PRACTICE Greenhealth

GREENING THE OR™

CASE STUDY

Providence St. Peter Hospital, Olympia, WA: Energy Efficiency in the OR– HVAC Setback Program

Demographic Information:

Providence St. Peter Hospital is a 340-bed, not-for-profit hospital. The campus consists of 157 acres with 835,323 square feet hospital, 53,000 square feet medical office building, and 12,000 square feet visitor hotel.[1] The facility offers comprehensive medical, surgical, and behavioral health services. Located in southwest Washington, the hospital serves a growing population in the five-county area. Providence St. Peter has 11 ORs and performed 8,300 surgeries in 2010.

Executive Summary Statement:

Providence St. Peter Hospital is part of Providence Health System, a 29-hospital integrated delivery network spanning 5-states in the Pacific Northwest. Providence Health System has been focusing for several years on how to rein in its energy use across the system. The system has benchmarked through Energy Star, and has a corporate director of sustainability who works with the individual facilities to set energy efficiency targets and goals. Providence St. Peter Hospital (SPH) identified the operating room (OR)—with its requirements for 15 air changes per hour, as a potential candidate for energy savings. SPH set out to reduce energy in the OR through an HVAC setback program. The hospital added two new ORs in addition to its existing nine. The new ORs can be controlled individually and have been the catalyst for multiple projects relating to energy efficiency. The project helped Providence St. Peter Hospital save energy while focusing on the thermal comfort of the clinical staff. The project payback was less than 1 year.

The Problem:

It is estimated that 30.1% of all health care outlays are related to surgical expenditures such as supplies and equipment.[2] The OR is also incredibly energy intensive. It has the highest air change requirements of any area within the hospital and uses high level filters to reduce particulates—both of which drive electricity and natural gas costs through the HVAC system. The OR also uses a variety of energy intensive equipment including medical gas vacuum pumps, diagnostic and monitoring equipment, and surgical lighting. Despite the fact that most ORs are often empty between the late evening and early morning hours, hospitals often keep the air changes the same no matter if they are occupied or unoccupied.

The operating room is one of the most energy-intensive departments in the hospital, requiring 15 air changes per hour for existing ORs built before 2010..

HVAC OCCUPANCY SENSOR LIGHTS

Estimated annual savings:

- *25,000 kWh or $2,000*
- *2,460 therms or $2,091*
- *Project cost to implement was $3,300*

Thus, return on investment is less than 1 year

Nine of the eleven ORs at SPH were not able utilize the occupancy sensor technology; the rooms were either all on or all off due to antiquated HVAC controls. The addition of two more ORs that could be controlled individually offered an opportunity to decrease SPH's energy use and increase its Energy Star rating. SPH maximized energy efficiency in the operating room through installation of HVAC setback programming.

Strategy & Implementation:

SPH recognized that in order to maximize energy savings across the OR department, the best scenario is to have individual control of each OR room. Originally, the hospital created an OR night setback system for the original nine ORs. The system consisted of a mushroom button at the main desk of the nine original ORs. The staff was required to hit the button in the middle of the night when the OR went down for the night—typically between the hours of 12AM and 5AM for SPH. The HVAC system would then reduce its output from fifteen air changes to six air changes per hour during that time frame, resulting in a 60% setback. The system was rejected after five months due to concern that staff would not remember to turn the system on before surgeries, risking patient safety. In order to implement additional energy efficiency measures in the OR, the sustainability team had to assure the surgical staff that they would not have to push the mushroom button or add any extra steps to their routine.

The staff instead decided to move forward with installing occupancy sensors for the two new ORs that were tied into the HVAC system. If no motion is detected for 60 minutes, the HVAC system goes into unoccupied mode and moves down to 6 air changes per hour.

SPH's Sustainability Coordinator, Keith Edgerton applied for grants from Puget Sound Energy to fund the individual controls package to dial back the HVAC system in the OR. Puget Sound Energy did award the hospital funding for its project and supplied $55,000 for the front-end investment for the total HVAC efficiency project: $22,494 for the HVAC fan and $32,506 for the night setback controls. The $3,300 occupancy sensor cost, including labor and equipment, was an out-of-pocket cost for SPH.

Three operating engineers were responsible for implementing the new sensors. They added two ceiling mounted infrared occupancy sensors to each of the two new ORs. Each sensor operated independently so that only one sensor must detect motion to turn on. The occupancy sensitivity was set at the high setting and a delay of three minutes was set before the HVAC system started

up when the occupancy sensor detected motion in the room. The delay ensured there was human activity in the room. Sensors were mounted kitty corner to each other and had uninterrupted visual access to each entrance. The staff installing the sensors verified that none of the ceiling-mounted equipment obstructed the views of the doors to affect the sensors. If the sensor did not detect any activity for 60 minutes, the HVAC system goes into unoccupied mode. As a safety feature, a red flashing light was installed outside each OR. The red light flashes to signal that the HVAC system is not on.

The new system did manage to achieve the 60% setback in the two newly wired ORs. Reducing air by 60% in the two ORs when the OR is unoccupied 47% of the time results in a 25,000 kWh energy savings and $2,000 dollar cost savings, and an additional 2,460 therm energy savings and $2,091 cost savings. SPH pays $0.08 dollars per kWh of electricity and $0.85 dollars per therm of natural gas..

Benefits:

- 25,000 kWh or $2,000
- 2,460 therms or $2,091
- Occupancy sensors and high efficiency fan would save $4,992 (62,400 kWh) annually if all 11 ORs functioned the same way
- OR's energy usage is 1% of SPH's total energy usage

Challenges and Lessons Learned:

SPH spent years trying to increase efficiency in its ORs through a variety of methods. The new occupancy sensors tied into the HVAC system were a success and Providence is interested in implementing this technology in other hospitals across the system. There are 10 Providence hospitals in Washington and Montana that participate on the Sustainability Board and all plan to or have already adopted the practice of individually digitally controlling the HVAC for their ORs. The occupancy sensors are also being used in the catheterization laboratories. Ultimately, the hospital wants to tie

Perioperative staff looking at new occupancy sensors for HVAC setback programming.

Keith Edgerton, Sustainability Coordinator for St. Peter Hospital and Providence Southwest Washington Service Area

the HVAC system to the evacuation pump (EVAC) system by adding a variable frequency drive (VFD) to make the system work. Surgeons need to turn the EVAC system on to perform surgery. Linking the systems together would trigger the EVAC to turn down when not in use. Since the EVAC uses a lot of energy, linking the systems would result in a cost savings as well.

St. Peter Hospital attributes much of its success with the new technology to knowing the system would work before implementing it. The staff recognizes the importance of having surgical staff trust them that nothing will go wrong after the new system is implemented. In the future, SPH may also consider a shorter wait period before dialing down the HVAC, as 60 minutes can be excessive and a lesser duration might still ensure safety while also decreasing additional energy use.

Endnotes

1 "Providence St. Peter Hospital." *Providence Health & Services*. Web. 8 Mar. 2011. http://www2.providence.org/southwest-washington/facilities/providence-st-peter-hospital/Pages/default.aspx.

2 Kranich, D. and Byrd, J. "How to Increase Efficiency in the Operating Room." *Surgical Clinics of North America*. Volume 76, Issue 1, Pages 161-173, 1 February 1996. Accessed on 4Mar 2011. Available at: http://www.surgical.theclinics.com/article/S0039-6109(05)70429-1/abstract"\l "bib13

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