Floyd Medical Center Opts for the PINNACLE of Surgical Environments

The unyielding demands for accurate dew point, humidity, and temperature control in surgical suites creates a challenge for any engineer aspiring to deliver efficiency and optimum space conditions. It's a challenge that the Phoenix Design Group, Inc. in Nashville, Tennessee has faced many times since hospital work constitutes approximately 90% of the firm's business.

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According to John Wade, Senior Mechanical Engineer for the Phoenix Design Group, the low temperature and relative humidity needed in these spaces makes it difficult to rely on conventional refrigeration alone. That is why his firm opted for SEMCO's Pinnacle® primary ventilation system with integral energy recovery when designing the mechanical system for a new surgical suite at the Floyd Medical Center in Rome, Georgia.

The Phoenix Design Group consulted with surgical staff before setting the design parameters for the new suite. Based on the feedback they received, they set out to design a system that could maintain 62°F at a relative humidity of 45%.

Why So Cold?

Surgical suites have to be kept cool and dry, not only for the comfort of the surgeons and staff, but also for procedural efficiency and patient safety. Dew points must be kept very low in order to avoid condensation or "fogging" on any metal surfaces, surgical equipment, or optical equipment. The space must also be kept dry to prohibit bacterial growth. Some medical procedures even require low space temperature to help slow the metabolic rate of the patient during specific procedures.

Meanwhile, surgical staffs are covered from head to toe in multiple layers for infection control. Depending on the procedure, a surgeon might be outfitted more like an astronaut than a doctor, wearing face shields and even lead aprons if x-rays are being performed.

The 62°F space temperature and 45% RH requirement at Floyd Medical necessitated a dew point of 41°F. This dew point could not be achieved with traditional chilled water equipment, which typically involves overcooling the air to remove moisture and then reheating it to a suitable supply temperature. In this case, that would have meant using a special "glycol" chiller to create water temperatures in the 30's to allow for a leaving coil temperature in the 40's. The chiller would have to be oversized to compensate for the de-rated capacity caused by the low temperature water and glycol.

Instead, the Phoenix Design Group opted for a dual wheel Pinnacle unit that pre-treats 100% outside air, lowering both latent and sensible temperature before the air ever reaches the main air handler or VAV boxes serving the surgical suite.

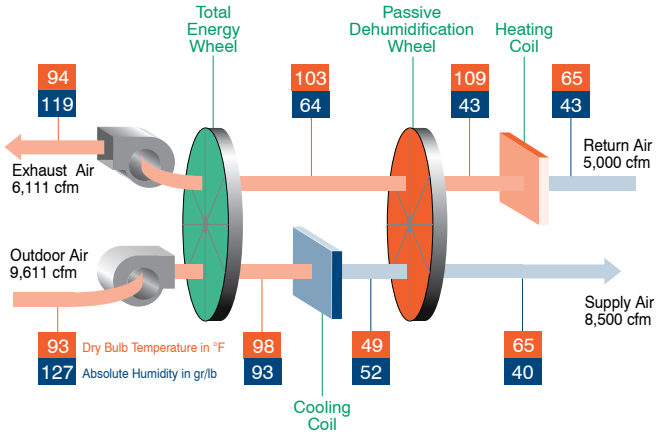

Figure 1: Schematic of the cooling season sequence

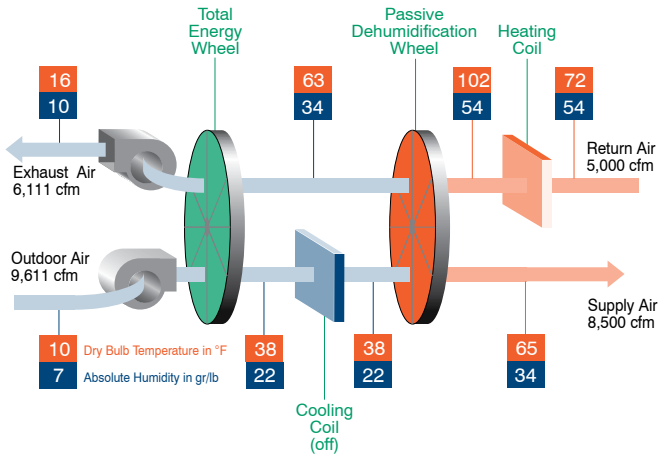

Figure 2: Schematic of the heating season sequence

How It Works

The Pinnacle system prescribed for Floyd Medical is comprised of a supply fan, exhaust fan, a total energy wheel, a cooling coil and a passive dehumidification wheel. Outdoor air first passes through the total energy wheel where it is pre-cooled or pre-heated by an adjacent return air stream from the hospital's main exhaust. Next, the air travels through the cooling coil and passive dehumidification wheel, respectively, where it is further conditioned to produce room temperatures at a very low humidity. The rotational speed of the wheels is varied according to the load conditions, with the passive dehumidification wheel typically rotating at a very low RPM to maximize moisture removal. In any case, the three main components work in concert to meet the requirements of varying space temperatures and humidity. This is a primary advantage of the Pinnacle system over other energy recovery systems, as it can respond to various combinations of temperature and humidity conditions.

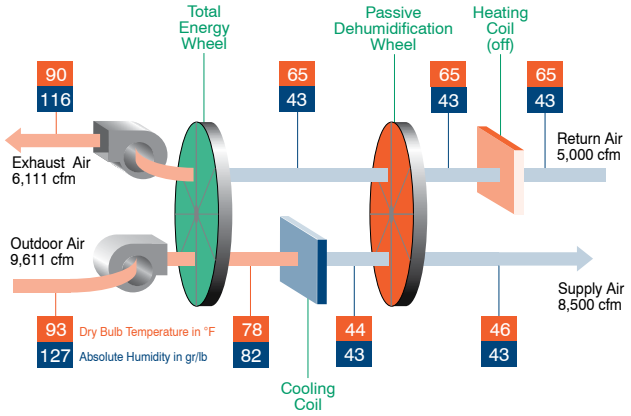

Figure 3: Schematic of the peak sensible cooling sequence

Most importantly, the Pinnacle's ability to remove moisture means that downstream air handling units needn't overcool to provide dry air to the surgical spaces. Higher discharge air temperatures also mean less energy expended on zone reheat boxes.

"It's a really good economic decision for a hospital," says Mr. Wade. "I think there is a positive return, but we sometimes must compete with medical technology."

Clearly there are operational savings associated with this design approach—improved chiller efficiency, higher supply temperatures, and reduced fan horsepower just to name a few; but in a surgical application, this is secondary to the high level of environmental control that the Pinnacle provides. Surgical comfort and functionality is enhanced, which is Floyd Medicals Center's greatest asset when it comes to the health and welfare of their surgical patients.

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Corporate Office
SEMCO, LLC
1800 East Pointe Drive
Columbia, MO 65201-3508
phone: 573-443-1481
fax: 573-443-7749

www.semcoinc.com

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