



## Providence Career and Technical Academy

## CASE STUDY

### Providence School Meets 40% Energy-Reduction Goal - Lowers HVAC First Cost

Designing a new high school to be 40% more efficient than ASHRAE 90.1 – 2001 energy requirements is a feat in itself. To achieve this degree of efficiency on a very limited capital budget while designing a state-of-the-art, energy-demanding technical high school is an even greater feat. This was exactly what architectural and engineering firm StudioJAED accomplished at the Providence Career and Technical Academy (PCTA) in Providence, RI to comply with the design requirements of the Northeast Collaborative for High Performance Schools (NE-CHPS).

PCTA opened its doors to its first class of students on September 2, 2009, after 212,000 S.F. of new construction plus 72,000 S.F. of renovation in the previously existing Hanley Classroom Building. Now one of New England's premiere technical high schools, PCTA features high-tech classrooms, equipment, labs, media centers, athletic facilities, and other amenities for a high-quality education. The school offers nine vocational programs including automotive technology, construction technology, cosmetology, culinary arts, and HVAC (heating, ventilating, and air conditioning), in addition to a required college-prep curriculum of math, science, and English.

The school building was designed to satisfy the full requirements of NE-CHPS, whose mission is to promote school environments that are not only energy- and resource-efficient, but also healthy, comfortable, and well lit. Oftentimes, highly efficient buildings mean premium costs. Because PCTA, like many public

schools, was no stranger to budget constraints, designers had to limit initial costs in creative ways.

### HVAC Cost Savings with Energy Recovery

A major design directive to save on construction costs led PCTA to install a dual-temperature, two-pipe HVAC system. In contrast to the more common (and more expensive) four-pipe system where heating and cooling are available at any time, two-pipe systems cannot engage cooling coils to reduce humidity on cool, damp days while in the heating mode. The solution to this dilemma was to install Airxchange energy recovery wheels containing a silica-gel desiccant for moisture transfer. By rotating between building exhaust and outdoor intake air streams, the wheels remove moisture from outdoor air on damp days and reject it into the exhaust air stream to keep indoor relative humidity at a comfortable level.



*HVAC Technician Brian Polak preparing to check an energy recovery wheel for cleanliness.*

Engineer Brian Zigmond, a principal of StudioJAED, stated, “Since the school utilizes a two-pipe system, we needed a way to mitigate humidity issues typical to the area during ‘shoulder’ seasons. Rejecting as much humidity as possible back to the outdoors with an energy recovery wheel is the most practical solution available. We’ve had success with implementing energy recovery wheels in new and existing schools. Given school budget constraints, installing energy recovery wheels to save on up-front and operating costs is a no-brainer.”

## Reducing Outdoor Air (OA) Load and Staying “In the Comfort Zone”

StudioJAED also realized during the planning phase that energy recovery would have to be incorporated into the design of PCTA’s HVAC system if the 40% energy-reduction goal were to be achieved. The team chose to utilize a combination of air-handling units and stand-alone energy recovery ventilators (ERVs) with Airxchange energy recovery wheels to provide outdoor air to PCTA’s new and retrofitted classrooms, labs, auditorium, and media center. The Airxchange wheels help to condition 45,215 CFM of outdoor air by continuously recycling the heating or cooling energy (depending on the season) from the exhaust air stream. On peak design days, the energy recovery wheels reduce the outdoor air load by as much as 80%.



*Airxchange energy recovery wheels installed at PCTA help achieve lofty energy savings goals.*

The ability of Airxchange wheels to save on energy is evident at PCTA, especially during the heating season. In the first winter of operation, PCTA Facility Manager David Gaudet kept his eye on the boilers to ensure they were able to handle the load. He was surprised at how infrequently the boilers actually started up, stating: “I kept waiting for the boilers to fire on cold days. But the energy recovery wheels were able to heat the outdoor air enough to significantly

reduce boiler operation. The wheels keep the supply air in a nice comfortable zone where frequent additional heating is not required.” With rising fuel prices, the conditioning provided by the Airxchange wheels to reduce boiler operation generates tremendous cost savings. PCTA HVAC technician Brian Polak added that he was able to shut down

## Value of New Energy Recovery Wheels at PCTA

Location: Providence, RI  
 Project Date: 2009  
 Project Scope: New Construction & Renovation  
 School Size: 296,000 sq. feet  
 Number of Students: 816 (grades 9-12)

## Impact of Energy Recovery Wheels

Outdoor Air Conditioned by Airxchange Wheels:	45,215 CFM
Outdoor Air (OA) Heating Load (Design Day):	4.33 Million BTU/hr
Total Recovered Energy:	2.81 Million BTU/hr
Net OA Heating Load:	1.52 Million BTU/hr
Annual Energy Savings:	Approximately \$28,000
Annual CO2 Reduction:	100 tons

*“We’ve had success with implementing energy recovery wheels in new and existing schools. With school budget constraints the way they are, installing energy recovery wheels to save on up-front and operating costs is a no-brainer.”*



*Brian Zigmond - Principal, Engineer StudioJAED*

the entire boiler system for a few hours to perform emergency work during one of the coldest days of the winter without the system being negatively affected. The ERV/air-handling unit with Airxchange wheels keeps the school in the “comfort zone.”

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## About Airxchange

Airxchange has 35 years of extensive experience in the energy recovery industry. Our mission is to design and manufacture high quality products that perform reliably and effectively for the life of the HVAC system, reduce energy consumption, and improve indoor air quality. The addition of high-tech materials and innovative designs to a technology based on fundamental scientific principles has earned us the trust of our valued OEM customers. We will continue to innovate and support our customers to meet evolving market demands for energy recovery ventilation technology. Visit [airxchange.com](http://airxchange.com) for more info.