



JOHN G. MATTOS ELEMENTARY | CASE STUDY

Wireless solution enables school to integrate portable classrooms into centralized energy management system

John G. Mattos Elementary School in Fremont, California, is home to more than 450 K–6 students and the only school in the Fremont Unified School District (FUSD) with a Science Magnet Program. This program enriches the student experience with its curriculum, labs and home experiments to build on a child’s natural curiosity for science. Mattos Elementary is particularly known for its dedicated faculty and hands-on involvement with parents. In many ways—scholastically and communally—Mattos Elementary is a model for many area schools, both in and out of the Fremont Unified School District.

The Mattos Elementary campus features three portable classrooms that sit 30–50 feet away from the main buildings where the central heating, ventilating and cooling (HVAC) controls are installed. The portables have a total square footage of 3,840 feet, and house the school library and media center, a science lab and general classrooms.



The Alerton BACtalk system dashboard provides at-a-glance displays of HVAC operations at Mattos Elementary—including integrated portable classrooms.

A portable is typically served by a packaged heat pump and programmable thermostat. The challenge is that these thermostats are consistently overridden resulting in excessive run times, reduced equipment lifecycle,

and higher energy bills. As these systems are typically stand-alone and not integrated with the campus energy management system, facilities departments are unable to monitor operation of these units remotely. As portables are often positioned on the outer perimeter of a campus, adjacent to residential areas, the after-hours noise can be a nuisance to neighbors of the school.

FUSD has a long history of finding creative ways to reduce energy consumption and become more sustainable with a yearly target of 10% energy reduction. As a result, one of its campuses, Irvington High Schools, was named “greenest high school in the U.S.” FUSD was also one of the first public school districts to sign up for San Francisco-based Pacific Gas & Electric’s (PG&E) Automated Demand Response program.

“Integrating stand-alone classrooms into an EMS using wireless technology provides one of the best opportunities to reduce energy costs, increase equipment lifecycles, and minimize noise impacts to the neighborhood,” said Scott Wallace, Syserco’s general manager of energy services. “Wireless makes the project viable.”

The preliminary savings for integrating the portables, as calculated by PG&E—one of the largest combination natural gas and electric utilities in the United States—are approximately 38,671 kWh or \$5,800 (based on \$.015/kWh blended rate for electricity) for the three portable classrooms. Greenhouse gas reduction (conversion data by the U.S. Environmental Protection Agency) equates the integration of these portables to:

- Removing 5 cars from the road
- Eliminating 26 metric tons of carbon dioxide (CO₂)

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The AZW-5000 wirelessly integrated Mattos Elementary portable classrooms so they can now be precisely monitored where once the heating and cooling ran unchecked.

FUSD has more than 400 portables across its 42 school campuses; integrating just 30 portables saves the District enough energy to pay for one teacher's salary.

"When I was approached to consider becoming a partner in a case study on a wireless integration from some of our portable classrooms to an Alerton global controller, I overwhelmingly accepted," said Gene Wheatley, manager of maintenance for the Fremont Unified School District. "Our District had been searching for ways to economically connect more of our portable classrooms into our Alerton EMS and this seemed like a potential solution."

As a long-time service provider for FUSD, Syserco knew how many campuses featured portables and was aware of the HVAC challenges they posed as well as the potential for energy savings. Syserco approached the District with an innovative proposal: use a wireless solution to integrate Mattos Elementary portables to the main HVAC system.

There were many benefits to the proposed solution. Wireless can offer a lower installation cost because it reduces the amount of wire and time required for installation as well as eliminates the need for costly trenching or long conduit runs. Wireless networks are unobtrusive—a good solution when cabling or conduit would create an eyesore or interfere with occupants' ability to use the space. Wireless technology also provides the flexibility if portables or individual devices need to be moved to accommodate configuration changes.

Syserco installed a BACnet®-based energy management system (EMS) from Alerton that provides centralized control and energy efficient operation for the entire school, and simultaneously controls the integrated portables with occupancy-based sensing. The project included Alerton's Envision for BACtalk™ front-end EMS software; BACtalk control modules (BCMs); AZW-5000 wireless communications devices, which provide for the wireless extension of a BACnet MS/TP

network; and VisualLogic® Displays (VLD-362W)—a communicating sensor-controller combination with built-in temperature and humidity sensors and an integrated wireless receiver. The project will integrate the portables' lighting system into the BACtalk EMS under a future phase.

The AZW-5000 uses ZigBee® mesh networking topology to ensure self-healing, reliable communications. The ZigBee standard is based on the IEEE 802.15.4 standard and specifies communication protocols for small, low-power radios. ZigBee networks are secure and require less power than other personal networks (e.g., Bluetooth). The VLD-W communicates to different combinations of sensors for occupancy and detects whether doors and windows are open or closed.

For each portable, Syserco installed the AZW-5000 to connect the global controller (BCM) to a VLD-W. Using a wireless MS/TP link between the BCM and VLD-W, each portable was then tied into the main HVAC, which is run by BACtalk. Wireless motion sensors and wireless door switches were put in place so that the school's facilities staff can control the HVAC and lighting using occupancy-based sensing and detection of open doors.

The Mattos Elementary portables are now wirelessly integrated into the school's central HVAC system and benefit from automated control that provides energy efficient heating and cooling based on both occupancy and open or closed door contacts, essentially eliminating all excess run time.

Even portables operating on a non-Alerton EMS system can benefit from Alerton's BACnet-based wireless solution by installing a global controller and a workstation, and then integrating the portables using the AZW-5000/VLD-W combination. As an open protocol, BACnet can efficiently and effectively integrate other manufacturers' devices into an Alerton BACtalk system.

The Alerton wireless solution offers many conveniences. Building operators and maintenance personnel can track building operations wherever they are. Whether for retrofit or new construction, wireless connectivity can save wiring and enhance system performance by connecting several systems to the same wireless backbone. With careful planning, a facilities manager can use a wireless system for lighting and HVAC while monitoring other building systems such as fire and security. Wireless technology also simplifies future changes to the physical structure such as moving walls and office cubes. Using one wireless backbone for several systems can reduce engineering, construction, commissioning and operating cost over the entire life of the building.

