Schools of the 1960s Get Mechanically Modernized

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School administrators in Byron Center, MI, recently overhauled the districts heating and hot-water systems to save energy and money.

Turtleneck sweaters, beehive hairdos and inefficient mechanical systems have this in common: they're all, thankfully, a thing of the past. However, despite the hipster fashions, the 1960s also ushered in a healthy dose of new environmental awareness. Buildings constructed during that decade show signs of it, too, with smarter use of insulation, improved construction and more efficient heating and cooling equipment.

The Byron Center, MI school district buildings, built in the mid-1960s and with roughly 4,500 students today, were about as inefficient as they come. Fortunately for the school district, however, the facilities' current Operations Director Doug Gallup is ardently eco-conscious and has gone to great lengths to "re-green" school facilities and administration buildings.

Gallup began his work at the school district in 2000 as Assistant Principal and Dean of Students. He assumed the role of Operations Director in 2012, and the school district has been making eco-friendly improvements ever since.

The first thing Gallup did in his new role was study the district's water and electric bills. The heating and cooling bill for one year for the high school alone was $398,000. It wasn't hard to calculate what they'd been spending yearly for all schools within the district—and there was only room for improvement.

Gallup began with quick fixes: replacing all indoor/outdoor lighting with LEDs and asking kitchen staff to fire up the commercial ovens only 15 minutes prior to their need. He learned that, previously, the behemoth ovens were ignited up to two hours before lunchtime meals.

Energy modifications

"I also began to record our energy consumption," said Gallup. "I wanted everything to be data driven—the usage, and eventually savings." Gallup initiated close monitoring of gas and electric use to collect accurate data.

"Fortunately, most of our school district transformers are owned by the district, so I was also able to negotiate rates with our gas and electric companies for tremendous savings," he said.

The first large, full-scale project Gallup tackled was to change all school's white roofs to black, a heat-retention method that makes good sense in Michigan.

"The majority of the district's high utility costs were for heating the schools," said Gallup. "We switched

Byron Center Public Schools are implementing numerous eco-friendly practices, including new heating systems.

from white to black roofs because they absorb and hold more solar energy, which helps by not having to utilize our heating systems as much."

Water consumption at the Nichols Building

When it was built in 1968, the "Nichols" building was originally the district's high school. Since then, it's been repurposed as the 5th and 6th grade intermediate school. When studying the exorbitant energy costs from years past, Gallup discovered there was a 750-gallon hot water tank continuously heating water for 32 showers at the Nichols building. In its high school years, the showers at Nichols were likely used frequently following gym classes.

"Kids in fifth and sixth grade don't shower after gym class," chuckled Gallup. "They spray on some Axe and call it good."

Gallup worked with a local rep agency to find the best manufacturer for a high efficiency solution for the locker room project. Through the rep firm, he was introduced to Van Culberson, the regional manager for Laars Heating Systems.

Byron Center Public Schools' Doug Gallup plans to next invest in variable-speed motors, insulation and thermal imaging in order to help save money and energy.

"It turns out, we're practically neighbors," explained Gallup. "We like their products, and I can send my maintenance faculty to their rep training facility. An added plus was seeing that tax dollars were spent locally."

The solution: they kept the showers, but now a single, 199-gallon, high-efficiency Laars UHE condensing water heater manages the task of heating domestic water for the entire school, and handles the needs with stride.

They tapped Grand Rapids, MI-based Godwin Plumbing & Heating for all the plumbing and mechanical work at the school district.

The new, much more efficient heating systems at Byron Center Public Schools are saving the district roughly $400,000 per year.

David Breuker, project controller/estimator at Godwin Plumbing, says he sends his technicians to Bradford White for training on new technology, and has always been impressed with the products.

"The gas-fired UHE runs at a 99% efficiency rate," said Breuker. "That costs a whole lot less to operate than the 750-gallon tank that was in the Nichols building previously."

Breuker added that if the need should ever arise, a second UHE could be put next to (or stacked on top of) the existing one.

Heating, too

Next, Gallup turned his sights to two 4-million BTU "energy hog" boilers in the Nichols' mechanical room, chugging away at 72% efficiency.

"After putting our heads together, Van and I decided that a 3-million BTU Laars NeoTherm condensing boiler would be our best option for primary heating of the Nichols building," said Gallup. "We chose to keep the old ones there for backup—necessary on single digit days."

The gas-fired, modulating boiler runs at 95% efficiency and serves all of the heating needs at Nichols.

"The gas and electric savings in that building are noth-

ing short of incredible," Gallup added. "When we began to see the impact of these savings, we knew we were on the right track."

Over at ECC

The Early Childhood Center (ECC)/Administration Building was built in the 1950s, when it had been originally tied into a campus-wide steam system, and acted as the high school before Nichols was built in 1968. Now, the building is a weekday home-away-from-home for over 180 kids, ranging from six weeks to five years old.

When Gallup took on his current role, ECC had two, 2-million BTU boilers, much more than was necessary for the 27,000 sq ft single-story building.

"The ECC building has a convection heating system. When looking at loop temps, the target water temp Delta T is 20°F," explained Culberson.

Once Gallup looked over the metered data collected from the dashboard he had installed, he realized there was only 8–9°F difference between the incoming and outgoing water temps. Culberson quickly spotted the problem, likely due to the use of oversized pumps.

"An immediate solution to the oversized pumps was to put variable frequency drives on them," said Culberson. "They went from running at twenty horsepower to eight."

By modulating pump speed, they greatly improved heat distribution, seen quickly in the improved system ΔT.

"Those big pumps had been pushing water way too fast for system heat to be distributed," added Gallup.

Equipment upgrades

The addition of variable frequency drives delivered a quick solution to the expensive issue of oversized pumps, but it wasn't intended to be the main course of action with the energy overhaul.

For that, Culberson suggested a 1.25 million BTU Laars NeoTherm. The Laars NeoTherm line is a direct vent, sealed combustion line of boiler/volume water heaters that modulates with a 5-to-1 turndown, and an ASME stainless steel heat exchanger with low NOx emissions.

"Kids as young as the ones at ECC are always crawling around and playing on the floor," said Gallup. "We didn't want hot radiators where kids could very easily burn themselves, so we installed fin tube baseboards that accomplish easy heat distribution with much lower temps."

Also, a 55-gallon Bradford White water heater was installed to meet the need for domestic hot water.

Another building in the Byron Center School District, the Countryside Elementary school, needed some efficiency tweaking and new equipment, although on a much smaller scale. There, Gallup chose to install a 50-gallon Bradford White water heater.

Re-greening takes root

Gallup's passion for energy conservation, a penchant for efficiency data and aggressive courses of action to re-green the schools led all buildings in Byron Center School District's to receive an Energy Star rating, with several at 100%.

"Our school district went from spending $1.4 million a year for heating and cooling to $1 million," noted Gallup.

Gallup continues to introduce eco-friendly practices to the schools on smaller scale. For instance, students are learning to make natural fertilizer in school greenhouses for fields and trees. Many school windows now have an energy efficiency film on the inside surfaces. Attic and wall spaces have received enhanced insulation, and there is light-harvesting technology in use as well.

"I'm not done yet," said Gallup. "In the next three years, I'd still like to invest in variable speed motors, broader use of super-efficient insulation and thermal imaging of all the schools to see where we can enact further improvements." **ICM**