill,” Lawless said.

Lawless likes to talk about the results of the project. He is particularly satisfied that the ground exchange system operated efficiently to handle the building loads without the aid of the 85-degree set point cooling tower.

“Even in the heat wave of 2012 the cooling tower didn’t come online to assist the system,” Lawless said. “How many commercial projects in Oklahoma can say they deliver entering water temperatures in the 70s and 80s in August without a cooling tower?”

RYGAN partner Brandon Larson, whose background is in nuclear and chemical engineering, is very familiar with heat transfer. Talking about how efficient RYGAN piping is in terms of lowering thermal resistance for geothermal applications, Larson says that conventional u-tube loop installations have between .25 and .30 thermal resistance values. The RYGAN HPGX composite material tests at “somewhere less than a .05 in thermal resistance,” Larson says.

“Efficiency figures, in terms of lowering the thermal resistance, we probably have something like five to six times lower thermal resistance than a conventional u-tube, depending on how it is deployed,” Larson said.

The borefield, originally designed to meet the needs of the former Tulsa Paper Company warehouse, a building now revamped for a variety of art venues, very quickly exceeded those goals. Doyle says that the scope grew and the thinking changed to the reality of the
project becoming “a demonstration of a green field.”

Flynt & Kallenberger Consulting Engineer’s Project Manager Justin Roush says he designed the heat exchange field to get the most from the space available. “It wasn’t designed for a particular building load,” he said. The 600-ton borefield was supplemented with a 200-ton cooling tower.

“The cooling tower was there to supplement the heat exchange field during the extreme heat load peak of the summertime,” Roush says.

The cooling tower finally came into play with the addition of the Hardesty Visual Arts Center to the heat exchange field system, following its construction in the art complex that faces Guthrie Green on the south. The high efficiency of the RYGAN HPGX system allowed the later addition of the new Hardesty building to the heat exchange field.

Roush admits to being impressed with RYGAN materials used on the Guthrie Green project.

“They have performed better than advertised,” he says.

“Actually the performance has been excellent,” Roush said. “The temperatures have been lower than what we designed for. The project has exceeded expectations.”

With landscaping designed by SWA Group of Sausalito, California, Guthrie Green features an 11,000 square-foot covered pavilion, water features, cafe and performance space for cinema, theatre, music, dance, festivals and markets. Green features that are a visible attraction to the space include bio-swales, LED lighting and photovoltaic cells on the pavilion. Gardens with native plants and trees and paved paths lead visitors through the green space to appreciate the large interactive jet fountain, three other water features and activities at what is now one of Tulsa’s most popular venues.

Still winning awards, the project was a 2013 Brownfield Renewal Award winner, and also won the 2013 Henry Bellmon Award for Sustainability. Bellmon, a longtime wheat farmer who promoted soil conservation and was instrumental in the adoption of the Clean Water Act was elected Oklahoma’s first Republican governor in 1962. The website Thrillist also named the Guthrie Green as one of the Coolest Urban Spaces in America.

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Hunt Vineyard Retrofits Geo

By Drew Slattery
Hunt Country Vineyards in Branchport, N.Y. switched to GSHP to keep their patrons and wine comfortable while reducing fossil fuel consumption. (Photo courtesy of Matt Kelly)
The Finger Lakes region of upstate New York is home to over 130 vineyards and wineries. One of these in particular has retrofit their facilities with ground-source heat pump (GSHP) technology to help in leading the region away from costly fossil fuels in the face of the harsher ‘polar vortex’ winters being experienced.

Hunt Country Vineyards installed a GSHP system three years ago to condition four separate buildings including their visitor center, wine production building, and two wine storage buildings. The vineyard is located in Branchport, New York about two hours east of Buffalo. The winery grows their own grapes and produces and bottles more than 20 award-winning varieties of both red and white wine. Much of the wine is sold on site and around NY State, and some is shipped to customers all over North America.

The vineyard is a seventh generation family farm that “has sustainability in our DNA,” according to Suzanne Hunt, president of HuntGreen LLC. In the summer of 2012 the Hunts decided it was time to ditch their costly heating oil set-up for something more sustainable and efficient.

“Serving as an example of a sustainable and profitable operation to other farms and wineries is one of our major focuses,” says Hunt. Through this retrofit, the Hunt family aimed not only to save money and improve their environmental performance, but also to serve as an example for how relevant and beneficial GSHP technology can be to the countless other wineries and agricultural operations in the region.

As part of their sustainability mission, the family tracks their carbon footprint for each year on all energy consumption for the farm. Eliminating their use of fuel oil through the GSHP retrofit helped contribute to the vineyard decreasing its carbon footprint by almost a third from 2007 to 2014. In addition to this reduction in CO2 output by the farm, nearly $12,000 has been saved per year by eliminating their need to buy fuel oil or propane for heating.

Located in the Finger Lakes region of New York, Hunt Country Vineyards use GSHP technology to condition all four main buildings.

(Photo courtesy of Hunt Country Vineyards)
The facilities where the wine is produced and aged use GSHP to keep fermentation tanks and aging barrels at the desired temperatures to produce award-winning wines.

(Photo courtesy of Matt Kelly)
Working in tandem with the GSHP system is a 1.2 kW vertical axis wind turbine prototype aimed at demonstrating the effectiveness of small-scale wind power in the region. Topping off the farm’s renewable energy portfolio is 109 kW of American made photovoltaic solar panels installed on the rooftops of the various property buildings this summer, further reducing their carbon footprint.

Kevin Moravec of Moravec Geothermal out of Penn Yan, New York was brought in by the Hunt family to manage the process of the geothermal retrofit. Moravec immediately tapped John Manning and Jared Fortna of Earth Sensitive Solutions in Skaneateles, New York to handle the engineering design for the project.

Due to the layout of the winery facility compared to most single building commercial applications, the Hunt’s GSHP system is not the typical design. The system needs to be able to heat...
and cool four different sized buildings independently from each other, all spread out over an acre and a half of land, and all from one loop field.

To meet this demand, Manning and Fortna designed a system that pumps from the loop field to one centralized main flow center housed in the mechanical space of the tasting room. Fluid is then pumped from the central flow center using a Phoenix Flow Center out to the storage and production buildings, then sent back to the flow center. The flow center utilizes a patented non-pressurized concept to regulate efficient flow throughout the system, despite unit independence.

All four buildings’ individual heat pumps can kick on or off at any time, completely independent of each other and reliant only on the individual building’s needs. All mechanical controls for each individual building and pump unit are housed within the flow center room, so that the entirety of

The Hunt family leverages multiple sources of renewable energy including solar power to decrease their fossil fuel usage and increase their operational efficiency.

(Photo courtesy of Hunt Country Vineyards)
the system can be controlled from one location.

The loop field is comprised of 8 vertical wells each at a depth of 375 feet. Moravec Geothermal, who has been drilling wells in the region for 80 years and doing geothermal work for over 15, handled drilling and installation of the loop field. The system uses 1-1/4-inch HDPE pipe to run down each well, with 2-inch pipe being used for the lateral piping between buildings. Moravec and Earth Sensitive Solutions collaborated to design the loop field layout.

Daily Electric out of Penn Yan, New York handled all of the mechanical, ductwork, controls, and electrical installation for the project. WaterFurnace manufactured Geostar heat pumps were installed in each building, ranging from three-ton to five-ton units. Total size for the 6-unit system weighs in at 20 tons. Each building had its own heat calculations done to size the exact system needed for it. The entire GSHP system is controlled from one centralized mechanical room, streamlining and simplifying the user interface. (Photo courtesy of Matt Kelly)

The Phoenix Flow Center designed by Manning and Fortna at Phoenix Energy Supply allows all four of the buildings heat pumps to operate independently from a central loop field and flow center. (Photo courtesy of Matt Kelly)
visitor center utilizes MultiAqua high wall mounted fan coils as well as a pre-existing radiant floor system to condition the space. Meanwhile the production building uses radiant and ducted air with the storage buildings utilizing strictly ducted air.

The GSHP system installation cost about $140,000. Roughly 75-percent of the total system cost was covered by a grant from the New York State Energy Research and Development Authority (NYSERDA). One stipulation of the grant by NYSERDA was that calculated real-world performance data be provided showing the success of the GSHP system in terms of reducing fossil-fuel consumption. The money was awarded after the first year of data was collected from the system, proving that the real-world performance matched the proposed design performance.

The Hunt Country Vineyards GSHP retrofit also garnered statewide attention from NY-Geo, the New York Geothermal Energy Organization, when it won their Top Job Award in 2015. The Top Job Award is given to the project that demonstrates the most innovative and effective application of GSHP technology to a panel of judges chosen by NY-Geo.

In a congratulatory letter on the award to the Hunt family, New York State Governor Andrew Cuomo said, “The Hunt’s geothermal system provides a terrific model to other businesses and corporations across the state and enhances the vineyard’s standing as a positive force within the local community.”
Colvin Center Annex Gets Geo

By Drew Slattery
Oklahoma State University, the birthplace of modern geo technology, recently renovated one of its recreational buildings to include a GSHP system.

(Photo by Drew Slattery/IGSHPA)
Oklahoma State University is not only the home of IGSHPA, but it is also considered by many to be the birthplace of modern ground-source heat pump technology. So it is no surprise that the university turned to GSHP when renovating its Colvin Center Annex sports and recreation building.

The Colvin Annex is located on the west side of the OSU campus in Stillwater, Oklahoma. The 30,000-square-foot building serves as a multi-purpose gymnasium housing four full-size basketball courts with synthetic flooring. From 2011-2012 it went through an extensive $5 million dollar expansion and renovation project that included the retrofit addition of a 101-ton GSHP system.

GSHP now handles all HVAC duties for the building, which previously had no air conditioning or heating.

(Photo by Drew Slattery/ IGSHPA)

The athletic field adjacent to the building provided ample room to drill all 120 wells.

(Photo courtesy of IGSHPA)
Extensive custom ductwork allows the rooftop units to function properly indoors.

(Photo by Drew Slattery/ IGSHPA)

Monitoring solutions help prevent system failure which could lead to costly repairs for the land-grant university

(Photo by Drew Slattery/ IGSHPA)
Cobb Engineering and TME Engineering, both out of Oklahoma City, Oklahoma, did the engineer duties for the entire renovation project including the structural work as well as the GSHP system design.

Prior to the renovation and GSHP retrofit the building had no heating or air conditioning capabilities at all.

Utility usage for the building after the retrofit raised only slightly, providing the building with a year-round HVAC solution for little extra operational costs. Most all buildings on campus are conditioned using chilled water and steam. While this is effective, any improvement in efficiency is welcome and encouraged at the university.

“A lot of departments on campus want to utilize geothermal, but can’t due to the lack of open real estate for a loop field,” Interim Director of Wellness.

B&L used their years of experience in HVAC and geothermal installs to ensure the massive AAON units fit and function properly in a confined indoor space.

(Photo by Drew Slattery/ IGSHA)

Two vaults serve two mechanical rooms and GSHP systems, which are each completely independent of the other. (Photo courtesy of IGSHA)

The image shows a close-up of a AAON unit and the AAON logo on a wall.
Each AAON unit has its own dedicated mechanical space complete with all piping and controls. (Photo by Drew Slattery/IGSHPA)
Kirk Wimberley said. The Colvin Annex building sits next to the Colvin fields, a 250 by 250 foot multi-purpose athletic field. This spot provided an ideal location for the loop field.

Ardmore, Oklahoma’s Lake Country Drilling drilled a total of 120 vertical wells at a depth of 250 feet. The loop field drilling was problem free as there was ample open space for the rig to park and maneuver. Because the athletic field had to be available during the school year for intramural sports activities, the entire 120-borefield had to be drilled, headered, looped, and covered back up within a six-week period from June until August. Additional special consideration had to be given to minding the many underground cables and pipes that run across the campus. Despite these challenges, the ample space for maneuvering allowed drilling and looping of the field to be done on time and with no problems.

Local geothermal experts B&L Heating and Air out of Stillwater, Oklahoma, handled all of the
mechanical, ductwork, controls, and loop installation for the project. One-inch diameter HDPE pipe was used throughout the system, connecting through two vaults buried under the Colvin athletic field.

Both a 40-ton and a 50-ton AAON RN unit were installed inside the building to provide GSHP services for the basketball courts. These are package units that usually sit on the rooftops, but in order to keep the exterior of the structure clean looking and clutter free they were placed inside the building. Housed in two separate mechanical rooms, one on the east side and one on the west side of the building, these units were modified with special custom intake and exhaust ducting to allow them to operate indoors. In addition to the AAON units, a total of 11-tons of ClimateMaster TRH units were also installed in the building to condition the changing rooms.

Both the AAON and ClimateMaster units have their own individual set of controls, located in their respective mechanical space. While computer controls were initially proposed for the system, in the end mechanical controls were settled on for their reliability and stability. This split system design divides up the workload efficiently, allowing the massive AAON units to run according to the near constant demand of the building’s large open courts while the smaller ClimateMaster’s only kick on when needed for the changing rooms.
IGSHPA’s Kansas City Conference Looks to the Future

by Erin Portman
More than 400 people connected to IGSHPA went to Kansas City, Missouri, October 7-8, 2015, for the 28th Annual Technical Conference and Expo.

The week started with thirty-eight people attending one of four IGSHPA training classes during pre-conference training: Accredited Installer Workshop, Accredited Driller Workshop, GEO Inspector Workshop, and Certified GeoExchange Designer Plus Course.

The Geo Inspectors Workshop was developed due to the membership wanting training that would allow professionals to ensure total end-user satisfaction while maintaining code compliance. The training was offered for the first time during the 2015 conference.

“The first Geo Inspectors course was a success with 18 participants and three instructors during the 28th Annual Technical Conference and Expo,” said Roshan Revankar, IGSHPA manager. “Attendees included professionals from consulting firms, engineering firms, product distributors, dealers and utilities. The course taught professionals what is needed to perform on-site inspections and system tests during and after the installation process. These
inspections allow professionals to ensure total end-user satisfaction, long-term equipment effectiveness, and code compliance. The course foundation was built around IGSHPA, ASHRAE, and NGWA guidelines for ground-source systems as well as in-depth study of local and state ground-source codes. Participants concluded with training on sample inspection checklists to gain first-hand experience completing the documentation of a ground-source system inspection.”

Seventy industry leaders met face-to-face October 6 in marketing, membership, conference planning, research, advocacy, standards, and training committees planning the future of IGSHPA.

During the opening session, Bob Ingersoll, IGSHPA Director, and John Turley, IGSHPA Board of Directors President, spoke about the future of IGSHPA and the industry. Steve Smith, Geothermal Exchange Organization Chairman, updated attendees on the latest events at GEO and urged attendees to be involved in GEO, IGSHPA, and other organizations within the industry.

“We are looking for an extension in the tax credit to move us forward,” said Smith. “We have been lobbying and working hard in the states and in Washington D.C. to get that tax credit extended. We need all hands on deck. We need strong unity. When we walk into representatives’ or senators’ offices, or to committees we need a long list of constituents in their district or their state who are involved in geothermal. We are going to be working hard with NGWA and IGSHPA where we tie this together so we can show them the power that we have.”
During the opening session, the 2015 IGSHPA Ambassador Award was given to Richard Soper, retired President of Bosch Thermotechnology of North America, for his continued leadership, support, and promotion of the ground-source heat pump industry.

William Varley, New York American Water President, accepted the 2015 IGSHPA Visionary Award for American Water for their vision in recognizing the value of Geothermal Heat Pump technology for their customers and the foresight in using energy in the ground to provide space conditioning to facilities in your service territory.

Commissioner Patricia Acampora, New York Public Service Commission, accepted the 2015 IGSHPA Visionary Award for the New York Public Service Commission for their vision and support of the geothermal heat pump industry and their leadership in recognizing the value of this technology in New York State.

The Board of Directors followed the opening session with a special plenary session to discuss various changes, opportunities, and future plans for IGSHPA and how IGSHPA
as an association can do more to assist members. Members were also given the opportunity to ask questions during the plenary session.

Session tracts over the two days included residential applications, commercial applications, institutional applications, technical, and marketing/advocacy.

Terry Proffer with Major Geothermal presented about Merriam, Kansas’s, new IKEA store that has a ground-source heat pump for space conditioning the 359,000 ft² facility. The closed-loop system has 180 boreholes six inches in diameter 600 feet deep underneath the 1,200-space parking lot.

After the presentation, Proffer led a group of more than 20 conference attendees through a tour of the mechanical rooms at the IKEA store.

Attendees also had the chance to meet with more than 60 vendors in the exhibit hall. Attendees could meet with heat pump manufacturers, pipe manufacturers, geothermal associations and more in the exhibit hall over the course of two days.
“It was a great conference,” said Dr. Dan Fisher, Professor and Head, Mechanical & Aerospace Engineering at OSU and IGSHPA Board of Directors member. “The presentations were excellent, the expo was fantastic and the venue was first rate! Most importantly, the sharing of ideas brought us together and expanded our horizons as we considered the challenges and opportunities facing our industry.”


Centennial Plastics was first in the industry to offer Bullet™ U-Bend fittings and test-cap systems. Now our CenFuse pipe and Bullet™ U-Bend fittings are the first in the country to meet NSF International’s NSF/ANSI Standard 358-1 for geothermal heat pump systems. This assures you that our pipe and fitting system is independently tested and certified for safety and performance. It’s just another way quality and service continue to soar at Centennial Plastics!
"As Built" Advertising

I set in on the new Geo Inspector Course at this year’s IGSHPA conference in Kansas City. Excellent! I strongly recommend it for any involved in system inspections – from contractor inspector personnel to code enforcement inspectors, owner’s inspection agents, real estate building inspectors, and any others charged with correctly and accurately inspecting new or existing geothermal heat pump system installation/applications.

One topic addressed during the course was the need for an accurate reference illustration of the “as built” ground heat exchanger on the site plan. This made me think about many conversations over the years concerning the need for readily available general information on new or existing applications, such as “What is the:

- Number and average depth of boreholes/trenches
- Header trench average depth and location
- Building entry location (if not above grade)
- Marking/identification means used
- Antifreeze (if used) and solution strength
- Location of the ground heat exchanger.”

AND, why not use it for advertising and education? Residential owners talk about the geothermal heat pump system with friends and relatives – give them something to show off besides “its out back under the yard.” The education – it’s a readily accessible reference for ground heat exchanger location and information for new service technicians, other trades, or future planning for renovation or addition activity, to name a few. Commercially, it’s the same type of information for use by facility and maintenance staff or contractors – especially considering employee turnover.

I’m not talking real as built drawings (those still need to be properly done and presented at close-out) – instead, I mean a single line schematic of the ground heat exchanger and related information on a very basic site plan. Residentially, this would be a quality 8 ½ X 11 or 11 X 17 drawing that is framed and secured to a geothermal heat pump unit cover panel or wall mounted in a clearly visible location in the equipment closet/room. Commercially, it would be the same, only bigger and wall mounted.

The drawing should illustrate and include information/notes such as:

- On vertical applications, show the number and average depth of vertical boreholes and their locations. There should also be a cross section detail of a vertical borehole.
- On horizontal applications, show the number and average depth of horizontal ground heat exchanger trenches and their location. There should also be a cross section detail of the horizontal ground heat exchanger piping showing configuration (2-pipe, 4 pipe, slinky, etc.)
- Show the average header trench depth, header connection pattern or patterns, and header trench path from the loop field area to the building
- Accurately dimensioned location of the header building entry locations (if not above grade)
- Clearly describe the marking/identification means used in the trenches – locator wire, marker balls or plates, warning tape, etc.
- Identify the type of antifreeze utilized (if used) and the solution strength (example – 20%) and type of solution (by weight or by volume)
- Accurately dimensionally locate the outside of the ground heat exchanger area so the area encumbered is clearly defined.
- Include any other notes/information you think appropriate.

And finally, include your company name, logo, and contact information, in color if possible, and larger than would normally be included in the title block of a typical drawing.

The client will be looking for this information – take advantage of it!

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.
I had the pleasure of spending the last 25 years with one of the largest geothermal manufacturers in the business. When I started with that company, we had one thing in mind; growing our business through our dealers. Everything was about generating leads, creating selling opportunities and clearing a path forward for our dealers to build their geothermal business. It worked very well.

I’ve found that mentality again with EarthLinked Technologies. From top to bottom, this company is about building its business through our dealers. We offer our dealers a product that is incredibly easy to install, that needs only the standard HVAC tools- no carts or antifreeze drums. The diverse selection of pre-engineered loops allow almost any home to be a geothermal customer regardless of yard size. And the peace of mind that you can sell with confidence as none of your competitors can offer the same product and undercut you.

EarthLinked stands strong on creating technology that is simple, efficient and effective. The desire to stand out in a crowd is who EarthLinked is and it drives our continued efforts to build products that deliver superior performance, fit in more customer’s yards and contribute to a no-hassle installation.

It’s not often we get a chance to return to simpler times of doing business, but I’ve found a renaissance with EarthLinked and we are very excited to show you what we can do for you. I’d invite you to email me directly and set up a time to connect.

Phil Albertson is the Director of Sales for EarthLinked Technologies and can be contacted via email at palbertson@earthlinked.com.
Bosch products allow your customers to relax while watching the big games at home. Install a Bosch high efficiency, cost-effective geothermal heat pump, and make your customers’ lives more comfortable and worry-free. Our American-made heat pumps, designed for efficiency and quality, provide an unstoppable line-up against high heating and cooling bills. In addition, Bosch now offers a full line of Geothermal Flow Centers that are built for easy, time-saving installations and are available in a wide variety of combinations to suit your needs. Along with our unbeatable 10 year limited warranty on parts and labor*, your customers may be eligible for federal, state and local utility rebates. Go for the win in home comfort. Bosch - the team you know and trust.

*Full warranty, rebate details, and product line up are available at boschheatingandcooling.com