

ENERGY TO CARE *SUCCESS STORY*

Midland Memorial Hospital Sustainability Case Study: Big Upgrades on Recent Additions

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Midland Memorial Hospital

ENERGY STAR Rating: 85 (2018)

Beds: 474

Founded: 1950; new tower added 2012

Sometimes even newer hospitals can be tweaked to improve sustainability. That was the case with Midland Memorial Hospital in Midland, Texas, which opened a new patient tower in December 2012.

“When we became involved with Midland Memorial in 2014, we did a study that assessed the systems and the lay of the land and realized there were a lot of moving parts because of the recent expansion,” explains James Hess, Energy Engineer at Bernhard TME, the engineering firm that helped the hospital reduce energy consumption. “The hospital had 445,000 square feet prior to 2012, but with the new patient tower that rose to 789,000 square feet. The building had been commissioned when it was opened, but we still found significant savings potential.”

Bernhard TME developed a wide range of energy-saving plans for the hospital, ranging from tweaking the Johnson Controls Metasys building automation system (BAS) to a complete upgrade of the heating water system and chilled water system.

Heating Water System Upgrade

Among the most important projects was the heating water system upgrade.

When the consulting engineering firm did the new patient tower, they provided a new steam plant. But the steam capacity was not adequate to handle the existing process, humidification, and heating water system loads, along with the new patient tower heating water system load. “One winter the hospital was short in steam capacity and had to shut down the process load (sterilizers and washers in CSPD),” says Hamid Habibi, Project Manager at Bernhard TME.

To address that problem, the Bernhard engineers added four Aerco high-efficiency condensing boilers and transferred the heating water load off of the existing Cleaver Brooks fire tube steam boilers. The new heating water system is more efficient, uses less energy and substantially reduced the steam load.

“With the new heating water system, we added redundancy to the heating water system and reduced the steam load while also creating redundancy in the existing steam system, because now the steam is only used for the kitchen, humidification and sterile processing,” Habibi says. “With the dual fuel requirement, we had to keep the steam-to-hot water heat exchanger, but now they’re valved off, because the steam boilers are dual fuel.”

Chilled Water System Upgrade

Several improvements to the hospital's chilled water system also reduced energy consumption. "When we took over the project the chilled water system was brand new, and they had installed variable speed pumps and everything for the new patient tower. But the existing hospital was a hodgepodge – there were pumps pumping into other pumps. There were literally 50 or more pumps in the chilled water system," Habibi explains.

Their solution was to convert the existing chilled water system from a primary-secondary-tertiary pumping arrangement to profile pumping with variable primary. This allowed the hospital to eliminate all the secondary and tertiary pumps and operate the chilled water system with higher efficiency due to less pumping energy consumption.

"By converting the chilled water system to variable primary with profile pumping, we could maintain the differential pressure at the plant at the minimum, and allow zone pumps to supplement the additional pressure required during the peak cooling condition," says Habibi. This meant that during the winter season or low cooling conditions, the chiller plant's differential pressure would be adequate to handle the zones without additional pumps required, resulting in reduced energy consumption.

Additional upgrades made cooling for surgery suites more energy efficient. A Trane CDQ dedicated air handling unit was added to provide conditioned outside air to the surgery air handling unit. This enabled the surgery suite to continue receiving low temperature air without requiring the central chiller plant to make colder water than is needed for the entire system. The chilled water supply temperature was reset to 44 F, which improved the overall chilled water system energy efficiency.

The team also sought to make the plant free-cooling option actually operational, which improved the overall system's energy efficiency. The BAS contractor accomplished this by modifying plant controls, allowing the cooling tower to meet the facility's cooling needs in colder weather, with the chiller compressors off.

Ventilation Schedules

In an effort to reach optimum efficiency, room ventilation schedule and variable air volume (VAV) schedules were revised. Part of this effort involved taking advantage of the current ASHRAE Standard 170 minimum airflow requirement for patient rooms, which changed from 6 air changes per hour (ACH) to 4.

"We went through the entire facility, including the new patient tower, and redid the room ventilation schedules from scratch," Habibi says. "The majority of the VAV was set on constant flow. By implementing revised room ventilation calculations, we were able to reduce the minimum air flow set-points in almost every patient room."

This change required no new equipment – it was simply a programming change at the air handling units and VAV terminals.

"All of a sudden we had lot more capacity available for the air handling units. And patient comfort was not affected, because if they needed more air, the capacity was there," Habibi explains. "We were able to reduce the fan horsepower, and considerably reduce reheat."

Air handling unit discharge air temperature set-point and fan static pressure set-point reset was also implemented for all of the air handling units.

“This reduced the chilled water, reheat and fan energy requirements.” Habibi says. “The discharge air temperature and fan static pressure resets were just simple programming or set-point changes.”

Other Changes

The modifications described above illustrate the chief sustainability improvements made at Midland Memorial Hospital, but a number of important minor changes also took place. For example, engineers discovered that one entirely unoccupied floor – that had not yet been built out – was needlessly receiving full HVAC capacity.

“Basically that entire floor was just running the full amount of air as if the space was fully occupied,” Hess says. “The air handling unit was running at full blast 24/7. So that was a good discovery from an energy standpoint.”

The team also added occupancy sensors in certain areas to minimize airflow and temperature requirements during unoccupied periods.

“We added the OR occupancy sensors for 15 operating rooms and then we came back and basically did a very similar approach for the CVOR and Cath labs upgrade project, as well as other areas within the hospital,” Hess says. “It’s often said in hospitals that they run 24/7 and you can’t do any resets or unoccupied controls, but I would argue that’s really not true. If you get specific and go area by area you can find several areas within a hospital where you can implement unoccupied reset controls using occupancy sensors.”

Maintaining the Gains

To ensure that Midland Memorial Hospital’s sustainability gains continue to accrue, the engineers review monthly diagnostic reports for the VAV terminals and air handling units. Through analysis of HVAC systems data, the diagnostic reports focus on finding faults or issues that affect energy performance. The analysis shows which issues need attention, and the team decides whether a given issue can be addressed in-house or requires the BAS contractor.

All of the changes and ongoing monitoring helped the hospital increase its ENERGY STAR® score from 32 in 2013 to 75 in 2016, and then to 85 in 2018. The annual energy savings from the projects exceed \$1 million.

Habibi sums it up: “Their savings are huge.”

The Energy to Care program, sponsored by Johnson Controls, encourages hospitals across the country to reduce their energy consumption by 10 percent or more over their baseline energy consumption. Since 2009, hospitals participating in the Energy to Care program have tracked more than \$67 million in energy savings. This free program includes a robust energy-benchmarking tool in addition to the awards. ASHE congratulates these hospitals for their leadership in reducing energy consumption.



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