RANDOLPH COMMUNITY COLLEGE

CASE STUDY

OLD WAREHOUSE TURNED LEED GOLD EDUCATION CENTER

ASHEBORO, NORTH CAROLINA

Engineers and architects took the seemingly impossible task of recycling an outdated industrial factory into a LEED® Gold showcase of the HVAC industry's most innovative equipment.

The plans for Randolph Community College (RCC) involved transforming a 46,000-square-foot uninsulated brick shell into a high-efficiency educational facility. Two Raleigh, NC firms, consulting engineering firm Progressive Design Collaborative (PDC) and architecture firm, Smith Sinnett Architecture, were up for the challenge.

With the encouragement of RCC's Cindi Goodwin, director of facilities at the Asheboro, NC-based technical school, PDC's Scott Ennis, P.E., project engineer, and Steve Campbell, P.E., president, thought well beyond convention. They designed one of the nation's first combination of active chilled beams with an off-peak hours ice storage/chilled water loop.

The foundation of the Continuing Education and Industrial Center's (CEIC) cooling system is 184 IQHC active chilled beams and two Pinnacle® dedicated outdoor air systems (DOAS) manufactured by SEMCO.

The two-pipe chilled beams, which range from 2 to 10-feet in length, supply 100% of the $7.6-million facility's cooling. Chilled beams have the potential for

Photo Credit: Lewis Perkins

Pinnacle DOAS at Randolph

condensation in humid environments such as North Carolina. Therefore, PDC's specification of Pinnacle allows dry outdoor air to be delivered to the chilled beams, preventing condensation and complying with ASHRAE 62.1 - The Standard For Ventilation And Indoor Air Quality. Besides providing a comfortable relative humidity (RH), the Pinnacle/chilled beam combination allows for small six-inch-diameter ductwork, reducing plenum height and saving space over a convention system. "We wanted to keep ceiling heights at 10 feet, so the inherent feature of the active chilled beams' reduced duct sizes caught our interest," said Scott Ennis, who had never specified a chilled beam project before, but is already specifying them again for a hospital with low ceilings. Additionally, energy-efficient chilled beams use approximately 40% less fan horsepower versus the alternative of a conventional rooftop and ductwork system.

The two 10,000-cfm Pinnacle DOAS systems also contribute to the project's sustainability and indoor air quality (IAQ), because they use True 3Å molecular-sieve enthalpy wheel technology to dehumidify outdoor air and recover heat from exhaust air for pre-heating outdoor air. Versus silica gel desiccant wheels, Pinnacle's True 3Å energy recovery wheel technology quickly adsorbs the exhaust air's moisture, but not its contaminants that pollute incoming outdoor air. The wheel also uses acid-resistant, anti-microbial and anti-stick coating treatments that help sustain the equipment's lifecycle and maintain design static pressures.

The CEIC's comprehensive energy savings result in a six-year payback of the mechanical, electrical and plumbing specification with the following equipment generating the greatest savings:

- chilled beams and Pinnacle DOAS by SEMCO;
- variable frequency drives (VFD) on the piping loops and DOAS fans;
- variable air volume (VAV) boxes with their own dedicated hot water loop;
- ice storage system by Calmac, Fair Lawn, N.J;
- high-output T-8 fluorescent lighting by Philips Lighting with occupancy sensors Wattstopper, Santa Clara, Calif.;
- solar domestic hot water heating system by Lochinvar, Lebanon, Tenn.;
- a 3,200-gallon rainwater harvesting tank;
- polypropylene manufactured by Aquatherm, Lindon, Utah, was used on piping runs less than three-inches in diameter. The pipe is helped attribute to LEED credits;
- and various other MEP equipment.

The payback is reduced to four years when considering the $60,000 utility rebate. Duke Energy/Progress Energy offered the incentive because the CEIC's chiller operates mostly at night and is needed rarely, if at all, during daytime high-peak electric rate periods, according to David McDaniel, sales engineer at Brady Services Inc., Morrisville, N.C.

When compared to a more conventional design, such as constant volume package rooftop HVAC units with VAV boxes, the college is saving 28.2% with PDC's innovative mix of high-efficiency technologies.

The LEED 2.2 project's HVAC equipment is also racking up 7 of the total 41 credits submitted for LEED Gold

Photo Credit: Lewis Perkins

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- Scott Ennis P.E., Project Engineer

certification. The CEIC became the first LEED Gold Certified building in Randolph County in June 2013.

The CEIC, which was also the first North Carolina community college project to become a Challenge Partner of the U.S. Department of Energy's Better Building Challenge program, uses a separate hot water loop and VAV box hot water coils that are supplied by two Lochinvar, Lebanon, Tenn., condensing boilers and VFD-controlled pumps by Bell & Gossett, Morton Grove, Ill. Specifying a separate heating loop saved tens of thousands of dollars in installation labor and material costs versus piping hot water to each chilled beam.

The building envelope was a LEED challenge for Smith Sinnett architect, Robert Carmac, AIA, LEED AP, BD+C, because it lacked a vapor barrier, insulation and other modern energy-efficient building materials. The original building's wall and roof insulating values were low at R-3.45 and R-7.17, respectively. However spray foam insulation was able to increase the wall and roof R-values to R-14 and R-30, which are considerably higher than the minimum building code of R-5.7 and R-15, respectively.

Based on the project's energy efficiency, many of the CEIC's HVAC technologies will be combined in future PDC projects, especially schools and hospitals, according to Ennis and Campbell.

Converting the old Klaussner Furniture warehouse into a sustainable showcase was a challenging project. Therefore, RCC proudly promotes the project's energy savings with its BuildingLogiX, Vandalia, Ohio, building automation system's EcoRate dashboard that used web pages designed by Brady Trane, Greensboro, N.C. The wall-mounted dashboard in the CEIC's lobby allows any visitor touch-screen access to a real-time analysis of the facility's ongoing water and energy savings.

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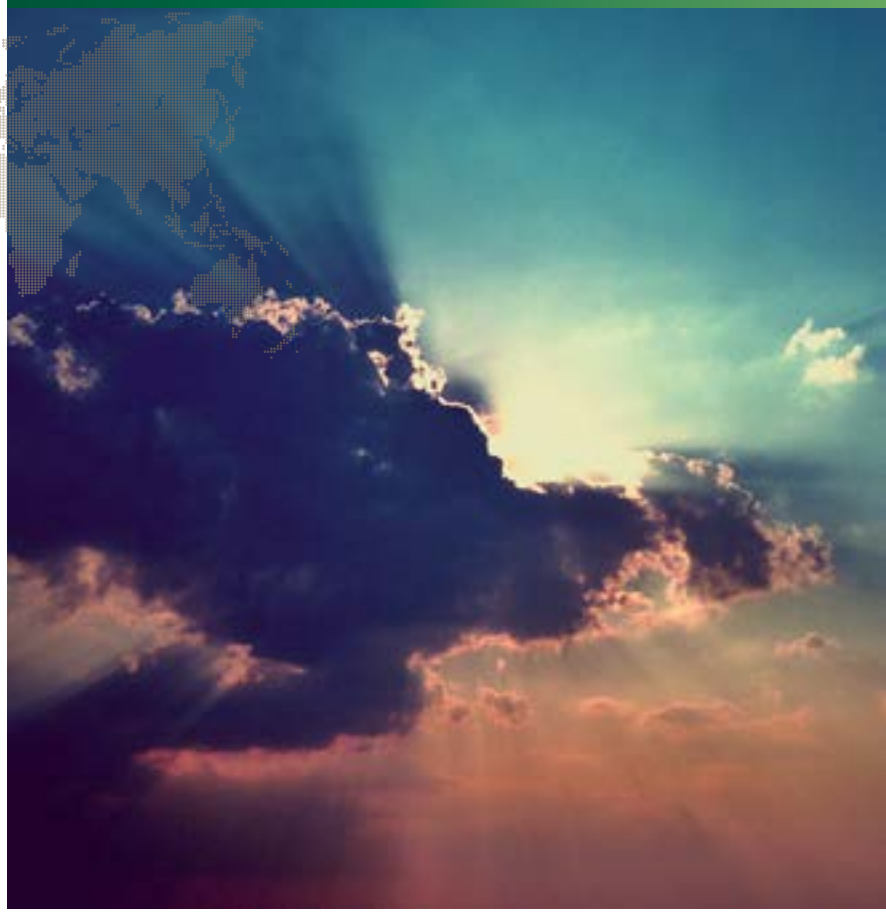

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