

Investment in ‘SMART’ HVAC Controls Technology Allows College to Cash in on its Power Supply.



Bryn Mawr College is located in Bryn Mawr, Pennsylvania - 11 miles from Philadelphia. Founded in 1885, it is one of the world's most distinctive, distinguished liberal arts colleges. The campus includes 50 buildings on 120 acres.

America's institutions of higher education spend a significant portion of their annual operating budgets on utility services, diverting funds from valuable education programs and community-building activities. In 2003, Bryn Mawr College, a long-time advocate of conservation, decided it could do better. It embarked on a five-year plan to improve control of its HVAC operations and upgrade the efficiency of its systems. Today, the College not only has a fully automated HVAC controls system, it is leveraging that system to cash in on its power supply and using the money to fund a variety of conservation and sustainability efforts on campus.

A Tradition of Conservation

As early as the 1980's, Bryn Mawr College realized it had the potential for significant savings by improving the efficiency of its HVAC system. It installed a DOS-based HVAC control program, considered cutting edge technology at the time. "It was one of the best technologies available," explained Jim McGaffin, College Engineer at Bryn Mawr College. "Compared to what we have now, the DOS-based system was cumbersome and complicated, but it still provided a valuable service and allowed the facilities to be managed efficiently."

Microprocessor-Based Technology Replaces DOS

In 2003, driven by advances in technology, the College decided to upgrade to a Windows-based system that would allow for an optimal level of HVAC system control, while minimizing energy use in the campus' 50 building structures. "We put together a five-year plan for the upgrade so that we could get the funding and manage the upgrade effectively," said McGaffin. After an extensive product review, the College chose an HVAC controls integration system from American Auto-Matrix. "One of the reasons we chose this system was its flexibility. It uses 'open source' technology, which means we are not locked into one supplier for maintenance or new devices. It also allows for 'backwards' compatibility. This was especially important because it meant the technology could interface with the systems we already had in place. We would not have to replace the existing 3000 control points. The cost of replacing these up front would have been prohibitive. Our five-year plan called for a complete replacement of the existing controllers — but not all at once."

System Installation and Integration

The original company hired to install the American Auto-Matrix system unfortunately did not understand the technology well enough to envision what the College wanted in its five-year plan. After a number of errors and

setbacks, another contractor, The Tustin Group an American Auto-Matrix dealer from the Philadelphia area, was asked to take over the project. Tustin was one of the newest American Auto-Matrix dealers in the area. Tustin was one of the newest American Auto-Matrix dealers in the area and could customize their systems and make them work with maximum efficiency.

Potential Road Block

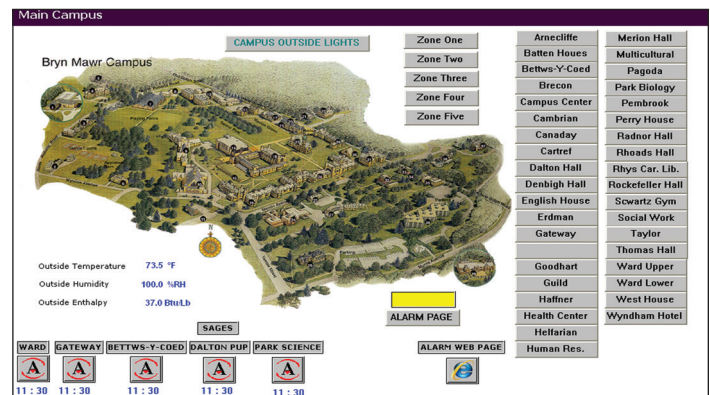
One of the challenges Tustin faced at the outset was how to make the systems in the different buildings communicate without installing any hard wiring or fiber optic lines. "Transmission lines are unsightly and shared fiber optic lines can raise issues of security," explained McGaffin. "We told Tustin we needed them to make the systems communicate through some form of technology — we didn't care what it was — just so it didn't require running new network cabling through cinderblock, plaster and brick walls." Tustin worked with a local software company to develop a wireless solution that used the campus' existing network to communicate between the buildings. "Not having to dig and lay wire saved us hundreds of thousands of dollars," said McGaffin.

Monitoring the System from a PC

The new Windows-based system allows mechanics to "see" what is happening in each building from any PC in the network. They can monitor multi-system performance, identify and resolve issues, and change operational parameters in real time to respond to shifting climate and occupant needs. The college's buildings are broken into zones, explained Harold Maryea, Assistant Director of Maintenance and Operations at Bryn Mawr College. "When a complaint comes in, the mechanic assigned to that zone no longer has to rush to that building. He can make whatever adjustments are necessary from the Windows-based control system, which has a point and click user interface. No programming is required."

Benefits of Upgrading

"It took us five years, but we have a beautiful system," commented Maryea. "It was well thought out and Tustin did a great job. During that period, we've increased the campus cooling load square footage by 16%, without any significant increase in energy consumption and without any increase in staff.



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In addition, we've significantly improved our response time to complaints, and we've increased the ability of the mechanics to serve their particular zone. It allows the mechanic to focus on what he should be focused on, which is maintenance and efficiency."

Leveraging the Automated Controls System

With the integrated controls system in place, Bryn Mawr could now begin to see and manage energy consumption data differently and to take advantage of the changing times. "We wanted to be more efficient about what we consume," said McGaffin. The opportunity presented itself when EnergyConnect, Inc., a Regional Independent System Operator, suggested the College could unlock the potential of its new intelligent HVAC controls system by enrolling in an automated price-based load curtailment program offered by the company. By partnering with EnergyConnect and reducing or shifting energy usage from periods of peak usage, Bryn Mawr could sell the energy it would have normally used back to the electricity grid, creating a completely new revenue stream.

Wholesale Energy Market

Price-based curtailment programs provide energy market participants like Bryn Mawr with the ability to actively manage their operations in response to dynamic wholesale energy market prices. Currently the College's electric rates are capped at \$23.72/kWh. However, the wholesale market price ranges daily from \$30/kWh when there is no demand to around \$400/kWh when there is a high demand. "EnergyConnect said that if we could tell them what hours we will use less energy than the baseline, they will pay us for every kWh we don't use, not at the capped generation cost of \$23.72/kWh but at the wholesale price which could be as high as \$400/kWh, depending on the time of year," explained McGaffin.

Lowest Cost Solution for Meeting Power Needs

Energy curtailment programs are particularly attractive to environmentally conscious institutions such as Bryn Mawr. Seen as an alternative to new

power plant construction, they are considered to be the cleanest, most efficient and lowest cost solutions for meeting the nation's growing power needs. McGaffin believes that price-based incentives make curtailment programs very attractive. "Managing the demand for energy using demand-based market pricing is an excellent way to encourage electricity consumers to reduce their electric demand," he said.

Bidding Into the Electricity Market

Tustin customized and installed software to interface with EnergyConnect's web-based systems. The interface allows participants to proactively address their own energy usage by providing up-to-the-minute data on the energy marketplace. Armed with this information, McGaffin can see how much revenue the college can earn on a particular day by shifting load in the various campus buildings. "Normally, I write my targeted load strategy for the week, based on what is going on in the market," he said. "It only takes a few minutes a day to bid into the market and select when and which loads to curtail, without interrupting campus operations. All I have to do is adjust the temperature set point within a building or turn off some equipment for a minimum duration to earn money." "Shifting load in this economic climate to create a revenue stream is a slam dunk," said Glenn Smith, Director of Facilities Services at Bryn Mawr College.

Participation Reaps Major Rewards

In one year alone, the curtailment program earned the College enough money to fund a number of programs designed to promote a more energy aware and sustainable campus. For example, it has paid for the development of a demonstration windmill project, provided compact fluorescent light bulbs for incoming students, funded a carbon footprint study, improved heating in three dorms, funded prize money for a contest to see which dorm or organization could consume the least amount of electricity during Energy Awareness Month, and solicited estimates on funding a solar powered demonstration project. Finally, the savings will hopefully be used to retrofit the controls system on the college's science building, the one remaining structure that was not part of the original HVAC controls upgrade — and the largest consumer of electricity on the campus.

Conclusion

The college has used both capital investment and operational investment to bring the HVAC controls system to where it is today. "With technology changing constantly, it is truly a system that will never be finished," said McGaffin. "However, we have an excellent backbone on which to continue building." The fact that the technology upgrade provided the platform for an energy curtailment program was a huge bonus. "By being able to strategically shed load in response to changing prices in the electricity market," said McGaffin, "we've not only reduced and optimized our energy consumption, we've created a new revenue stream in the process."



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About Tustin Energy Solutions Tustin Energy Solutions (TES) provides customized, web-based energy management solutions for today's sustainable buildings. They are experts at making buildings and their processes work together to conserve resources with seamless and optimum efficiency. Building owners and managers look to Tustin Energy Solutions to help reduce energy use and improve their carbon footprint. For more information, contact Tustin Energy Solutions at 2555 Industry Lane, Norristown, PA 19403, call 610.539.8200 or visit the website at www.thetustingroup.com.

About EnergyConnect, Inc. EnergyConnect provides industry leading demand response technologies and services that enable a smarter, more sustainable power grid while creating additional income for participating companies. The EnergyConnect web-based automated platform enables consumers of energy to participate in unprecedented incentive opportunities by cutting back power when the grid needs it the most. www.energyconnectinc.com



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