

CASE STUDY
St. Luke's + Delta Controls

**O3 Operating Room
Sensing Solution**
At St. Luke's Hospital,
Boise, Idaho.

St. Luke's is the region's leader in heart, cancer, women's, and children's services. Its hospitals and cancer centers are nationally recognized for excellence in patient care, with prestigious awards, accreditations and designations reflecting the exceptional care that's synonymous with the St. Luke's name.

Background

The modernization of operating rooms (ORs) is critical for maintaining high standards of healthcare delivery. St. Luke's Hospitals, in Boise, Idaho, U.S.A., selected ATS to upgrade their ORs, to enhance environmental control, improve surgical outcomes and patient care, and meet stringent regulatory requirements.



This case study delves into the technical solutions by Delta Controls as implemented by ATS, the challenges faced, and the successful outcomes and benefits.

The Challenge

Operating rooms are extraordinarily complex environments requiring strict controls over various parameters to ensure patient safety and surgical success. The primary challenges in the design and operation of ORs at St. Luke's Hospitals included:

- 1. Temperature and Humidity Control:**
 - Precise control of temperature (68-75°F) and humidity (20-60% RH) is critical to prevent surgical site infections (SSIs) and ensure comfort for both patients and staff.
 - Traditional sensors placed on walls and return ducts often provided inaccurate readings due to stratification and distance from the surgical site.

2. **Airflow Management:**
 - Operating rooms require laminar airflow (25-35 cfm/ft²) to minimize contamination.
 - Airflow must be designed to sweep over the surgical area and exit through return grilles located in opposite corners of the room.
3. **Positive Pressure Maintenance:**
 - Maintaining a positive pressure differential (+0.01" WC) is essential to prevent contamination from adjacent areas.
 - Accurate and responsive pressure control systems are needed to maintain this differential despite varying external conditions.
4. **Regulatory Compliance:**
 - Compliance with ASHRAE 170 is mandatory.
 - Ensuring that the environmental control systems meet these standards consistently can be challenging, especially during high-demand surgical procedures.



The Solution, Benefits & Results

The Delta Controls O3 Sense was introduced for its advantageous features including:

- **Composite Sensing:** Combines humidity, composite temperature, passive infrared motion, and multiple other sensors in a single device.
- **Ceiling-Mounted Sensor:** Ensures accurate measurement of space conditions at critical occupant locations, avoiding interference from wall or return air effects.
- **Sensor Fusion Technology™:** Provides composite temperature readings for precise control by integrating multiple sensor inputs.
- **BACnet IP and IoT Capabilities:** Ensures seamless integration with existing Building Management Systems (BMS).

Occupancy Detection and Environmental Sensing:

- Includes motion, sound, light, and thermal sensors for comprehensive environmental monitoring.

Technical implementation by ATS involved:

- **Sensor Placement:** Three O3 sensors were installed on the ceiling to capture accurate readings of the entire OR environment. Traditional sensors remained on walls and return ducts for comparative analysis.
- **Data Collection:** Data was collected over four-months, comparing the performance of O3 sensors with traditional wall and return sensors. Environmental parameters such as temperature, humidity, and pressure were continuously monitored and logged.

Lastly, testing the setup to ensure a successful outcome was completed in three steps:

1. **Initial Setup:** OR environment was equipped with multiple sensors (wall, return duct, O3 ceiling-mounted). Baseline data collection focused on understanding the existing control system's performance.
2. **Testing:** Simulated surgical conditions with mockup room lighting, equipment, and personnel to replicate real operational conditions. Collected temperature and humidity readings from various locations within the OR.
3. **Data Analysis:** Compared the accuracy and responsiveness of O3 sensors against traditional sensors. Analyzed the impact of sensor location on environmental control effectiveness.

Benefits & Results

Installation and configuration of the O3 Sense in the space space lead to numerous successful outcomes:

- **Improved Accuracy:** The O3 provided more accurate temperature readings, particularly at the surgical site, reducing discrepancies by up to 8°F. Traditional wall sensors showed significant lag and lower accuracy due to distance from critical areas.
- **Energy Efficiency:** More reactive control led to energy savings and reduced hunting of mechanical systems. The O3's quick response to environmental changes minimized the need for constant adjustments, leading to smoother operation and less energy consumption.
- **Enhanced Comfort:** Surgeons experienced improved comfort, and the need for temperature adjustments was minimized. Stable environmental conditions reduced the need for frequent manual interventions.
- **Compliance and Safety:** Sustaining steady temperature and humidity levels reduced the risk of SSIs and ensured code compliance without frequent manual adjustments.

The system's ability to maintain consistent conditions improved overall patient safety and surgical outcomes.

- **Improved System Durability:** Reduced wear and tear on mechanical equipment minimizing maintenance needs and costs with less frequent hunting and adjustments facilitating longer equipment life.

Additionally, with the O3 Sense in-place, several data analysis benefits were realized that could be translated to automated room functions and included:

- **Temperature Control:**
 - O3 maintained a steady temperature with less fluctuation compared to wall sensors.
- **Humidity Control:** O3 provided more precise humidity control, critical for preventing SSI prevention and maintaining staff comfort
- **Pressure Control:** The system effectively maintained positive pressure differentials, ensuring a contamination-free environment.

In conclusion, Delta Controls' innovative O3 sensor technology significantly enhanced the environmental control within St. Luke's Hospitals' operating rooms. The project not only met but exceeded the needs and goals outlined, demonstrating the efficacy of modern sensor technology in critical healthcare environments. This case study highlights the importance of precise environmental control in operating rooms and sets a benchmark for future upgrades in healthcare facilities.



About Delta Controls

At the forefront of building automation systems, Delta Controls provides global solutions through its network of Partners in 80+ countries. Focusing on innovation and sustainability has made the company industry leaders for over 40 years. Delta Controls manufactures all products in Metro Vancouver, Canada, offering dependable, user-friendly control solutions for buildings in the commercial, healthcare, hospitality, education, and leisure markets. As part of Delta Electronics, Delta Controls is committed to leading building automation into a sustainable future. deltacontrols.com

References

1. Stanfill, W., Winter, B., & Arion, T. (2019). "Operating Room Upgrade Pathways & Modernization Solutions." Niagara Summit.

For further details and inquiries, please contact Delta Controls or visit www.deltacontrols.com.