



# AIRXCHANGE®

partnering with industry for  
sustainable energy recycling technology

## Case Study: Providence Career and Technical Academy



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

#### Background

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.

#### Key Statistics

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

#### 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 CO <sub>2</sub> 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

#### 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.

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 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.”



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

## The Results Speak for Themselves

PCTA operates in the 43 kBtu/S.F. range, which is about 40% lower than the national average for all high schools, not just technical schools. The improved efficiency yields huge savings on utility bills. Through their reduction in outdoor air load, Airxchange energy recovery wheels account for an estimated \$28,000 in annual utility savings.<sup>1</sup> Because of PCTA’s Northeast location, the majority of the savings are realized in the heating months, but because Airxchange wheels exchange moisture and maintain superior indoor air quality, they benefit the school year-round.

*“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.”*

David Gaudet, Aramark, Facility Manager at PCTA

<sup>1</sup> Estimate based on a 10 month, 10 hour/day x 5 day/week operating schedule using actual utility costs of \$0.17/kWh (electric) and \$1.30/therm (gas)

## About Airxchange

*Established in 1982 Airxchange has extensive experience in the design, manufacture, sale, and support of energy recovery ventilation components to manufacturers of Heating, Ventilating and Air Conditioning (HVAC) equipment. The company played a pioneering role in the formation of industry standards and third party performance certification programs, which validate their transformative technology. Airxchange technology is now widely available through leading HVAC manufacturers.*

*For more information about Airxchange, please visit [www.airxchange.com](http://www.airxchange.com).*