50% SOLUTIONS SERIES

CINCINNATI 2030 DISTRICT

Operational Strategies for Healthy Buildings

Siemens Smart Infrastructure | April 21, 2020
Objectives

1. Listing common challenges to facility operations

2. Reviewing emerging public health recommendations that every building operator should know:
   - Increased outside air ventilation
   - Maintain humidity levels
   - Improved Filtration and air cleaning

3. Adopting a holistic approach to occupant health and experience and operational performance.

4. Considering how building automation technology can improve health, efficiency and costs.
What are the experts saying?

“Our results indicate that **aerosol and fomite transmission of HCoV-19 are plausible**, as the virus can remain viable and infectious in aerosols for multiple hours and on surfaces up to days.”

“Aerosol and surface stability of HCoV-19 (SARS-CoV-2) compared to SARS-CoV-1 2 3: Neeltje van Doremalen and all.

“Improved **air filtration** is probably the single most important lesson learned from China,”

Cushman & Wakefield CEO interview with Forbes, April 9, 2020

“…use a framework called the “hierarchy of controls” to select ways of controlling workplace hazards. In other words, the best way to control a hazard is to **systematically remove it from the workplace**, rather than relying on workers to reduce their exposure. “

.OSHA – Guidance for Preparing Workplaces on COVID-19

“Limiting the impact of this epidemic will require an **all-in approach**. With significant uncertainty remaining, we should be throwing everything we have at this highly infectious disease. That means unleashing the secret weapon in our arsenal — our buildings.”

## Workplace controls

### Engineering Controls
- Installing High-Efficiency Filters.
- Increasing Ventilation rates in the work environment.
- Installing Physical barriers, such as clear plastic sneeze guards.

### Administrative Controls
- Encouraging sick workers to stay home.
- Reduce face-to-face meetings.
- Alternative days/extra shifts.
- Communication and training plans.

### Safe Work Practices
- Clean and disinfect frequently touched objects.
- Require regular handwashing/Alcohol-based scrubs.
- Post handwashing signs in restrooms.

### Personal Protective Equipment (PPE)
- Selected based on the hazard to the worker.
- Employers are obligated to provide their workers with PPE needed to keep them safe while performing their jobs.

Source: Summarized from OSHA “Guidance onPreparing Workplaces for COVID-19”
Common Facility Management Challenges

- **Manpower**
  - Overworked,
  - Understaffed,
  - Training

- **Aging Equipment / Infrastructure**

- **Excessive Comfort Calls / Occupant Comfort**

- **Overly Reactive and Rarely Proactive**

- **Rising Operating / Energy Costs**

- **Lack of Transparency**

- **Inconsistent Operation Across Portfolio**

- **Future Challenges**
  - Future Challenges
  - 1101000
  - 1101000
Space, people and building efficiency should be managed together with an eye to the savings available from each component.
Smart Buildings reduces operating costs and focuses on occupant experience.

Today
- Predictive 12%
- Preventive 31%
- Reactive 55%

With Analytics
- Predictive 45 - 55%
- Preventive 25 - 35%
- Reactive 10%

Energy

Operating Costs

Sources: U.S. Department of Energy and Lawrence Berkeley National Labs
Fault Detection and Diagnostics (FDD)
Examples of Faults and Results

1. Supply Temperature not at Setpoint
2. Outside Air Temp GT/LT
   Mixed Air Temp with OA
   Damper at 100% Open.
3. Dirty Filter
4. Heating Coil Valve Closed
   with Rise in Temperature
   across the coil.
5. Cooling Coil Valve Closed
   with Drop in Temperature
   across the coil.
6. Simultaneous Heating and Cooling
7. VFD staying at constant speed
8. Supply Static not at Setpoint
Task Based vs. Rule Based Services

**AHU Control Check**
*Frequency: Annually*

1. Verify sequence of operation as system design intended
2. Review history reports for improper system operation
3. Review client site log book with customer
4. Review site logs (with operating engineer if present)
5. Visually inspect. Note general condition and operation
6. Log and evaluate all unit operating conditions
7. Control devices (valve, damper actuators and EP valves):
   8. Verify proper operation
9. Check and calibrate safety and/or operating controls
10. Perform integrity test and system wide function test
11. Verify set point(s) is in control range of controlled medium
12. Check and record return temperature
13. Check and record supply temperature
14. Confirm relative accuracy through system reports
15. Compare with previous test results & values from system
16. Document all results and reads
17. Inform customer of needed repairs or operational adjustments
18. Discuss potential equipment or service delivery problems

**AHU w/ FDD Rules**
*Frequency: Daily*

- Cooling coil valve @ 100% and supply air temp above setpoint
- Heating coil valve @ 100% and supply air temp below setpoint
- **Simultaneous Heating and Cooling**
- Cooling coil valve closed w/ temp rise across coil
- **Cooling coil valve closed w/ Temp Rise or Fall across coil**
- Heating not active when SF off & coil protection active
- OA damper open in unoccupied mode
- OA% too low or high during mechanical cooling
- **Leaking Heating Coil or Cooling Coil Valve**
- Dirty filter: differential pressure increases with time
- **Mixed Air Temp not equal to OA TEMP with OA Damper @ 100%**
Continuous Commissioning (CCx)

Fig. 4. VFD fan run times and speeds before and after recommissioning
<table>
<thead>
<tr>
<th>Min CFM &amp; room temperature less than setpoint</th>
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<th>CFM flow vs. Setpoint</th>
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<th>Room temperature vs. Setpoint</th>
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<th>Max CFM &amp; room temperature higher than setpoint</th>
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Humidity

- Monitor RH levels
- Understand outside air ventilation/infiltration vs. building humidification
- Winter/Summer concerns
Uncovering hidden efficiency + capacity
Enhancing Service Delivery with Remote/Digital Services

Building Automation System

Cell Modem

Cell Network

Customer Firewall

Proxy Server

Internet

Digital Services Center

Operations Dashboards

Fault Detection

Secure VPN Connection to Siemens endpoint

Encrypted Cellular Connection over dedicated M2M network

Standard RJ45 Ethernet
This CDC guide below explains elevating levels of cleaning, which may be used, in the event of confirmed COVID-19 cases (defined as Level III and Level IV). The final determination of cleaning level will be based on a full investigation and agreement with US EHS, SRE, Local Management. Note: Level may be increased or decreased depending on actual conditions.

**LEVEL II: CURRENT STATUS**
*(general level due to covid-19 pandemic)*
Level II provided at Sites currently supported within SRE FM program

- General office cleaning – 1 time per day
- Common area cleaning - 4 times per day (Recommended concentrated cleaning at peak times i.e. every 2 hours between 9:00 am and 6:00 pm)
- Restroom cleaning – 4 times per day (every 2 hours between 9:00 am and 6:00 pm)
- Hand sanitizer dispenser in entrances and lobbies
- Touch points such as garage access buttons, door handles, elevator call buttons, turnstiles, handrails, elevator doors, touchscreens, restroom fixtures, restroom partition latches, refrigerator/microwave handles and keypads in meeting rooms will be cleaned at least 4 times per day.
- Disinfect floor mats – daily

Mar 26, 2020

**LEVEL III: One Confirmed Case in Siemens space**

- General office cleaning – 2 times per day
- Common area cleaning – 6 times per day (Recommended every 90 minutes between 9:00 am and 6:00 pm)
- Restroom cleaning – 6-8 times per day (every hour between 9:00 am and 6:00 pm)
- Hand sanitizer dispensers in entrances and lobbies

**LEVEL IV: Multiple Confirmed Case in Siemens space**

- Conduct office sanitation via aerosol spray sanitation, commonly known as “Fogging”, weekly the use of “Quat” base disinfectant localized office floor following specific direction of local health authority
IoT enable smart sensing: Generate actionable data
Thank You!
Q/A and discussion....
Siemens Smart Infrastructure Presenters:

Tim Foster, Director, Strategic Accounts, has been with Siemens since 2007 and in the building automation and energy efficiency industry for 30 years and has served in various local and regional positions focusing on new construction, service, technology, and energy efficiency retrofit projects. He currently manages key account relationships in Fortune 500 and Higher Education markets collaborating on digital transformation solutions for the built environment.

Tim earned a B.S. degree from West Virginia University, and is qualified as a Certified Energy Manager (CEM) and LEED accredited professional.

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David Eslinger, an energy engineer with 20 years’ experience in building controls, performance contracting, heating and cooling, lighting, mechanical systems, industrial process equipment, combined heat and power, and renewable power generation. In his current role, he develops new energy projects and services for Siemens building automation customers around Cincinnati, ranging from retro-commissioning air handling units to optimization of chilled water plants. David also helps deploy cloud-based data analytics to help sustain energy savings and improve operations and maintenance productivity.

David received a B.A., Physics degree from Grinnell College, and M.S. Mechanical Engineering from the University of Illinois at Chicago. He is qualified as a Certified Energy Manager, and member of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

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Siemens Resources:

• Siemens Smart Buildings

Healthy Building Resources:

• For Health
• Fitwell
• WELL Certified
• Urban Land Institute America-Healthy Places

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