

Aircuity case study

Richardsville Elementary

Better Learning Through a Better Environment - Inside the Classroom

FOR AS LONG AS STUDENTS HAVE BEEN EDUCATED in modern buildings there have been studies showing how environmental factors in the classroom affect the learning process. These studies have analyzed lighting levels, acoustics, furniture comfort and even seating arrangements. Air quality in the classroom has often been studied as well, but only in terms of how the temperature or humidity of the room affects a child's learning. Measuring the full indoor environmental quality (IEQ) of the learning space is much more important, as CO₂ or other airborne particulates can play a big role in how safe, comfortable and productive a classroom really is.

Ideally, school building ventilation systems would be designed to continuously monitor the entire IEQ of the classroom, going beyond temperature levels to look at levels of pollutants such as CO or CO₂. This would give schools a more complete overview of the learning environment and provide the information needed to change ventilation conditions and ensure that the classroom remain a healthy and productive environment. While everyone agrees that this is a high priority, questions remain about how best to cost-effectively achieve this.

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Ken Seiber – President
CMTA Engineers

Fortunately, those questions now have an answer: Massachusetts-based Aircuity, Inc. has developed technology that continuously monitors the air within classrooms, libraries and multi-purpose rooms for agents that degrade the learning environment. In addition to the traditional temperature and humidity, Aircuity's

OptiNet[®] system can monitor the space for elements such as Carbon Dioxide (CO₂), Carbon Monoxide (CO) or other airborne particulates. When the concentration



Photo courtesy of Sherman Carter Barnhart Architects.

of these agents increases above a prescribed limit, the OptiNet system directs the building's ventilation system to increase the amount of fresh air delivered to the space being monitored. Increased ventilation levels remain in effect until the environmental quality is back to a desirable level.

NEW DIRECTIONS IN VENTILATION SYSTEM DESIGN

The ability to make decisions based on environmental quality expands the options available to the designer of the ventilation systems. One that is gaining prominence due to excellent results is the implementation of air handling systems dedicated to inducing fresh air in to the building. Traditional mechanical designs mixed fresh air with air returned from the space to maintain supply air suitable to handle the heating and cooling demands.

The new approach implements a separate air handling system to induce fresh air, and does so based on the demand as established by the OptiNet system. The benefits are twofold:

- Students are always provided good quality air; and
- When the students are not present, the amount of fresh air can be reduced significantly, saving the energy needed to distribute and condition it.

By monitoring the airflow and directing the ventilation system to increase ventilation only when needed, a great deal of energy is saved. Think of the energy that is wasted on ventilating an empty classroom or assembly area; with Aircuity, ventilation is directed based on occupancy and air quality—meaning the learning environment is safer and more productive while occupied, but not a source of wasted energy when empty.

Aircuity's technology also brings an added benefit in that it guards against fouled air from outside being admitted to the building. There are times when the air quality outside the school is less desirable than what is already inside. Aircuity continuously monitors outdoor air quality as well, and can direct the ventilation system to re-circulate the air in the building until outdoor conditions improve.

REAL RESULTS: GREAT IEQ IN A NET-ZERO SCHOOL

The Richardsville Elementary School in Bowling Green, Kentucky, is designed to use 75% less energy in its



Photo courtesy of Sherman Carter Barnhart Architects.

mechanical systems than the ASHRAE 90.1 design standard for elementary schools. The highly efficient mechanical systems are a key component in making Richardsville the first net-zero public elementary school in the U.S.

One of the significant features of this design was the use of a dedicated fresh air system that delivers air to the space based on demand, as measured by Aircuity's technology. At this school, each classroom and assembly area is measured for CO₂ levels. Aircuity's technology then makes an exact comparison to CO₂ levels in the outside air. When the indoor levels indicate an increase

in the student population, fresh air is induced in proportion to demand.

Providing fresh air on demand has yielded savings beyond just the energy needed to distribute and condition ventilation air. The school includes a number of alternative energy systems, such as a photovoltaic system that generates electricity. By managing the ventilation according to demand, the physical size of the ventilation system was reduced. This in turn reduced the demand on the photovoltaic system, allowing it to be reduced in size as well. A smaller ventilation system, plus a smaller energy system equals a lower overall construction cost of the building.

Ken Seibert, the President of CMTA Engineers, which designed the systems at Richardsville, said "Aircuity was a key component to helping Richardsville become the first net-zero public elementary school in the nation. The company's technology made a safe learning and teaching environment a reality—while at the same time helping the school save on short-term construction costs and decrease its long-term energy spending."

NEW TECHNOLOGY - LOWER LIFE CYCLE COST

As with all new technologies applied in school facilities, keeping them working over time is a challenge for the staff of the school and or district. Aircuity has taken a step forward in this regard by designing a service program that assures continued operation and minimizes the life cycle cost of their technology, with no impact on school or district staff. Aircuity remotely monitors the performance of the OptiNet system to ensure that it is working normally and IEQ parameters are recording correctly. Trained personnel routinely perform on-site inspections of the system and replace sensors on an established schedule. School personnel can rest assured that IEQ monitoring and control will not result in an additional burden on facility maintenance staff. This makes long term budgeting of the operating cost of the technology a simple task.

IMPROVING THE LEARNING ENVIRONMENT WHILE CUTTING COSTS

Schools are under constant pressure to raise student achievement, often times with diminishing budgets. Finding a way to improve classroom learning while saving money is a daunting challenge. Aircuity is answering that challenge by helping to deliver a better learning environment, a more energy efficient school, and lower life cycle costs to schools around the country.

