



Tomorrow River School invested in condensing boilers – a relatively new technology – and other HVAC improvements to increase their energy efficiency which will result in energy cost savings of \$41,500 annually.

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The Tomorrow River School District had long suspected that its school in Amherst wasn't as energy efficient as it could be, and knew it wasn't as comfortable as they wanted it to be. "Some rooms were always too hot, others were always too cold. We were trying to find a way to balance the comfort of the learning environment against the cost required to achieve it and we weren't happy with the results," said John Haugen, Tomorrow River School District administrator.

The district turned to Don Keck, an energy advisor with Focus on Energy, Wisconsin's energy efficiency and renewable energy program, for help. Keck conducted an energy audit of the building. After the results were reviewed he recommended creating an energy committee for the school—and promptly signed up to become its first member. He also suggested the school study their energy benchmarking report which had been conducted by the Schools and Government Program of Focus on Energy for public K-12 schools across the state. "We examined Tomorrow River's energy benchmarking report and the results were pretty sobering: the school was in the bottom 17 percent for energy efficiency compared to other K-12 schools," said Keck.

Discovering why was the next step.

"I recommended that Tomorrow River participate in a retro-commissioning study, which Focus helped to fund," said Keck. "This study looked at things like HVAC, boilers, the building envelope and the domestic water heating system, to pinpoint problems."

The study uncovered a number of areas of concern, with the school's HVAC and energy management

system topping the list. "When you saw how the building had changed over the years, their low scores weren't at all surprising," said Keck.

The school had gone through seven additions since it was originally built, and the quality of construction and types of heating systems were inconsistent from one addition to the next. "One area even had rooftop units with electric heating elements because they were cheaper to install than tying into the hot water supply from the boilers—though more expensive to run—and the energy management system was out of date," said Keck. "The custodial staff had been doing everything right in terms of maintenance and repairs, but there was only so much they could accomplish with the existing systems."

Another HVAC problem was the eight inefficient hot water boilers of various ages and manufacture scattered in four separate locations throughout the building. Fewer boiler plants in a more centralized location are typically recommended for energy efficiency and ease of maintenance.

Using the results of the energy audit prepared by Keck and the retro-commissioning study conducted by Focus business ally, Complete Control, Inc. (a local boiler and controls provider), the school administration was able to convince the school board of the benefits of updating the HVAC system.

Keck strongly recommended that the school make a switch to condensing boilers and add an upgraded energy management system. "Condensing boilers are a new technology for many people, but if you're really committed to energy efficiency, they're the best choice," said Keck.

Keith Waterson, the school's building and grounds supervisor was eager to put the new systems to use. "Sometimes people are intimidated by new technology—and I was too at the beginning—but you just have to dig in and learn the system."

The new energy management system uses a program that Waterson wrote with the help of Complete Control, Inc. "We can run trends for different rooms and different times of day, we can look at the impact of air flow levels and adjust them accordingly. We can determine the optimal time to start the boilers or adjust air handlers," said Waterson. "We have knowledge, control, flexibility and efficiency that we never had in the past."

The system now employs two boiler plants—instead of four—and an energy management system that regulates everything from the boilers to hall lights to vent fans. The upgrade cost the district \$514,000 and with a Focus on Energy financial incentive of \$18,480, and estimated annual energy savings of \$41,500, the predicted payback period is just under 12 years.

"In this era of finance caps, saving money on energy is one of the best ways we can keep services high for our students," said Haugen. "Focus on Energy has been with us every step of the way in our efforts and Don has been an outstanding resource. He's helped us to write grants, put us in touch with other schools that are facing similar issues and helped us to partner with excellent contractors."

The district has more projects in the planning stages including relamping in the cafeteria and shop areas and adding energy saving curtains in the school's greenhouse.

"It's all about uncovering areas of opportunity and Focus on Energy has made a long-term commitment to help us do just that," said Haugen.

The total project produced 112,670 kWh and 15.12 KW of annual electrical savings, and 34,374 therms of annual natural gas savings.

AN INTRODUCTION TO CONDENSING BOILERS

Condensing boilers beat out typical boilers in two ways: they extract more heat from flue gases and they can produce cooler water when needed — which requires less energy to heat.

Heat extraction

With a typical boiler, large amounts of heat are lost in the flue gas as it travels out the stack. Condensing boilers have larger, higher efficiency heat exchangers that extract this heat for re-use.

Lower water temperatures

Traditional boilers require water heated to temperatures between 140 and 200 degrees because water heated to lower temperatures will create acidic condensation on the heat exchangers that destroy them over time. High efficiency condensing boilers are built of materials designed to handle these acidic substances and they can extract more energy from the flue gases at water temperatures that meet the building's heating requirements.

ENERGY MANAGEMENT SYSTEMS OPTIMIZE EFFICIENCY OF CONDENSING BOILERS—YEAR ROUND

To get the most out of a condensing boiler, it's critical to tie it to an energy management system or boiler management system. This will let you program both internal and external conditions into the energy management equation—such as the internal heat load caused by lights and warm bodies and Mother Nature outside. So on a bitterly cold day, your system might be programmed to heat boiler water to 180 degrees to combat the chill, but to only 120 degrees on a milder spring day.

In addition to more efficient heating, the energy management system will also increase the efficiency of air conditioning—a common amenity as schools add features like carpeting and drywall which are susceptible to mold. After the hot, humid outside air is dropped to dew point to "wring" the moisture out, it needs to be reheated to a comfortable temperature—and there's nothing more efficient than a condensing boiler to do the job. Instead of requiring the 180 degree water of a conventional boiler, the condensing boiler can deliver comfortable air temperatures using water heated to a much more efficient 110 degrees.

HOW CAN FOCUS ON ENERGY HELP YOU?

"There's a direct correlation between the money you save on energy and the money you can put back into the classroom. To maximize your resources you have to improve your energy efficiency, and Focus on Energy can help make that happen."

John Haugen

District Administrator, Tomorrow River School District

"Focus on Energy has been an integral part of our success in lowering energy usage."

Keith Waterson

Building and Grounds Supervisor, Tomorrow River School District

Increase your energy efficiency, and get more out of your district's budget, with the help of Focus on Energy. Our energy advisors can offer in-depth, up-to-date knowledge on a variety of energy topics and offer a neutral, third-party perspective that can help you to determine the most effective ways to solve your energy challenges.

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