Integrated Air Conditioning & Dehumidification System Wins R&D 100 Award

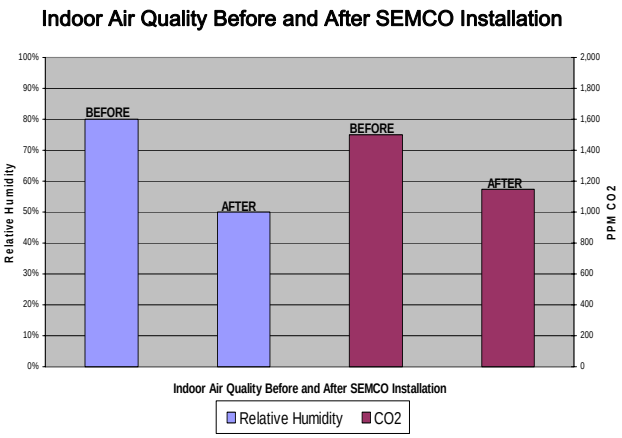
New Technology Improves Air Quality at Georgia Elementary School

The SEMCO Revolution™ was installed at Timber Ridge Elementary School in response to years of problems and complaints related to the building's indoor humidity. The award-winning Integrated Active Desiccant Rooftop (IADR) system now successfully controls humidity, temperature, and air quality at reduced energy costs.

Background

Maintenance of indoor air quality in schools should be top priority. Molds, particulates, and CO_2 levels must be controlled through proper ventilation and humidity control. Otherwise, students and teachers are at higher risk of developing respiratory illnesses leading to increased absenteeism. Damage to books, carpeting, wood flooring, and ceiling tiles can also occur from mold and mildew growth in excessively moist conditions.

Conventional HVAC systems cannot independently control temperature and humidity levels, and this limitation has creates a tension between comfort, air quality, and cost issues. Delivery of fresh, but moist, outdoor air prompts occupants to lower thermostat settings to maintain comfort. At Timber Ridge Elementary, costly over-cooling was followed by reheating. Furthermore, outdoor air louvers in the original unit were sealed, and dehumidifiers were used in efforts to control mold growth. Inadequate ventilation, air quality, and temperature/humidity control compromised the school learning environment.



Technology

In June 2005, Jim Sand of Oak Ridge National Laboratory and John Fischer of SEMCO won an R&D 100 award for their development of the SEMCO Revolution™. The awards are presented annually by R&D Magazine for the year's outstanding technology innovations.

The novel packaged system is compact, cost-effective, and extremely energy efficient. An Integrated Active Desiccant

Wheel offers unique dehumidification capabilities. “Bone dry” air leaving the desiccant wheel mixes with cool bypass air leaving the conventional cooling coil so that cool, dry, comfortable air can be provided at any temperature. A natural gas burner regenerates the desiccant as needed to bring down humidity when the internal humidity set-point level is not being met by conventional vapor compression cooling.

The effective provision of already dry air eliminates the need for overcooling to achieve dehumidified, low-dew-point ventilation air, as well the corresponding low suction pressures and air-conditioning operating efficiencies needed to obtain these low temperatures. The SEMCO Revolution™ uses fewer tons of mechanical cooling capacity to deliver a desired supply air dew point – up to 70% less than conventional systems.

Benefits

- Effective control of space humidity by the Revolution™ system allows school occupants to be comfortable at higher thermostat settings, resulting in energy savings.
- By controlling humidity in all conditions, the chance of mold and mildew growth within ductwork, ceiling tiles, carpeting, and classrooms is greatly reduced.
- Adequate outdoor ventilation air ensures low CO_2 levels during periods of high occupancy. By inference, it can be assumed that other contaminants (such as carcinogenic VOCs) are also reduced.
- Students and staff experienced greater comfort and better air quality as a result of the Revolution™ installation. The improved learning environment at Timber Ridge will promote learning and potentially reduce absenteeism.

Future Work

In 2006, SEMCO, Inc. will install several IADR units in a new, 1,500-student high school in Floyd County, Georgia. In an ORNL cost-shared project, four of the systems will use electric power and waste heat provided by a 200 kW reciprocating generator to operate at significantly higher efficiencies than the retrofitted Timber Ridge Elementary system.

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