



HVAC & MECHANICAL

Case Study

Higher IAQ, Lower Costs

How Bipolar Ionization Keeps Spaces Healthier



CHALLENGE

Concerns over indoor air quality have only increased after the outbreak of COVID-19. Since the cost of providing healthy indoor air was already a key budget item for most, many facility leaders are looking for technologies to help clean air effectively and efficiently for the people sharing spaces in their buildings.

Did You Know?

A 2020 study reported by one company demonstrated a **99.4% reduction of SARS-CoV-2** (COVID-19) at the 30-minute mark using ABM's preferred bipolar ionization solution.¹

"Reducing the need for outdoor air by reducing particles and VOCs in your indoor air saves energy, but we also don't want sick building syndrome (SBS), which can happen when spaces are completely cut off from outside air. With bipolar ionization we can do a pre-purge and post-purge of the air in a facility, exchange all the air, avoid SBS, and then reduce the need for outside air when the energy cost is highest."

— Kevin Brown
Director of Technical
Solutions at ABM.

What Bipolar Ionization or Cold Plasma Technology Really Does

The ions generated by the technology attach themselves to particles like SARS-CoV-2 and unwanted gas molecules in the air, leading to multiple helpful effects:

- Ions attach to sub-micron particles, making them filterable or causing them to fall out of the air.²
- Ions break down harmful volatile organic compounds (VOCs), rendering them into simpler, harmless compounds like oxygen and water.²
- Ions kill or inactivate pathogens such as SARS-CoV-2 by creating oxidative stress that reduces bacterial survival.³



INCREASED FUNDING FOR LEARNING ENVIRONMENTS IN PENNSYLVANIA

For their three-year financial recovery plan, Connellsville aimed higher than a simple downsize. District leaders planned for their consolidated school strategy to improve facilities and provide more opportunities to students. The question was how to fund the technology and infrastructure upgrades they needed, all while facing state and federal cutbacks.

A bundled energy savings program was the answer. To enhance their indoor environmental quality, put Smartboards in classrooms, and provide a Chromebook device for every student, the program needed to generate a lot of energy savings.

"A project like this provides us the ability to make education upgrades we may not have been able to do otherwise because of a lack of funding. There are many districts that may not be able to take on a project like putting devices in students' hands immediately, but they can do it with the right help."

— **Philip Martell**
Former Superintendent
Connellsville Area School District

How Bipolar Ionization Contributed to Millions in Cost Reduction

To generate \$26.4 million in guaranteed savings for Connellsville, ABM designed and implemented energy conservation measures. Engineers analyzed each school's assets and airflow. Bipolar ionization boosted the energy savings, making it possible for the school to redirect more savings to its educational technology and learning environment upgrades.

By adding bipolar ionization to heat pumps, roof top units, chilled water air handling units, and more, the cost of keeping spaces ventilated was significantly reduced.

Did You Know?

The CDC recommends schools consider increased circulation of outdoor air to help slow the spread of COVID-19, but only when doing so doesn't increase other risks, like introducing excess asthma triggers from outside.⁴ Bipolar or cold plasma ionization reduces particles and VOCs in the air, allowing increased air exchanges in a space with less outside air.

"While there are no singular "silver bullets" for air disinfection, needlepoint bipolar ionization technologies that produce no ozone hold substantial promise for effectively impacting indoor air quality during a time where optimization of strategies is critical."

— **ABM's Expert Advisory Council**

Making a Big Project Bigger

The energy savings created by bipolar ionization contributed to an extensive list of energy conservation measures designed and implemented across the district:

- LED lighting upgrades and advanced non-proprietary controls
- New HVAC units, cold plasma ionization, building envelope upgrades, and existing HVAC unit rejuvenation
- Water conservation measures
- High-efficiency boilers and pumps

Educational technology and learning environment upgrades funded by energy savings included:

- Smartboards for classrooms
- Building wide Wi-Fi and VOIP upgrades for seven schools and the Career and Technology Center
- Security cameras
- A Chromebook for every student



THEN AND NOW: AIR QUALITY AND ENERGY SAVINGS

As providers of vital services, county facilities wanted to eliminate wasted expenses and invest in improved security, communications reliability, and their infrastructure. Fire stations, elections department offices, the courthouse and jail, EMS, and Georgia Defense Force facilities needed upgrades.

That was before the COVID-19 outbreak. Now that the county is responsible for maintaining so many shared spaces for residents and county employees, the additional benefits to their air quality and occupant health are even more appealing.

A Solution Then: Upgrades Without Upfront Costs

To achieve healthier levels of ventilation, air exchange with outside air is required. A system that brings in outside air has to do more work (especially if that outside air is too humid, hot, or laden with unwanted particulates).

Cold plasma ionization (or bipolar ionization) may help

a facility provide healthier air without having to bring in excessive amounts of outside air, adding more energy costs and stress on the system for dehumidifying and filtering. For a rural county in southern Georgia with multiple buildings to keep healthy and efficient, reducing that reliance on excessive outside air brought down energy costs.

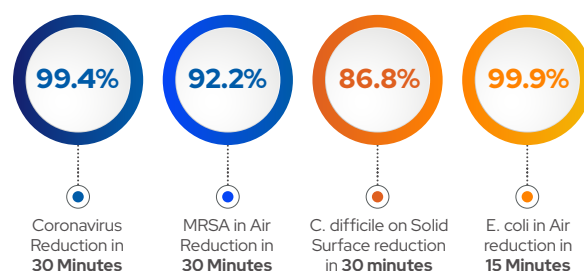
Those larger energy savings helped Turner County invest in energy conservation measures with slower payback and redirect funds to needs like:

- Upgraded fiber optic communication lines for the Emergency Response Center
- Renovated kitchen for the Turner County Jail
- Constructed a 2,800-square-foot addition to the Turner County Annex to help consolidate county services

A Solution Now: Cleaner Air in the Era of COVID-19

With upgrades in place and already reducing energy and operational costs, Turner County is enjoying an additional benefit of their project: technology capable of reducing the count of active bacteria and viruses in their indoor air.

Bipolar ionization inactivates pathogens with microbicidal effects on bacteria and viruses. One industry leader reports independent laboratory tests of that microbicidal effect:⁵



How a County Saves More Than \$7.2 Million

Generating that savings required a carefully engineered, custom deployment of energy conservation measures for 16 county facilities, including six fire stations:

- LED lighting retrofit
- HVAC replacements and retrofits
- Energy management control systems
- Solar fields at four elementary schools and three middle schools, including Jackson STEM Middle School

“As a banker and county commissioner, for me everything we do is about the return on our investment for our community’s needs and wellbeing. Thanks to ABM, not only did they help us upgrade and improve our infrastructure by reducing our operating expenses they also helped improve the air quality of our building by installing global plasma technology. And as everyone knows during this pandemic, there is nothing more important than the health of our employees and the community we serve.”

— Sam McCard
Turner County Commissioner

- Water conservation measures
- Building envelope sealing, including windows, doors, and a roof replacement for the County Annex
- Improved outdoor air intake management through cold plasma technology



CUTTING RUNAWAY COSTS IN SOUTH CAROLINA

The HVAC of two of the highest energy-consuming schools stood in the way of Aiken County School's potential energy savings. ABM experts analyzed the assets and controls to help them reduce that energy use.

How Cold Plasma Made a New Solution Possible

ABM discovered the existing outside air dampers in one school were open nearly 75% of the time. The brand-new building didn't need new HVAC, it needed its current assets expertly adjusted to improve outcomes.

Cold plasma ionization helped the systems at Levealle McCambell Middle School provide proper ventilation while reducing energy cost by \$25,000 a year. At the largest energy-using school in the district, Mossy Creek Elementary, solving similar over-ventilation with improved controls and bipolar ionization saved over \$30,000 a year.

Did You Know?

Reducing volatile organic compounds (VOCs) and increasing ventilation has been shown to improve cognitive test scores. For instance, in a 2015 study, lower VOC concentrations and enhanced ventilation over the course of the day improved test scores in adults by 61%.⁵ Bipolar ionization technology creates ions that break down compounds in the air, such as VOCs.

"Before the COVID-19 outbreak, bipolar ionization was a go-to energy savings generator with a fantastic extra benefit of better air quality. Now that ventilation has risen to be a key health issue for many facilities, we're excited to bring an air cleaning technology that also saves energy to our clients."

— Kevin Brown
Director of Technical Solutions at ABM

Helping a District Save \$70 Million

The projected savings of \$70 million during the 20-year life of the project was created by facility improvements and new systems at multiple facilities. ABM helped the school update infrastructure and meet sustainability goals without upfront costs, including:

- LED lighting retrofit
- HVAC replacements and retrofits with state-of-the-art control systems
- Building automation controls with remote monitoring capability
- Water conservation measures
- Improvements to ventilation and outside air intake, including bipolar ionization and building envelope sealing



IMPROVED INDOOR AIR QUALITY IN GEORGIA

Irwin County's problem was different. Some buildings featured smaller, residential-style air conditioning equipment, with no capability to ventilate with outside air. Some older courtroom facilities suffered from mustiness and odors. Options for improving air quality were limited.

How Cold Plasma Made a Courtroom More Comfortable

Buildings with residential-style air conditioning used the technology to improve air quality in their facilities despite their inability to draw in outside air. ABM's project reduced odors in the aging courtrooms, significantly improving indoor air quality while still achieving a small bonus to energy savings by lowering outside air setpoints.

Better Air and 32% Less Energy Use

Upgrades cut the energy cost of the courtroom facility from \$1.01 per square foot down to \$0.68 per square foot, with spending reduction accomplished through conservation measures:

- LED lighting retrofit
- HVAC replacements for 36 units
- New boiler
- Building envelope improvements
- Bipolar ionization/cold plasma technology for outside air reduction
- Energy management system (HVAC controls)

**BENEFITS**

ABM uses ionization technology in our HVAC and energy projects for multiple positive impacts, including:

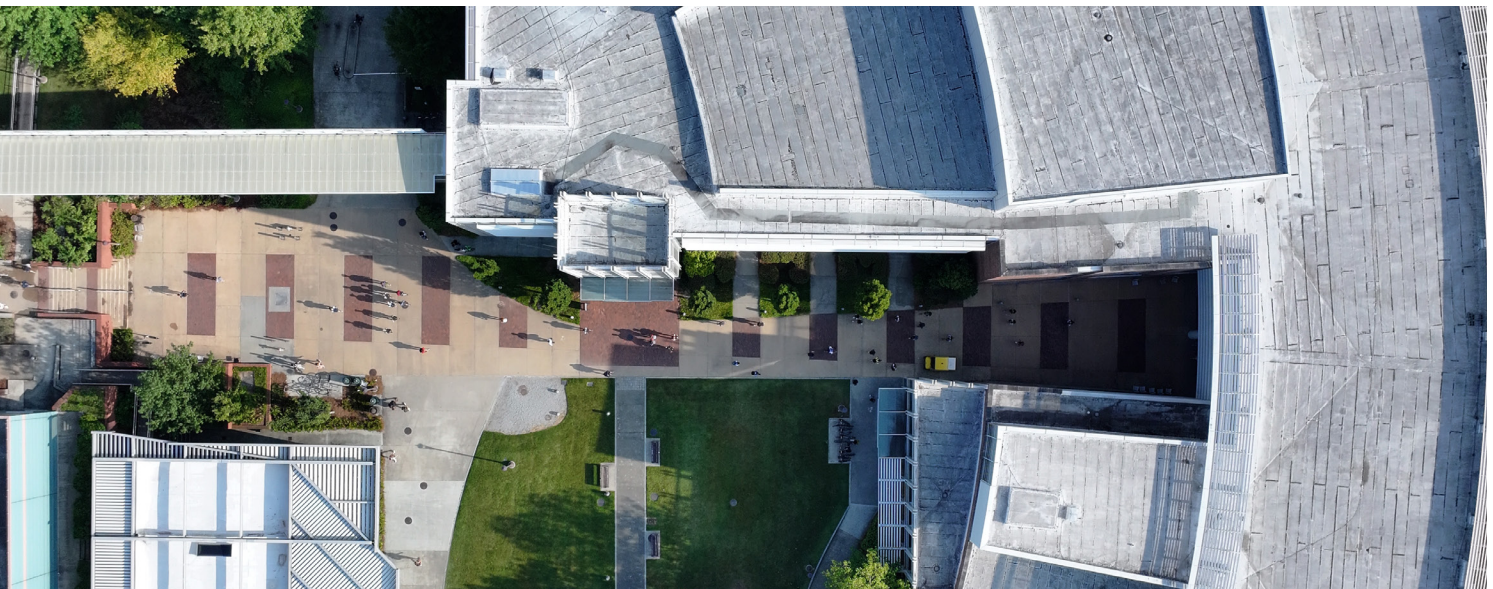
- Energy savings using improved indoor air quality, per ASHRAE 62.1, by providing healthier ventilation with a reduced reliance on outside air
- Disinfection and pathogen reduction from the microbicidal effects of ions on viruses and bacteria
- Reduction of VOCs and unwanted gases from indoor air, including odor reduction
- Improved filtration of unwanted particles, including asthma triggers
- Eliminating biofilms and other buildups on coils of HVAC equipment, contributing to energy and maintenance savings

"Our historic courthouse is the centerpiece of our county and has withstood many years of changes – even today's unique challenges. Thanks to ABM's bundled energy solutions and technological expertise, we've been able to make major upgrades and improvements to our lighting, mechanical, building envelope, and air quality. And we all know how important indoor air quality is during these times."

— **Joey Whitley**
Chairman, Irwin County

SOURCES

1. [Air Ionization and Case Studies Research](#)
2. [An Overview of Needlepoint Bipolar Ionization](#)
3. [The Bactericidal Effect of an Ionizer Under Low Concentration of Ozone](#)
4. [Centers for Disease Control](#)
5. [Green Office Environments Linked With Higher Cognitive Function Scores](#)



ABM helped these facilities substantially increase their indoor air quality.

Find out how we can make it possible for you by calling **866.624.1520** or visiting **ABM.com**.