Leander Independent School District

School District Introduces Full BAS Control of Lighting and HVAC

By Jack Sine

Mike Conkle had a problem. Actually, he had more than he could count. As Energy Manager for the very green and very budget-conscious Leander Independent School District in the greater Austin, Texas area, Conkle was always looking for ways to reduce energy use. But his most nagging current problem was lighting.

School District Growth

"This district is in the top five percent for growth in the state of Texas," Conkle said. "We average 1.5 new elementary schools every year, a new middle school every two or three years, and a new high school every three-and-a-half to four years. And we are constantly searching for ways to maximize our power efficiency."

The reason for the growth in population is the growth in employment opportunity. With it's corporate tax structure, Texas has been drawing manufacturers from other not-so-tax-friendly states, such as California. And Austin, nestled in the beautiful Texas hill country, offers ample recreation opportunities for the new employees without the traffic snarls of Dallas/ Ft. Worth and Houston. So companies like Dell, Samsung, and Motorola, among many others, have chosen the Austin area as an ideal place to build manufacturing facilities.

A DDC Solution

"When I started here in 2001 in HVAC maintenance we mostly had programmable thermostats in the buildings and we controlled the lighting with wall switches. That was the available technology," said Conkle. "We had what were basically just time clocks for HVAC. I would have to drive out to a school and reset it for holidays or weather days."

"I soon moved on to commissioning the new buildings, overseeing all the contractors, doing the test and balancing. I worked on high school 3, elementary schools, 12, 13, 14, 15, and 16, and middle schools 4, 5, and 6, so I had a real good knowledge of what we had in the way of HVAC and lighting. Right after high school 3, direct digital control (DDC) technology came on the scene and we were among the first districts in Texas to take advantage of it," said Conkle. "It was a godsend for us. We run air conditioning almost year round, so 65 to 70 percent of the utility bill is HVAC. Now with DDC we finally had the ability to run it efficiently."

Power Challenges

"The challenges we have at a school building are far more demanding than those in typical office buildings or shopping malls. Our buildings don't cease to be used at the end of the school day. There are a hundred activities at night, most school related like sports, and others community-based like scouts, YMCA, PTA, and church-sponsored activities. To save power, we needed remote control of each zone in each building well after school hours."

"After a lot of research, we were able to narrow our suppliers for building automation systems (BAS) to two. These systems met all of our HVAC needs. Because of the climate in Austin, that meant almost entirely air conditioning. We run our AC systems almost 12 months a year, even in January and February. With the varied demands of after school-hour use, these new systems enabled us to program in numerous scenarios to handle all of our air conditioning needs. We were even able to program in overrides in case, say, a wrestling coach had failed to schedule gym usage with maintenance, he could press an override button and have air conditioning for as long as he needed in half hour segments."

"More important, now, instead of someone driving to each facility, I could sit in my office or at home and schedule cooling for each zone in each building."

But lighting was a different problem.

The Search for Lighting Control

"After we started using BAS, the City of Austin dictated that all new commercial buildings, including schools, must have some system to prevent lights being left on when not needed," said Conkle. "We were only too happy to comply because we were always looking for ways to reduce energy use. In fact, we had already begun looking into lighting control systems."

It was the beginning of a long journey that ended up going through three lighting control companies before they finally found an acceptable solution.

First Steps to Lighting Control

"Initially, it looked like a solution would be easy," said Conkle. "All of the major lighting control companies said they were BACnet compatible. Since our BAS controllers were all based on BACnet, it seemed it should have been easy to integrate them with a BACnet compatible lighting control system. But there was much more to it than that. BACnet compatible didn't mean you could plug them together and they started talking."

"We went through a couple of companies looking for a lighting control solution that would communicate with our BAS controllers. One company gave us a tour of their operation and assured us they could solve our problems. We told them what we needed and they swore they could make their control panels work with any DDC system through BACnet. Turns out they could communicate to a degree, but not at the level we needed."

"For instance, there were control buttons for the lights in the schools, just small buttons for each zone, but they had a flashing light and that attracted the attention of kids, particularly at the elementary schools. So a kid would push a flashing button and we would get a call from the principal that one of his light zones had gone out. All we wanted was an option to lock-out the buttons during the day so we could stop getting calls from principals with no lights. We had to go through five or six trips from this one lighting control company. My control technician who integrated the systems, did a good job, but he spent about 200 hours just getting the controller to respond the way we needed it to. He had to install new drivers on their software to make it communicate with our BAS. We were having all sorts of problem with lockups. We'd have to go back and reset the hubs and the routers."

"Although the companies we used said their control panels were BACnet compatible, it was far from simple. I would have to get with my engineer to write a spec based on code changes because it was something new to the industry. We had one computer communicating with all of the HVAC and another computer communicating with the lighting controls and they didn't talk to each other."

"For after hours events it was worse. A high school runs typically 12 to 13 hours a day and all of the lighting needs change on a daily and hourly basis. The lighting panel that's right for a large office building is not designed for the needs of a school district. None of the panels we initially used had that kind of flexibility. What we did have was a 30 minute override that was designed for custodians to use to perform their after hours cleaning. When the 30 minutes was up, the lights went off. Say in the weight room the football team is staying late and didn't notify me. You don't want some kid squatting 300 pounds and the lights go out and he injures himself."

A True BACnet Solution

"So we'd gone through three lighting control companies and had achieved only a partial solution and we were still looking for one that could talk directly to our BAS controllers. When we told our primary BAS provider, Automated Logic, about our problems, they said they might have a solution. They had become our primary BAS provider because they were so committed to the BACnet protocol and were committed to integrating other systems and incorporating other manufacturer's proprietary protocols into their own product. They said a lighting control company named Blue Ridge Technologies used the same approach and communicated easily with Automated Logic's BAS controllers."

"Most other lighting control company's products are designed to function on their own as standalones," said Steve Pachal, director of technology for Blue Ridge. "We designed our system specifically to be integrated with a BAS. In addition to Automated Logic, we also have integrated with proprietary protocols of Johnson Controls and Siemens. In fact, our lighting controllers will work with any BAS controller that is BACnet MSTP compatible. We don't require any proprietary gateways or front end software because we are native BACnet."

"It all sounded good on paper, but so had the previous lighting control vendors", Conkle continued. "So I decided to put Blue Ridge to the test. I gave them eight different lighting scenarios that would cover just about everything I wanted in lighting control. I thought that if they could only achieve the first four of my scenarios, I would be happy because none of the other three companies could do any of them."

"They didn't just meet all eight scenarios, they customized down to the point that I could define the requirements I needed by using a simple check box format to control a given zone. Say in the weight room the football team is staying late and the kids working out with heavy weights. I simply check the "blink/warn" box for that zone, and they get a warning blink that the lights are about to go out and they have five minutes hit the override button and add time."

"The new lighting system also solved the problems I had with groups who failed to notify me they were staying late so I could program in a scenario for their zone. I wanted the lights and HVAC to communicate. There is already an override on the HVAC thermostats, so if someone has booked the gym and goes over time, they can turn on the air conditioning and that will turn on the lighting. When they leave, they turn off the air conditioning and the lights at the same time. With the other panels, they only have that 30 minute override and then the lights go out. So one of the scenarios I wrote had the zone air conditioning control communicating with the lighting control and telling the lighting how long it has been overridden for. We can also uncheck them so it works both ways. We can either lock them together or we can unlock them. So if I have a school that consistently doesn't schedule events with me and are complaining that the lights go out in the middle of the event, I can tell them to just use the HVAC override and push it once for every half hour they need and the lights will be tied into it. When I presented this to Blue Ridge, they said they could do this because the lighting controls would accept commands from Automated Logic's HVAC controllers. Other lighting controls have their own logic, their own processor, and their own computers. With this system we have the same piece of wire that is tying all of the HVAC together also tying all of the lighting together. So it's not two different systems on two different networks, it's one system fully automated, fully BACnet compatible."

"I did a presentation on our new integrated lighting system at a seminar and I had engineers and architects come up afterwards. They said what we had done working with our vendors has taken all of the liability out of the hands of the engineer who has to specify how each zone operates and put it into the hands of the building and facilities managers. So if one scenario isn't working for a certain zone, the facility manager can change it on the fly without going back to engineering for a solution."

"It's paying off financially, too. We're going to get a $140,000 utility incentive check for our newest high school, and the lighting control system contributed to that success."

About the Author

Jack Sine is a freelance writer specializing in energy and HVAC marketplaces.