

Increase Square Footage While Driving Energy and Labor Costs Down Through Wireless Technology

By Will Grindall

It's no surprise that cell phones, I-Pods, laptop computers and personal digital assistants (PDAs) are now the norm on every college campus. These ingenious wireless devices, once reserved for students, have made the leap from fostering entertainment and social networking to capturing and transmitting critical data that keeps campus systems up and running.

"People are looking for measurement, economics, safety and security and we see a sharp adoption curve of wireless technology within the next five years," said Hesh Kagen, president of the Wireless Industrial Networking Alliance (WINA). The WNA is a coalition of end users, industry suppliers and academics formed in 2002 to help identify and educate the users of wireless technologies and influence standards for marketplace acceptance.

While portability and freedom from wires are obvious benefits, the rising cost of energy and a reduced labor force are key drivers behind the full-scale adoption of wireless technology at campuses like Western Michigan University in Kalamazoo, Mich.

Peter Strazdas, director of maintenance services at WMU, has spearheaded the use and integration of wireless technology across WMU's 151 buildings and nearly nine million sq. ft. of space.

"With two campuses spread out over 1,200 acres, we needed a



Peter Strazdas, director of maintenance services for Western Michigan University, is responsible for overseeing operation and maintenance of more than 151 buildings and 8.8 million sq. ft.

way to remotely monitor systems and processes to ensure they're operating properly, and to deploy maintenance crews in a more cost-efficient and proactive way versus just reacting to issues as they come up," Strazdas said.

The maintenance services group at WMU is responsible for

overseeing a wide variety of services and departments including maintenance, engineering, utilities, project remodeling and scheduled/planned maintenance. Strazdas has a management staff of 28 and more than 100 skilled-trade employees who are called upon daily to deal with everything from replacing an out-of-control thermostat to maintaining 13 miles of steam and condensate lines. Strazdas knew early on that successfully operating and maintaining a physical environment of this scope would require leveraging technology in every way imaginable.

'WIRED' FOR WIRELESS

Shrouded by a modest building exterior, the third floor of the Physical Plant at WMU looks something like the bridge of the space ship Enterprise from the TV series, Star Trek. The Control and Service Center team is constantly monitoring the conditions, systems and performance of products and components contained within buildings, classrooms, offices, dormitories, boiler rooms, and miles of underground steam lines – all from a central command center.

PC stations flank a 50-in. flat screen monitor with a scrolling ticker informing facilities management staff of the status of a number of conditions, including temperature, humidity, BTU output and steam pressure, in various locations. For example, motion sensors are positioned in classrooms and offices to monitor human movement, and then temperature and other environmental elements are automatically adjusted according to occupancy. The Central Elevator Monitoring System (CEMS) can even determine the location of elevators by floor within any given building.

Keeping customers satisfied – in this case the 25,000 students that attend WMU – is the key focus for Strazdas and his team. Within this high-tech setting are two staff members who receive and respond to customer service requests of system problems or equipment issues. Staff members receive reports via phone, e-mail or the web request system and then process work orders through a Web-enabled interface that feeds information to maintenance crews through hand-held PDAs. The system operates 24/7, so after each workday or crew shift the PDA is placed at its docking station to download the most recent information so the incoming team can follow through and perform the required service. Afterward, a status report is e-mailed back to the customer who initially reported the problem, along with a feedback form to measure customer satisfaction of the work performed. Last year, Strazdas' team of two staff members processed over 50,000 work orders through this process.

"Through the use of technology, we've been able to shift more of our resources against preventative maintenance issues resulting

in more productive use of a high-value, finite labor pool,” Strazdas said. Of the 50,000 work orders processed in 2006, Strazdas estimates that 40 percent focused on preventative maintenance.

MEASURING THE PAYBACK

While Strazdas notes that gaining more control and better deployment of a reduced workforce should be justification enough to make the investment to go high-tech, he acknowledges that it takes more than that to convince key decision makers. “You have to demonstrate a real financial payback in areas that can be measured and understood by the stakeholders,” he said. “And that doesn’t happen overnight.”

Eighteen years ago WMU began demonstrating this payback by focusing on energy consumption, which accounts for about 20 percent of the overall cost of running WMU facilities. And like most institutions, WMU uses steam to supply heat and run a host of other processes and equipment. The campus has more



WMU processed more than 50,000 work orders in 2006 through a Web-enabled interface.

than 13 miles of steam and condensate lines that run above and below ground and those lines are equipped with more than 4,500 steam traps. When steam traps are stuck open or closed, they disrupt the flow of heat and cause other systems and equipment to malfunction or operate inefficiently. With the average cost of steam for colleges and universities pegged at \$20 per 1,000 lbs., a single high-pressure trap that has failed open can cost a facility more than \$5,000 per year in losses. The average trap failure rate is 25 percent for those facilities that do not test traps annually. At this rate, there would be 50 failed traps for every 200 high-pressure drip traps resulting in a staggering \$250,000 in projected annual losses.

According to Strazdas, WMU began to inspect steam traps back in 1989. At that time, the trap failure rate was benchmarked at 26 percent and the campus was consuming more than 650 million lbs. of steam annually across 6.5 million sq. ft. of building space — at an average cost of about \$2.6 million (in today’s dollars).

While Strazdas knew the cost of replacing traps would be significant, the cost of not replacing them was just as significant — and it was recurring. Even when steam traps are regularly replaced they can fail, and manual trap inspections aren’t practical because they divert human resources and expose

workers to hazardous environments including confined vaults and tunnels that produce extreme heat. For help, WMU looked to technology.

THE 24/7 WATCHDOG

The use of wireless, radio-frequency (RF) monitoring systems for steam traps have been on the market since the 1990s. These types of systems have gained popularity as they’ve become more compatible with different steam trap brands and building automation systems. Steam traps mounted with RF transmitters can constantly monitor for trap failure and immediately notify personnel of the failure through a pager or e-mail system.

RF steam trap monitoring devices act as a campus security system by keeping a close watch over the steam traps they’re monitoring and alerting their operators of any breach. While they can’t prevent a trap from failing, they can provide immediate alerts about traps that need attention.

“Manual trap inspections offer only a point-in-time evaluation,” said Chris Gibbs, account manager for Armstrong International. According to Gibbs, wireless RF trap monitoring systems enable a facility to monitor hundreds of steam traps 24/7 and immediately dispatch a maintenance team to address problems.

Strazdas and his team have been big proponents of regular trap inspections. Over the past 18 years the trap failure rate has declined from 26 percent to less than 5 percent and with the aid of wireless technology, they’re working to reduce that even further. “We want to realize additional energy and labor savings and achieve ‘best in class’ steam system efficiency,” Strazdas said.

“These incredible results are due to energy management designs on new and existing buildings, building commissioning and recommissioning efforts, and best energy management practices in operating our buildings. All of this was leveraged with computer technology and people who know how to push the envelope to create new best practices,” Strazdas said. Today, WMU has expanded its campus to nine million square feet while at the same time reduced its energy and steam consumption from 850 million pounds of steam to 480 million pounds of steam. Strazdas estimates that the cumu-

Photo courtesy of Armstrong International, Inc.

Radio frequency (RF) wireless monitoring systems are becoming more popular because of their reliability, 24/7 monitoring capability and adaptability to any manufacturer’s trap.

lative cost avoidance has reached more than \$2.5 million. “The money we have saved through these energy conservation methods is reinvested by our university back into energy saving technology,” he said. **CFM**



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