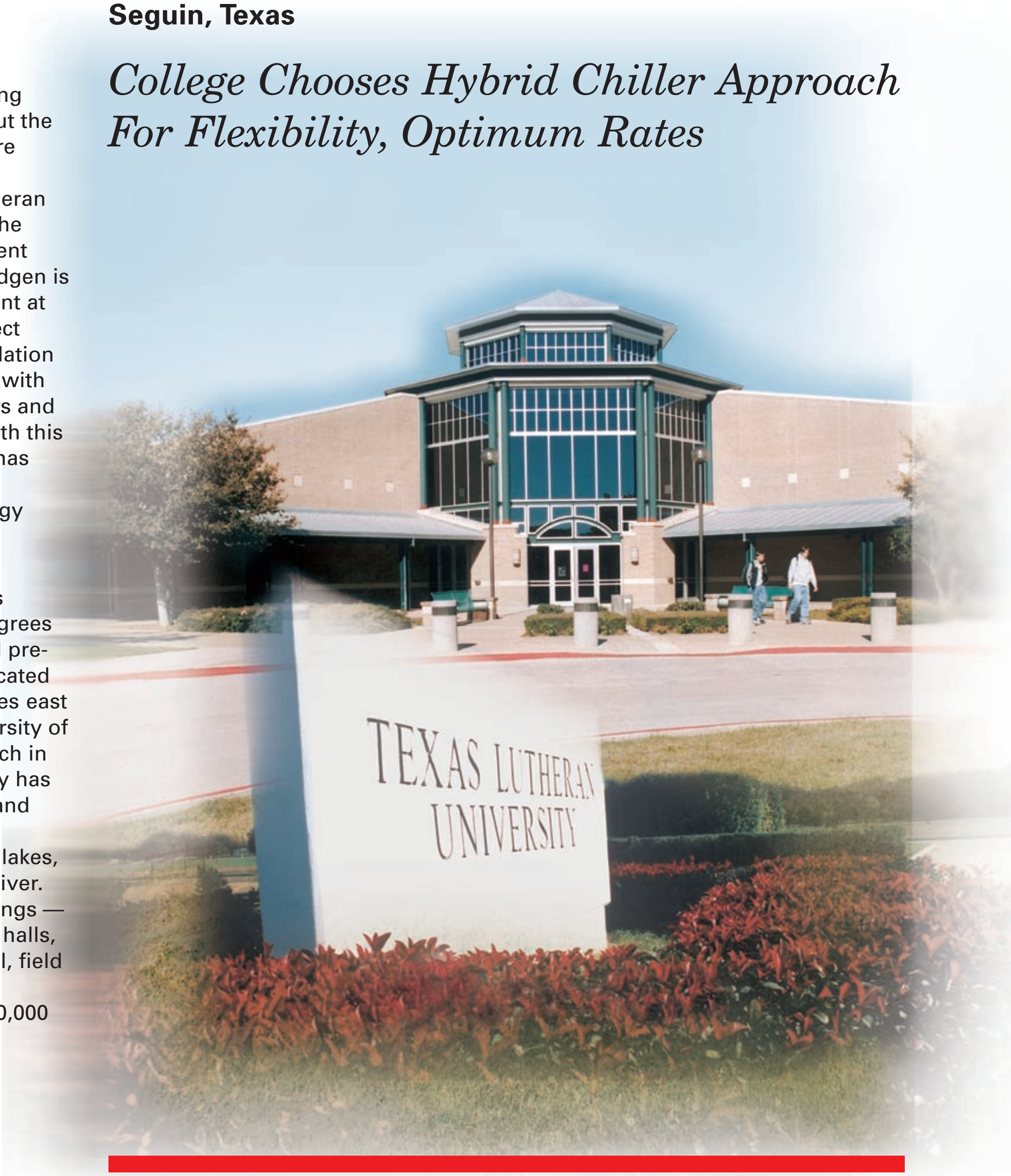
Texas Lutheran University

Seguin, Texas

College Chooses Hybrid Chiller Approach For Flexibility, Optimum Rates

"When we hear nothing from the students or staff about the comfort system, we know we're doing a great job." In this way Thomas Dodgen at Texas Lutheran University describes one way he measures the success of a recent chiller plant improvement. Dodgen is the director of the physical plant at the Texas university. The project involved the design and installation of a combination chiller plant, with both electric centrifugal chillers and a gas-fired absorption unit. With this hybrid system, the university has placed itself in a favorable negotiating position with energy suppliers, and has increased system reliability.

Texas Lutheran University was founded in 1891 and offers degrees in 36 academic disciplines and pre-professional programs. It is located in Seguin, Texas, about 20 miles east of San Antonio, and is a university of the Evangelical Lutheran Church in America (ELCA). The university has an enrollment of about 1,300 and occupies an open, landscaped campus that is surrounded by lakes, parkland and the Guadalupe River. The campus includes 19 buildings — classroom facilities, residence halls, a student union, library, chapel, field house, and administrative and service facilities — totaling 570,000 square feet.



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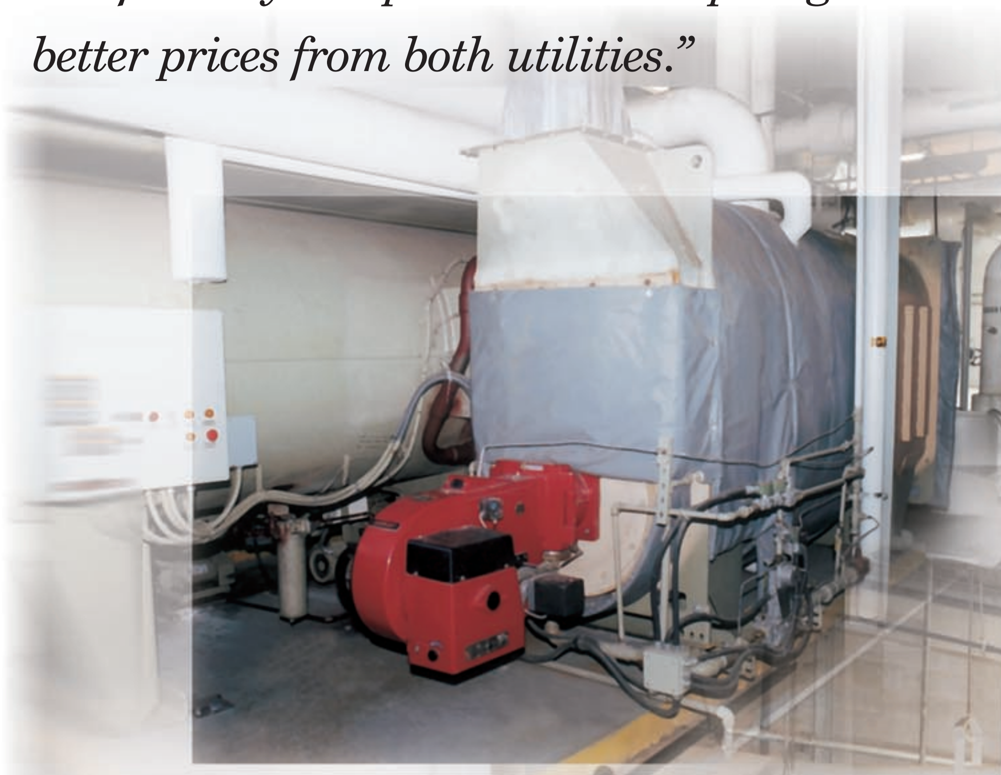
Older Plant Insufficient

Campus buildings receive central chilled water service and hot water service from a central plant building. Dodgen tells how by the mid-1990s, it had become apparent that chiller plant improvements were necessary. "We had only 950 tons of usable chiller capacity, and on hot days we were sending out water at up to 58°F (14°C). We could only barely meet sensible load." The chiller plant consisted of two older centrifugal chillers.

The University worked with BMW Engineering of Corpus Christi and with the Trane San Antonio sales and service organization to evaluate options for plant improvement. An option that was studied in detail was a combined chiller plant, using both electric centrifugal and gas-fired absorption chillers. This type of system is often called a hybrid chiller plant. BMW identified this as an attractive option because of the availability of favorable off-peak rates for both natural gas and electric energy.



The absorption unit is a Trane direct-fired Horizon machine rated at 500 tons.

The university's natural gas supplier is Reliant Energy of Houston and the electric supplier is the City of Seguin, which buys energy through the Lower Colorado River Authority. The campus receives three-phase electric service that is primary metered at 7200 VAC at a campus substation before it is distributed on a mostly-underground campus electric loop. The electric chillers operate at 600 volts.

Hybrid Solution Chosen

The combined chiller plant approach was the solution chosen by the university. According to Dodgen, "We felt a hybrid plant would help us get better prices from both utilities." He points out that the summer use of natural gas would put the university in a more attractive rate bracket. "Having a good solid load in the summer helps us negotiate a better year-round price."
With the decision to install a hybrid

“Trane and BMW Engineering did everything they could to make the transition as seamless as possible.”

system, BMW Engineering began designing the plant immediately. The university worked with the engineer and with equipment suppliers to have the new plant up and operating in time for the graduation weekend in May of 1997. The equipment chosen was two Trane CenTraVac™ Model CVHF electric centrifugal chillers rated at 500 tons each, and one Trane Horizon™ direct-fired absorption chiller rated at 500 tons, for a total capacity of 1,500 tons.

The CVHF units are high-efficiency two-stage machines with hermetic compressors that use low-pressure R-123 as a refrigerant and operate at exceptionally high efficiency. The Horizon absorption chiller features an integrated gas-fired steam generator and it matches up well with the centrifugal machines. Both types of machines operate in the same temperature ranges, so the chilled water outputs are identical.

Chillers Operate in Any Combination

The three chillers are designed to operate in any combination and the chiller plant provides chilled water at 44°F (7°C), with the chilled water normally returning at 54°F (12°C). The system is designed as a primary-secondary loop system with a plate-and-frame heat exchanger at the mechanical plant. Condenser water from the three chillers is piped to ground-level cooling towers adjacent to the mechanical plant. Under design conditions, condensing water goes to the towers at 95°F (35°C) and returns at 85°F (29°C).

The performance of both the centrifugal and absorption machines can be optimized and analyzed with the Trane UCP2™ unit control panel. Chiller plant control is provided by a Trane Tracer Summit™ system, which interfaces with a campus-wide control system that includes both Tracer Summit and Siemens control elements.

The central plant delivers chilled water to a mixture of constant-volume air handlers and Trane UniTrane™ horizontal concealed fan-coils that are installed in many campus buildings. Some of the newer campus buildings are equipped with Trane Modular Climate Changer™ central station air handlers and Trane

Chiller plant also features two new trane CenTraVac chillers rated at 500 tons each.

“Both the control system and the equipment itself allows us to watch and maintain comfort levels very closely.”

Central chiller plant.

Chiller plant control is provided by a Tracer Summit system.

VariTrane™ variable air volume (VAV) distribution boxes. With the new chiller plant, the airside equipment was finally able to operate at full efficiency. According to Dodgen, as new air handlers are installed in campus buildings, the school is installing Tracer Summit controls.

The new chiller plant was started up in the spring of 1997. According to Dodgen, “There were some hiccups at the beginning – not surprising with an all-new plant – but we worked through them. Trane and BMW Engineering did everything they could to make the transition as seamless as possible. It took a lot of coordination.”

Startup Challenges

Ken Dixon, an existing building sales consultant from Trane San Antonio, worked with the university through this process and echoes this experience. “With the new lower temperatures of chilled water, there was a need to re-balance most of the air handlers and terminal boxes. This is a time-consuming process, but it had been expected. Ultimately, the new chiller plant was available to run at full capacity by graduation time.”

Because of recent energy prices and electric demand charges, since initial startup the university has generally chosen to base-load the absorption chiller and bring the electric machines on line as needed to meet campus cooling loads. Since 1997, the school has added a 53,000 square foot residence hall, a 13,000 square foot fitness center and a 12,000 square foot field house. The chiller plant continues to be able to carry the full cooling load.

Dodgen indicates that there has been a wide range of interest by other institutions in their experience with a hybrid plant. “School districts, universities and hospitals from all over the U.S. have called or visited us, asking about our experience. We tell them we really like the hybrid approach. We feel we made the right decision.”

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Literature Order Number	CASE-SLX067-EN
Date	June 2002
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Stocking Location	La Crosse