Out with the old, in with the new

Campbell-Tintah school saves big with energy-efficient renovation

The students and faculty of Campbell-Tintah Public Schools in Campbell, Minnesota, are staying warm and breathing fresh air this school year as the result of a newly installed electric thermal-storage (ETS) system in addition to a new ventilation system. This makes the nearly century-old school the largest Steffes ETS heating installation in the United States designed with a new ventilation system. The systems are part of a $4 million energy-efficiency renovation that also included a steam-to-hydronic hot-water piping conversion, new energy-management system, and updates to the roof and interior lighting.

The path to an ETS system

Wayne Olson became Superintendent of Campbell-Tintah Public Schools in 2009, and it wasn’t long after that he began looking for ways to lower operating costs by improving the school’s energy efficiency. “This is an old building, and we were spending a lot on energy costs, so we started looking for ways to make improvements,” said Olson. Improved efficiency began with small steps. “In some of the classrooms we put Styrofoam over the windows, and we started shutting off lights when rooms were not in use,” said Olson. “But heating was the biggest issue for us, so I started looking at the possibilities.”

The school’s old and deteriorating steam boiler was using 24,000 gallons of fuel oil a year to heat the school. And with fuel oil around $3.50 a gallon at the time, that was costing approximately $86,000 a year.

“When there isn’t air flow, students start nodding off. Now we have an efficient, reliable heating system and fresh air coming in. It’s a much better learning environment for students.”

- Wayne Olson
Superintendent, Campbell-Tintah Public Schools

Continued . . .
At about that time Olson also met representatives from Ameresco, an independent provider of energy efficiency and renewable energy solutions. They discussed the idea of a performance contract, in which Ameresco would guarantee cost and energy savings. “It’s going to take us a few years to break even, but after that we’re going to be pulling in an increased amount of savings each year,” said Olson.

In early 2010 Otter Tail Power Company Energy Management Representative Bill Klyve suggested replacing the fuel oil steam boiler with an energy-efficient ETS system. The ETS system would save the school approximately $65,000 a year in heating costs.

Cost comparisons

<table>
<thead>
<tr>
<th>Fuel oil steam boiler</th>
<th>Electric thermal-storage system</th>
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<tbody>
<tr>
<td>24,911 gallons No. 2 fuel oil at $3.50 per gallon</td>
<td>613,104 kwh at $.036 per kwh*</td>
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<td>= $87,188</td>
<td>= $22,071</td>
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* Calculation is based on 60 percent efficient fuel oil system and 100 percent efficient electric system. Price per kwh includes riders and adjustments for efficiency programs and transmission and renewable energy improvements in place as of November 1, 2012.

Enjoy warmth and save money

Electric thermal-storage (ETS) systems store heat in a bed of sand or in specially designed ceramic bricks. As part of our energy-management program, ETS systems qualify for our off-peak rates, which are about half of the price for electricity on our General Service Rate. Rebates are available for heating or cooling installations on the Deffered Load and Fixed Time of Delivery Rates. Financing also is available to qualified customers through our DollarSmart financing program.

Electric thermal-storage systems are available in several technology designs.

- **Central heat-storage furnaces** store heat in specially designed ceramic bricks and distribute it through ductwork to warm every room. They work well in new construction and retrofit installations.

- **Individually controlled room units** can heat a one-room addition—or an entire office building or school. These compact units store heat in specially designed ceramic bricks and work well in retrofit installations or in new construction.

- **Underfloor electric heat storage** is an excellent way to make use of the earth’s heat-storing properties. This technology works in new construction installations and is installed before the slab is poured. Choose an electric cable option or a hydronic system, in which an electric boiler or hydronic storage furnace heats liquid that flows through tubing buried in a bed of sand. Both warm the earth and create a heat reservoir beneath your home or business.

“The biggest factor in the project was the health and safety of the school’s occupants,” said Klyve. “The Minnesota Department of Education recommends up to 15 CFM of fresh air per building occupant. The new ventilation system would meet that recommendation.”
Achieving improved indoor air quality

The renovation began as a way to save on heating expenses but, for the school to have access to health and safety funding, a ventilation system needed to be installed. So a central ETS heating, ventilating, and dehumidification-cooling system was chosen even though ETS room units may have been a less expensive heating-only option.

The new ventilation system includes:

- New central system air-handling units and sheet metal air-distribution ducts. The larger fan motors use variable-frequency drives for variable air volume control and energy savings.
- New outside air intakes. If outside conditions are cool and dry, up to 100 percent outside air may be supplied to each room for economizer-free cooling.
- For the classrooms, the largest air-handling unit includes an energy-recovery wheel to preheat or pre-cool (dehumidify) outside air from the building relief airflow.
- High-performance air filtration of all supply air entering the classrooms.
- Individual room and zone temperature and humidity controls.
- Heated or dehumidified outside air for each occupied room.
- For demand-control ventilation with the new energy-management system, carbon dioxide (CO₂) sensors also are used to monitor ventilation effectiveness and prevent energy waste.
- Acoustically selected and designed system components for low-sound levels.
- New central air-cooled chilled-water system for space dehumidification. Dehumidification reheat is provided by a special heat-recovery, water-cooled condenser included as part of the packaged chiller.

Technology leads to savings, better learning environment

With students and faculty on summer break, construction began on May 29, 2012. A 2,400 square-foot area of the school previously used for shop classes was transformed to accommodate the new 14-unit ETS system. Ceilings throughout the school were torn down to make room for the new ductwork and hot-water piping, and workers began to renovate the roof and lighting.

The school’s new ETS system uses specially designed ceramic bricks to store heat. The bricks heat water to 180 degrees overnight, when electric rates are lowest. The water then is pumped to new

Central-storage furnaces may be the perfect heating solution for:

- Replacing the forced-air furnace in your existing home or business.
- Building a new multilevel home or business that needs a comprehensive system.
- Accommodating summertime cooling.

The school received more than $135,000 in rebates and grants through Otter Tail Power Company’s demand-response and Conservation Improvement Programs to help pay for the updates. The ETS system, lighting and motor upgrades, and new off-peak water-heating system all qualified for incentives.

Rebates

- Thermal storage $32,000
- Water heater $1,500
- Variable-frequency drives $1,830
- Motors $2,655
- Lighting $13,160

Grants

- Ventilation $84,347

“Before these updates, we had students opening windows in classrooms because it was so hot, and they might go to the next classroom and have to wear coats. There was no consistency in the heating,” said Olson. “When there isn’t air flow, students start nodding off. Now we have an efficient, reliable heating system and fresh air coming in. It’s a much better learning environment for students.”
Increase your efficiency through technology
Our industrial services engineers and energy management representatives can help you identify and evaluate energy-efficient productivity-increasing technologies for your business. In addition to helping you understand operational requirements and advantages, they will conduct rate and payback analyses. Contact your representative today!