How Reducing ACH Can Save Hospitals Cash

Guidelines reduce air changes in unoccupied operating rooms

**CUTTING EDGE:** Monitors in the operating rooms at the Cleveland Clinic track the rooms’ temperatures, pre-humidity levels, and air changes per hour.
The Cleveland Clinic is well-known for its world-class care. Patients from around the world come to the clinic, and the clinic comes to them. In addition to its main campus in Northeast Ohio, the Cleveland Clinic has facilities in Florida, Las Vegas, Canada, and Abu Dhabi. All told, the clinic’s enterprise consists of 250 buildings encompassing more than 25 million square feet.

With that big of a footprint, the clinic is always carrying out ambitious projects to optimize the performance of its physical plants. One such project involves adjusting the air changes per hour (ACH) in unoccupied operating rooms. As set forth in ANSI/ASHRAE/ASHE Standard 170-2013, “Ventilation of Health Care Facilities,” and the 2010 Facility Guidelines Institute (FGI) guidelines, operating rooms must be maintained at strict temperature and humidity levels. Conditioning air to meet the guidelines consumes a large amount of energy, especially when operating rooms are occupied and experiencing the required 20 ACH.

Reducing those air changes to six during the hours when an operating room is not being used, however, can provide a tremendous cost savings to the facility while still meeting the ASHRAE standard and the FGI guidelines.

Larry Rubin, senior director of facilities management for the Cleveland Clinic, told The NEWS that by reducing ACH in unoccupied operating rooms from 20 to six across all 200-plus operating rooms in its enterprise, the clinic stands to save about $2 million annually.

“We're highly regulated,” Rubin said. “The design standard for an operating room is 20 ACH, and we have to be right on the money. But, based on an addendum to the FGI guidelines, we saw an opportunity to bring the ORs down to six air changes per hour when they’re not in use. When these rooms are kept at 20 ACH 24/7 — even when no one is using them on nights and weekends — it represents a tremendous waste of energy.”

At the clinic, the building automation system (BAS) interfaces with the surgery scheduling equipment (OpTime) program. The room will stay in the setback mode until 30 minutes prior to the first case of the day.

“The 30-minute buffer is to provide the higher airflow as the room is prepped for the first case, and the surgical packs are opened,” Rubin explained.

The program accommodates the surgery schedule, reducing the ACH when no one is scheduled to be in the operating room while maintaining the pressure, temperature, and humidity. Rubin noted this system is vastly superior to simple mechanical occupancy sensors, which would change the parameters in the operating room whenever anyone entered, including a cleaning crew at night.

“Occupancy sensors are not sophisticated enough to provide really great savings,” Rubin said. He added, however, that the Op-Time system is easy to manually override in the case of unscheduled surgeries.

According to Rubin, the amendments to the FGI guidelines that allow the ACH to be reduced in unoccupied operating rooms will likely cause hospital administrators to take notice of the potential for cost savings.

“You're going to see more and more people do this to save energy,” he said. “In addition, it gives the users of the room and the facilities staff data they didn’t have before. The information is live, on the wall and in real-time, and it’s extremely accurate.”
Twinsburg, Ohio-based Enterprise HVAC Service and Control works with the Cleveland Clinic on the ACH initiative. Dick Starr, president and CEO of Enterprise, says that constant, real-time monitoring is a key component in making the ACH savings possible. He notes that, even at the reduced ACH, positive pressure must be maintained in the operating room without affecting pressures in the adjacent zones.

“The addendum to the FGI guidelines allow hospitals to reduce ACH in unoccupied operating rooms as long as they have an engineered method for doing it,” said Starr, who is a member of the national boards of both the Mechanical Contractors Association of America (MCAA) and the Mechanical Service Contractors of America (MSCA) and a past chairman of MSCA. “The challenge is that you must make sure you don’t lose pressurization in the operating room or affect the pressurization of adjacent zones. It sounds easier than it really is. The calculations must be very accurate, and the measurement and monitoring must be sophisticated and continuous.”

For contractors interested in helping hospitals achieve the cost savings of reduced ACH, Starr recommends first looking at where the hospital is right now. Make sure it’s compliant to begin with, or bring all its zones into compliance, then balance the zones. Starr, whose company is a National Environmental Balancing Bureau (NEBB)-certified air and water balancer, said he’s seen instances in which zones that are only required to have 15 ACH were cranking away at 30 ACH all day, every day. Take care of those things first, he advised, then start thinking about reducing ACH in unoccupied operating rooms.

According to Starr, in addition to the ACH savings, hospitals present a wide range of other opportunities for skilled HVAC service companies to provide cost savings. These include:

**Humidity Control** — Another addendum to the FGI guidelines allows humidity levels in surgery suites and critical care rooms to be reduced from 30 percent to 20 percent. “That’s significant, because some older hospitals just don’t have the capability to achieve 30 percent,” Starr said. “Reducing it to 20 percent was well-accepted by the entire health care network.”

**Chilled Water Coils** — It seems basic, but take the time to ensure chilled water coils are piped properly. “We’ve seen situations where chilled water coils are piped in backwards — the supply is the return and the return is the supply,” Starr said. “In that scenario, you lose the coils’ dehumidification capability, and the system has to work much harder to achieve the desired humidity range.”

**Filters** — Not all areas in a hospital require HEPA filters. Quite to the contrary; only a few areas, such as isolation rooms, are required to have HEPA filtration. Over-applying HEPA filters can cause high static pressure drops and airflow issues.

“MERV-14 filters, which are required in operating rooms, have an initial pressure drop of 0.5- to 1-inch water column, then a final pressure drop of 1.5 to 2,” Starr said. “A HEPA filter has an initial pressure drop of 1 to 1.5, and a final pressure drop of 2 to 2.5. So, there’s a big airflow difference between a MERV-14 filter and a HEPA filter.”

Although there are opportunities in hospitals, the market is a difficult one filled with major players and should not be taken lightly, concluded Starr.

“To work in the hospital sector, you’d better have a high skill set in HVAC service, building controls, and air and
water balancing," he said. “You need to have all three of those resources on your team to diagnose if a system’s problem is in the mechanicals, the controls, or the balancing. As we’ve found so many times, the answer is usually a little bit of each.”

**SIDEBAR: Physician Involvement Can Make Doctors Feel Good**

When working with hospital clients, getting physician and surgeon buy-in can be very helpful in maintaining a harmonious atmosphere.

Larry Rubin, senior director of facilities management for the Cleveland Clinic, said working at an institution where a doctor is in charge of the energy committee, as is the case at the clinic, helps facilitate dialogue and understanding between the medical and facilities teams.

“For example, docs like the operating rooms to be as cold as possible,” Rubin says. “But, overcooling spaces increases humidity levels simply because cooler air holds more moisture, and that increases the risk of mold growth. We know that, but many doctors don’t. Having a doctor in charge of the energy committee takes it out of our hands and allows him to explain to his fellow doctors why we, on the facilities side, can do certain things and can’t do others. Having a doctor in charge of the energy committee has been fantastic as far as getting doctor buy-in to our efforts.”

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