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Environmental issues

HVAC setback: Saving energy and reducing cost

Depending on your facility's type and pattern of use, one or more of your ORs likely is not being used a majority of the time. Yet for most facilities, the heating, ventilation, and air-conditioning (HVAC) system operates continuously, providing air exchanges, humidity, and temperature control as if the OR were occupied.

In addition to wasting energy, running your OR HVAC system costs money even while the room is unoccupied. In today's energy-conscious environment, many facilities are implementing operating room HVAC setback as a way of controlling these costs.

Operating room HVAC setback (also referred to as "night setback" or "unoccupied setback") is an energy-saving strategy that reduces the amount of air supplied to an OR when the room is not in use. HVAC setback may also allow temperature or humidity settings (or both) to drift during times the room is not in use.

Energy savings

Considering the OR's high air change rate requirements, high use of outside air, and often significant cooling and humidity requirements, a hospital or ambulatory surgery center can save energy by adopting an HVAC setback strategy. Although savings will be greater in more extreme climates, they are significant for any facility. Particularly when a facility's HVAC system uses 100% outside air, the return on investment can be as little as a few years.

OR setback during unoccupied periods is not new or unproven. For example, OR setback has been standard practice in Washington State since it adopted its own health care design standard in 1986. But before moving forward, the facility's staff should understand the factors that influence the method and controls chosen to achieve OR setback. Just as there is no one kind, size, and type of OR, there is no one solution for OR setback. Techniques and systems can be applied in various ways to meet the needs of individual facilities and their staffs.

Is the investment worth it?

Though all ORs are potential candidates for a setback strategy, a first step is a basic assessment. This assessment should weigh the benefits and costs of implementation and determine if the expected rate of return meets your facility's requirements or expectations. A basic assessment can also determine the method of setback control that offers the best solution for a particular facility.

These are factors to consider:

Understanding your occupancy

How will your operating room (or rooms) be used and how often? Developing a profile of actual or expected OR use and occupancy can help the HVAC or mechanical system designer estimate savings and determine what your optimal system control strategy should be. One basic question is whether you need to have one or more ORs

ready for use at all times (as in a trauma facility) or whether your OR schedules are more predictable. This will help determine the level of setback as well as the optimal controls. Clinical staff will be key participants in this discussion.

Retrofits

If you are considering a setback strategy for an existing facility, ask your design team to examine carefully how your existing HVAC system will integrate with a setback strategy. For example, the team will need to understand how your HVAC system conditions the environment and controls airflow to your existing ORs. The configuration of the existing HVAC system will inform both the scope of the upgrade and the decision about which control strategy is optimal. In addition, integration of a setback strategy with your current system is critical to achieving maximum energy savings.

Cost of setback

In the design and construction of a new OR, a setback strategy can be adopted with little or no additional upfront cost. In a retrofit of an existing facility, however, upfront costs must be weighed against the expected energy savings. Also, because most OR setback solutions require periodic maintenance, the cost of maintaining your system should be part of the equation.

The total cost of a setback strategy depends on the specifics of the strategy selected. Generally, the finer the level of control, the more complex the system is, which means a higher upfront cost.

Codes, standards, and design requirements

For the safety of patients and staff, state and federal codes govern the environment of ORs closely. Your design team will need to address requirements for air change rates, pressure relationships, and temperature and humidity levels while devising an appropriate solution for your facility and staff.

How much and what type of control do you need?

The controls for an HVAC setback strategy can differ from one facility to another. Just as there is no one setback strategy for ORs, there is no one control system that works best.

Designing the right controls depends on understanding what the users of the space need and how they interact with the system.

Some staff may prefer a simple system interface, such as a series of pushbuttons, while others are more comfortable interacting with the system directly, perhaps using a control panel that shows the temperature, pressure, and humidity settings.

To respond to these user differences, the control options may vary for ORs in the same facility. For instance, one OR may be kept in "ready" mode (ie, in occupied mode), even though there is no code requirement to do so. It is important that your clinical and facility staff work together to decide which control solution meets your staff's needs while still saving energy.

System control options

Here are a few common system control options:

Time schedule

A time schedule program can be an effective means of controlling your HVAC settings if your ORs are used on a regular basis either daily or weekly. The schedule

Q & A on HVAC setback

Answers to OR directors' questions on OR HVAC setback by Christy Love, Mechanical Designer with Mazzetti Nash Lipsey Burch:

Q. **Is there a risk to the sterile supplies stored in the OR? Will the humidity get too high?**
CL: No. You would still control humidity and other parameters as needed in setback mode. You would have one range of parameters that achieves the desired conditions when occupied and another that allows a broader range but still sets limits during unoccupied mode. These parameters would be determined as part of the design process.

Q. **How does a facility quantify the savings from OR HVAC setback?**
CL: When designing the system, you would need to look at how your current OR is operating—how long the system is on, the number of air changes, and the temperature setting. You can estimate savings by comparing the actual conditions with the proposed conditions using OR setback (ie, how long your OR would be running occupied and unoccupied, the difference in the number of air changes, and difference in temperatures). An engineer could do a quick calculation to quantify projected savings.

Q. **What safeguards are in place to notify the right individuals if the system malfunctions?**
CL: Part of designing a system is determining how users want to interface with the system. Audio and/or visual alarms would alert the designated persons and the building management if something is operating incorrectly. These could be located where the building management system is monitored by the facilities staff as well as in areas that are appropriate for alerting clinicians.

Q. **Would HVAC setback affect the anesthetic gas scavenger system?**
CL: No. The anesthetic gas scavenging system is part of the medical gas system and is not typically connected to the HVAC system.

Q. **Would HVAC setback help filters last longer?**
CL: Yes. If less air is moving through the filters, the buildup of contaminants is reduced over an equivalent period of time.

shows when each OR is scheduled for occupied or unoccupied mode. A time schedule program is easy to understand and modify and does not require interaction from staff, as it is usually part of the building automation system. Time schedule controls are well suited for use in ambulatory surgery centers, where surgical teams keep regular hours, and emergency cases are not anticipated.

Occupancy sensors

Occupancy sensors (which can combine audio, infrared, and motion detection) switch an OR between unoccupied and occupied modes automatically and do not require staff interaction.

The sensor controls often embed a delay in the change to unoccupied mode so the system ramps down slowly enough to maintain positive pressure in the HVAC system. The sensors may also embed a delay in the switchover from unoccupied to occupied mode to correct for brief entries into the room (eg, users borrowing equipment or passing through).

Manual switchover

An OR can be fitted with controls (typically using an OR interface panel) that are manually activated when the room is to be occupied. One benefit of manual controls is that the time it takes the HVAC system to reach occupied mode settings is typically much shorter than the time it takes the surgery team to prepare for surgery. When this control method is chosen, though, staff must be trained to press the button that reactivates the HVAC system when the OR is needed.

Combined control methods

Any of the control methods described can be combined to provide flexibility as operational patterns change. For example, HVAC controls can be designed to operate on a time schedule, but occupancy sensors and a manual override button can be installed for use during unscheduled events. When the time schedule is in unoccupied mode (eg, overnight), but the occupancy sensors indicate the room is occupied, the system will switch to occupied mode after a defined delay (eg, 30 minutes). This allows for temporary, nonsurgery-related occupancies such as cleaning.

The override button allows a surgery team to override the delay immediately if the room is needed for an unscheduled surgery. After a manual switchover, the OR can be set to remain in occupied mode until the next unoccupied cycle in the time schedule (usually the next day).

Any of the user interface methods can also be paired with visible indicators, such as a green light in the OR, when the room is in occupied mode and a red light when it is in unoccupied mode.

Energy-saving strategy

OR setback is a proven energy-saving strategy for hospitals and ambulatory surgery centers in all climates. By considering relevant factors and the needs of the health care organization and its staff, your facility can use this strategy to meet clinical and operating staff needs while saving significant energy and money. ❖

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This article was developed from an American Society of Healthcare Engineers (ASHE) 2011 monograph on operating room setback. The monograph, intended for hospital facility staff, is at www.ashe.org/resources/management_monographs/mg2011love.html