



## **SHC onDEMAND® Modular Chillers from ClimaCool Delivers on The Charles Machine Works' Energy Efficiency Goals in Headquarters Renovation Project**

In the late-1940s, 28 year-old Ed Malzahn applied a combination of knowledge from his father's blacksmith business and his degree in mechanical engineering to produce a machine that would revolutionize the underground construction industry as we know it today. At the time, Malzahn was paving the way for compact trenchers that now efficiently install water, sewer and gas lines and telecommunications, CATV and fiber optic cables across the globe. Malzahn's original DWP launched a more than 60-year history for Perry, Okla.-based The Charles Machine Works, Inc. (CMW), as well as its leadership in manufacturing Ditch Witch® branded equipment used in construction projects worldwide.

True to its longstanding reputation for innovating cutting-edge utility construction solutions, CMW has recently developed horizontal directional drilling (HDD) equipment which is being

used in the growing geothermal industry. Rising fuel costs and an elevated interest in renewable energy technologies have made geothermal heating and cooling a more popular HVAC industry choice in recent years, particularly in relation to the exceptional comfort and long-term energy savings it can provide.

The company is not only innovative in its product development, but has exhibited an ongoing commitment to incorporating the latest construction technologies and methods into the design of its expanding Perry headquarters campus. This has included three geothermal projects over the past 21 years — a 45-ton system for its 14,000 sq. ft. training center in 1992, a 160-ton system for its 30,000 sq. ft. electronics building in 1997 and, most recently, a 150-ton system for its 28,800 sq. ft. product development center in the spring of 2012.

“As a company, we've made a living out of serving the underground construction industry, and to stay on top of the latest trends and understand the newest innovations, we figure there isn't a better way than to install them at our own facilities,” said Tony Guinn, plant engineer for CMW. According to Guinn, he and others at the company initially

familiarized themselves with geothermal system concepts via relationships with nearby Oklahoma State University, where the International Ground Source Heat Pump Association (IGHSPA) is headquartered.

“IGHSPA is leading the charge in creating a global awareness of geothermal’s benefits, and the organization was a great resource for us in learning how and why to incorporate these systems into our building projects and upgrades on the campus,” Guinn said.



Working with Stolhand Heating & Air Conditioning and Oklahoma City-based manufacturers’ representative firm Air Products Supply, CMW designed its latest geothermal project, a retrofit system for its existing product development center, with innovative new simultaneous heating and cooling heat pump units from neighboring Oklahoma City-based ClimaCool Corp. The three 50-ton ClimaCool SHC onDEMAND® modular chiller units were specified to replace an antiquated reciprocating chiller-driven HVAC system installed during the building’s original construction in 1978. The existing chilled water system had a capacity of 1,853 MBH for cooling and a natural gas-fired boiler with a capacity of 1,853 MBH for heating.

“As part of an overall assessment of how we could make our product development center more energy efficient, and ultimately shave a considerable amount of operating costs, we knew some significant HVAC upgrades would be in order,” said Guinn. “We were doing a lot of work to improve the building envelope performance, including replacing the floor-to-ceiling window walls, which make up the entire south-facing side of the building, with low-e glass.”

Darrell Stohland was keen on specifying the new SHC onDEMAND units from ClimaCool for several reasons. “I’d been to training with Air Products Supply and was highly impressed



with the unit’s ability to generate heating and cooling simultaneously,” Stohland said. “The project goal was to save money, and a system like this that can blend energy versus just blast heat or cool seemed like the way to get that job done. Also, the comfort level of this type of system is exceptional, especially when considering the design of the building, which includes two levels of an open floor plan and a south-facing wall made entirely of windows.” According to Stohland, the SHC onDEMAND units’ ability to allow any module to be indexed for heating or cooling regardless of its position in the bank, providing optimum module/compressor run time equalization, was also viewed as a significant benefit.

Each of the three, six-pipe ClimaCool SHC onDEMAND units also feature a unique modular design with built-in redundancy with separate module electrical feeds and dual independent refrigeration circuits, allowing for the unit to maintain operation while individual modules are being serviced. “This is such an advantage compared to standard chillers, particularly as it means there’s no down time in the facility when maintenance or other system adjustments are necessary,” Stohland said.



“The new SHC onDEMAND modular chiller unit offers dramatic energy saving benefits – potentially more than 50 percent when compared to traditional boiler/chiller systems,” said Ross Miglio, ClimaCool president. “It also features a patent-pending six-header design that eliminates the required space between and external to the modules, creating the smallest system operating footprint when compared to a typical simultaneous system. This design additionally simplifies installation, design and controls, and satisfies required heating and cooling demands without the use of inter-module/external header isolation valves, controls, associated logic, piping or wiring.”



According to Darrin Beller, president of Air Products Supply, this ClimaCool configuration incorporates several notable features that maintain precise chilled and hot water temperatures, building loads and compressor run time equalization for ultimate operational efficiency.

“The SHC onDEMAND heat pump unit is an exceptional piece of equipment when it comes to reducing energy consumption,” Beller said. “Features such as the CoolLogic Control System and integral motorized valves for variable pumping can result in cooling efficiencies up to 25 EER and heating efficiencies up to 5 COP. This opens a lot of doors for us in supplying to projects that demand a high level of energy efficiency, including sustainable building projects, and the flexible nature of the system means it can be integrated with cooling towers, geothermal loops or hybrid systems.”

The SHC onDEMAND unit was specified as part of a new 150-ton system at CMW’s product development center that would also incorporate two existing air handlers with replacement Wilo brushless DC motorized pumps for load demand sensing. The controls system and fresh air vents with an economizer, considered state-of-the art when originally installed in 1978, would also be replaced with a web-based building automation system (BAS).



“The new BAS provides much more control than the previous system, and really brought mechanical operations to a whole new level in the building,” said Mark Furgason, sales and service manager at Automated Building Systems, which designed and installed the BAS.

According to Furgason, the system includes a graphical floor plan of the building that shows all zones and readings from their associated temperature sensors. It allows Guinn and others at CMW to monitor temperature in real time, as well as easily make any necessary adjustments.





“The system allows you to adjust operations either onsite or remotely from any web-based device, including a computer or smart phone, and can also send alerts about system operation changes or problems directly to Tony via email or text,” explained Furgason.

Initial geothermal field drilling for the project began in September of 2011 simultaneous to digging for new French drains on the north side of the product development center building. “This was our first vertical loop field geothermal



project on the campus,” said Guinn. In all, the field includes 168 400-foot deep boreholes with HDPE double U-bend pipe installed throughout.

The drilling was conducted in tandem with the construction of a separate foam-insulated 20ft by 24ft mechanical building that would house the new ClimaCool units and ancillary HVAC system equipment. “With our original HVAC system, the chiller was external to the building, and the boiler, which we removed, had been installed in the shop,” Guinn said. “We really needed a separate space for the new equipment, and



also had a goal of making it a showplace of sorts, to use as a model for how this innovative system looks and operates.” According to Guinn, the building’s dual steel wall construction was designed to be highly energy efficient, as well as provide a clean, finished look for those visiting the space.

In addition, an underground vault made of waterproof polyethylene was constructed to house the geothermal ground loop manifolding system.

Upon completion of the loop field in March of 2012, the ClimaCool unit was installed and initial flow testing was conducted.

“After the commissioning phase, the ClimaCool system has performed very well,” Guinn said. “We locked the thermostats at 73°F to eliminate user fluctuations during last summer’s heat wave, and the system kept the building very cool and comfortable at that temperature.

Guinn additionally shared, “we’ve been operating on only half of the complete borehole field to date, as Ditch Witch is using part of the field for performance testing. When the testing is complete, we plan to use the full capacity of the field.”

“We are still waiting to see what happens when the system’s been operating longer-term, but we expect that we’ll be



said. “Beginning with our early days as leaders in the supply of modular chillers to the U.S. market, ClimaCool has built on this legacy to become a premier manufacturer of ultimate comfort solutions like the SHC onDEMAND. With a new 100,000 sq. ft. facility in Oklahoma City that includes a state-of-the-art test stand for AHRI certification along with multiple production lines of advanced manufacturing equipment, ClimaCool is well-positioned for continuing its trajectory of success with future such projects.”

According to Miglio, thousands of ClimaCool units are currently in operation throughout North America, with a dominant and growing concentration of successful simultaneous heating and cooling unit applications.

All ClimaCool modular chillers are designed to minimize installation time and costs, with individual modules that can fit through standard doorways and have low centers of gravity for easy transport via pallet jacks and forklifts. Modular chillers from ClimaCool are additionally engineered to streamline maintenance, with single-point electrical connections and waterside isolation valves that allow for the servicing of an individual module while the remaining modular chillers in the bank continue to operate. Their non-proprietary designs also afford contractors the ability to service the units without proprietary parts or factory technicians.

With a focus on system efficiency, ClimaCool has engineered its units with a holistic view on cooling, heat recovery, heat pump operation, geothermal capabilities and simultaneous heating and cooling applications in mind.

“In all such central plant applications, the company stresses the importance of using free condenser heat whenever possible, thus lowering the approach of the source by employing geothermal boreholes to maximize efficiency,” Miglio explained.

In addition, ClimaCool stresses the energy-saving advantages of variable pumping for cooling, heating and source loops, so that only the amount of water flow required by the system at any given time is provided. All ClimaCool modular chiller designs are available with motorized water valves ideally suited for this type of variable pumping system.

Looking toward the future, ClimaCool is focused on developing cutting-edge comfort solutions in alignment with dynamic industry needs, including those associated with energy costs, total cost of operation, redundancy, ease of installation, serviceability and refrigerant legislation.

seeing about a \$50,000 annual savings in operating costs,” Guinn continued. “This is much in part due to the highly energy efficient operation of the geothermal system, as well as how the ClimaCool units ideally capitalize on this type of energy.”

“The success of this project echoes ClimaCool’s history of innovation in developing and applying cutting-edge HVAC technology in commercial projects across the U.S.,” Miglio





**The Charles Machine Works  
Perry, OK**

**Mechanical Contractor:  
Stolhand Heating & Air Conditioning**

**Equipment:  
Three 50-ton ClimaCool SHC onDEMAND®  
Modular Chiller Units**

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ClimaCool’s modular chillers are utilized in a wide variety of commercial and industrial applications such as cooling, heat recovery, geothermal heat pump and simultaneous heating and cooling. When compared with conventional chiller and boiler systems, ClimaCool solutions occupy a minimal footprint and are easily maneuverable to create lower installation costs and improved placement flexibility. ClimaCool systems are more serviceable, maximize energy efficiency, provide true redundancy, offer expandability, have low operating noise levels, and utilize a micro charge of non-ozone depleting, chlorine-free refrigerant.



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