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In our last few healthcare-related trade show reports, we covered some topics and trends that seemed to dominate the industry during the past year. Patient/visitor hospitality and single-patient rooms are no longer trends, but have become staples in the design of healthcare facilities. Technology seems to be directing designers these days, with a strong focus on central data infrastructures and improved HVAC systems.

Operating Room HVAC Design

Moisture in patient rooms and surgical suites, a result of

rooms being kept at cooler temperatures than HVAC systems were designed for, can be a major discomfort and health risk to staff members and patients. Health issues resulting from excessive humidity and condensate include microbial growth in ductwork and drain-pans, condensation dripping from ceilings in operating rooms, wet cooling coils and nosocomial infections.

It can be difficult to control humidity in healthcare facilities because of several factors. There may be a lack of understanding of psychrometrics, the study of the physical and thermodynamic properties of air and water vapor mixtures. Other factors may include improper design conditions inside the facility and improper installation of equipment.

To determine the capacity requirements of an HVAC system in a surgical suite, designers must meet with the end-users to establish the actual space conditions. The quantity of ventilation air is significant and must be taken into consideration when calculating the cooling and dehumidification requirements.

What Type of System is Best for the OR?

Mechanical-based dehumidification and cooling systems and conventional air handling systems condense the moisture out of the air, which can leave coils wet, causing an indoor air quality hazard. The dew point of air supplied from cooling coils may be too high to achieve desired humidity conditions in surgical suites. Desiccant-based systems absorb and adsorb moisture out of the air and can help solve major moisture issues.

Advantages of desiccants:

- Dries air easily below 40 degrees Fahrenheit dew point
- Not dependant on chilled water temperatures in evaporator coils
- Responds quickly to change in space temperature setpoint adjustments
- No problems with dehumidification in off-peak weather
- Allows for higher chilled water temperatures
- Dries coils and ducts downstream for maintenance and health benefits

Disadvantages of desiccants:

- Needs supplemental cooling in most applications
- Cost of equipment is generally higher than mechanical equipment
- Most service support comes from the manufacturer until staff is familiar with the technology
- Installation cost is sometimes higher than for mechanical equipment

Room Air Pressure Control

There are three pressurized control methods: differential flow feedback, space pressure feedback and cascade control. Differential flow controls air supply and all exhaust for the patient room. For pressure feedback, measure pressure difference across the room boundary, compare it to the selected setpoint, and adjust flow or exhaust to maintain the pressure difference. With cascade control, the pressure difference is measured across the room boundary and compare to a selected setpoint.

To Maintain a Successful System:

- Keep pressurization consistent with other contamination control efforts
- Building envelope must be secure
- Test operating range
- Monitor continuously
- Check regularly

The Centralized System

Implement one integrated system for HVAC, lighting, electrical monitoring, egress, fire detection, security monitoring, access control, energy management, telecommunications and data.

Benefits include the efficiency of a central spine, combination and integration of the data infrastructure, easy maintenance, expandability that is built into the facility, and improved workflow and patient experience.

The Beauty of Integrated Design

The integrated design process looks at the building as a whole, not as a sum of its parts. Bringing all subgroups of the design and construction process together from the onset of the project can be beneficial to everyone on site, from architect to stakeholder.

Incorporating key members of the facility's design and operations allows the exploration of multiple sets of possibilities for the building's design and functions. The process brings all of the information to the table early and keeps it organized. It can result in lower operating costs because energy use is considered by all subgroups, producing a more efficient building.

The building can be more efficient in floor space per equivalent patient discharge as well. With consolidated mechanical, electrical and telecom systems, patient flow and care can be improved, waiting space can be eliminated and length of stay can be shortened.

Improved workflow and safer, nature-connecting designs will improve workflow, patient and staff satisfaction. In one project completed by HGA Architects of Milwaukee, Wis., the integrated design process increased patient satisfaction from 48 percent to 98 percent, increased nurse-to-patient care time from 30 percent to 65 percent of working hours, and decreased the daily average of a nurse's footsteps from 12,500 to 5,000.

Healthcare Facility Design Staples

- Single-patient variable-acuity rooms
- Views and connections with daylight and nature
- Patient-adjustable comfort control
- Space for families and areas of respite
- Incorporation of artwork and sculptures
- Resort-like amenities in patient rooms and bathrooms
- Hand washing sinks and alcohol-based hands rubs inconvenient locations
- Ventilation systems that allow better control of airborne contaminants
- Improved acoustics through air system design and acoustically sensitive space layouts
- Better floor plans and wireless technologies that reduce staff members' footsteps

FEATURED PRODUCTS

Facility Monitoring System

Trane, a supplier of HVAC systems and building controls, introduced its new Critical Hospital Systems Dashboard for healthcare facilities. The system allows hospital staff to continuously view, monitor, track and report environmental conditions in critical areas from a single location. It monitors temperature, humidity, energy and relative pressure, and alerts staff of sudden changes or malfunctions in the facility's systems.



The dashboard is customizable and based on each hospital's reporting and tracking needs, and runs on a tracer summit building automation system. It is designed to save time and money on Joint Commission environment of care documentation and reporting.

Contact **Trane**

Containment Unit

The Kontrol Kube Abacus is a temporary anteroom designed to convert operating, patient or procedure rooms into an emergency airborne isolation room. It features a beveled base with locking wheels that allow a single person to roll the unit or pass equipment through the unit. Side portholes allow cable pulls, power cables, compressed air lines or other hoses to pass through the unit.

The unit has a solid aluminum frame and features a



fire-retardant, vinyl-reinforced nylon enclosure. A four-zipper system allows various-sized ceiling openings for overhead work such as lighting, ductwork and HVAC access. The unit can be raised up to 10 feet.

Contact **Kontrol Kube**

Bed Arm System

Hill-Rom's Latitude Arm System was designed to decrease staff footsteps. Designed specifically for the ICU, NICU and ED, the arm can swing across the patient bed from one side to the other. It provides access to the patient and caregivers can place the patient's bed anywhere in a room.



Features of the arm include electrical receptors, gas service outlets, a GCX-style track for a monitor, vertical accessory tracks, horizontal accessory rail, and handle and break switches. It is available as a fixed-length arm or telescoping arm, which has a range of 41.5 inches to 64 inches. A positive locking system and electronic breaks prevent drifting.

Contact **Hill-Rom**

Clean Energy Storage System

Pentadyne Power Corporation, a manufacturer of battery-free energy storage systems that use composite flywheel technology, introduces the VSS + DC flywheel system. The flywheel is used to supplement or replace lead-acid battery arrangements used with uninterruptible power supply systems ranging from 50 kVA to several thousand kVA.

The flywheel delivers up to 190 kW of continuous power for 10 seconds, or longer at lower outputs. Features include a compact footprint, rapid recharging, and a wide-operating temperature range. Multiple units can be added without the requirement of communications gear, and units require no maintenance.

Contact **Pentadyne Power Corporation**



Eager listeners packed lecture halls to gain insight on new design approaches and system options.



Attendees walk the floor on opening day, trying to catch the 1,200+ products and 250+ exhibitors on display.



Gathered around exhibits, attendees discuss product options and best practices.



Several healthcare facility projects were on display in the rear of the exhibit hall.



The exhibit hall served as a place for architects, engineers and facility owners, to network.