

# Energy-Recovery Ventilating Units Help Beat Efficiency, Comfort Expectations

**Also help Navy Federal Credit Union earn LEED points**

**H**aving completed Florida's first Leadership in Energy and Environmental Design for New Construction and Major Renovations (LEED-NC) Gold-certified commercial building—a 56,000-sq-ft call center—Navy Federal Credit Union was looking to expand its Pensacola campus. Phase 2 was to consist of a 166,000-sq-ft call center (Building 2), a 165,000-sq-ft administrative building (Building 3), a central energy plant, and a parking deck. Navy Federal invited back architectural design firm ASD, which enlisted Newcomb & Boyd for the mechanical, electrical, and plumbing designs.

To meet project director Ebb Ebbesen's goal of at least matching the success of the first building, Newcomb & Boyd focused on maintaining a thermally comfortable environment that demanded less cooling, heating, and fan energy. Engineers discussed the design with Tom Rice, Southeast regional manager for SEMCO Inc., who suggested a modified Pinnacle ventilation system as an option for raised-floor air delivery.

The modified system provides conditioned air at relatively warm supply temperatures and relatively low relative humidity by recovering thermal energy from exhaust- and return-air streams and using that energy to pre-condition outdoor air and condition supply air. This energy exchange reduces



*Navy Federal Credit Union's Pensacola, Fla., campus.*

chilled-water electric-heat demand. The raised-floor air-delivery approach used in Building 1, but enhanced with Phase 2, helped reduce fan energy by conditioning only the first 48 to 60 in. of space above floors.

## FIFTY- TO 60-PERCENT SAVINGS

The system delivers pre-tempered air at a suppressed dew point of 45°F. This dry-air delivery, along with the underfloor-air-distribution (UFAD) system, makes keeping Building 2's occupants comfortable at a 76°F dry-bulb temperature possible. However, higher set points are just a small part of the savings. The recycling of energy from exhaust air via four Pinnacle primary-ventilation-and-energy-recovery units accounts for much of the savings.

The system pre-conditions and dehumidifies outdoor air using exhaust air from bathrooms, janitorial rooms, breakrooms, etc. throughout Building 2. Pre-tempering and dehumidification are accomplished by recovering

(or rejecting) heat from exhaust air via two internal heat wheels. The first, a total energy wheel, and the second, a passive desiccant-dehumidification wheel, work in series to pre-temper and dehumidify supply air, reducing it to an arid 45°F dew point. The system responds to variations in temperature and humidity by modulating the rotational speed of the passive dehumidification wheel

and/or adjusting the energy input to the cooling coil, which is positioned between the two heat wheels.

Although typically designed to condition 100-percent outdoor air, the Pinnacle units were designed with an internal chamber in which return air mixes with supply air just upstream of the cooling coil. This keeps Navy Federal from having to condition unnecessarily large volumes of outside air. Building 2 utilizes four Pinnacle units sized at 45,000 cfm each for a total supply-air capacity of 180,000 cfm. Each unit has 15,000-cfm outdoor-air capacity, but normally operates around 6,000 to 8,000 cfm. This outdoor air meets code requirements for ventilation and serves as makeup air for the dedicated exhaust air.

Phase 2, which includes Building 2, the central plant, and electrical consumption from the construction of Building 3, is recorded on a separate electrical meter.

Despite the fact this represents three times the load of Building 1, utility bills for Building 2 have been more than \$1 less per square foot, even after normalizing the utility rates. This is significantly better than the 25-percent savings that was projected based on the original energy model for Building 2.

According to John Shaw, a mechanical engineer for Newcomb & Boyd, utility-meter data suggest 50- to 60-percent savings. Shaw estimates HVAC energy savings, not just from the SEMCO units, are 35 percent of that total savings. The rest is attributable to daylighting design, high-efficiency lighting, architecture, architectural geometry, building-envelope efficiency, and Navy Federal's decision to use Energy Star equipment.

"We've seen square-foot-per-ton numbers that are virtually unheard of," Shaw said, adding, "We were very surprised at the maintained low indoor humidity levels at such large square-foot-per-ton efficiencies."

#### EFFICIENT COMFORT IN A SUBTROPICAL CLIMATE

The UFAD system works best when the supply-air tem-

perature is no more than 4°F below set point. The SEMCO units can achieve a higher supply-air temperature while lowering the dew point, which not only makes the air more comfortable at a higher set point, but reduces the chances of mold growth and bacteria. Despite the relatively high set point of 76°F, office workers have reported being extremely comfortable and cooling off quicker when they step inside of the building because of the difference between indoor and outdoor humidity.

The inclusion of the SEMCO units helped Navy Federal earn LEED-NC Energy & Atmosphere Credit 1, Optimize Energy Performance; Indoor Environmental Quality (EQ) Credit 2, Increased Ventilation; EQ Credit 7.1, Thermal Comfort—Design; and EQ

Credit 7.2, Thermal Comfort—Verification.

With recorded performances of 650 sq ft per cooling ton on peak design days, Building 2 has convinced Newcomb & Boyd to repeat the same strategy in Buildings 3 and 4.



**Four custom-built energy-recovery ventilating units enabled Navy Federal Credit Union to earn LEED points.**

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