HEALTHY BUILDINGS WEBINAR SERIES

MEASURING & MONITORING: VITAL STEPS TO MANAGING YOUR ENERGY AND INDOOR AIR QUALITY

Pete Hmelyar, Aircuity

Thank you to our sponsors!
INTRODUCTIONS

Moderator:
Gillian Giem, Program Manager of USGBC West Michigan

Speaker:
Pete Hmelyar, Vice President of Sales, Aircuity
Measuring and Monitoring

Vital Steps to Managing Your Energy and Indoor Air Quality
We spend 90% of our time indoors where the concentration of some pollutants are often 2 to 5 times higher than typical outdoor concentrations.
The buildings where we live, work, learn and relax profoundly impact our health, well-being and productivity.
We Can Have Both – These don’t have to be a choice

**Efficient Buildings:**
- Lower OA
- Tighter Buildings
- LEED Designs
- Net Zero Designs
- < Carbon Footprint

**Occupant Health:**
- WELL STD
- Higher OA
- > CFM/person
- Better IAQ
- < TVOC / Particles
WELL Building Standard
The International WELL Building Institute™ (IWBI™) is leading the global movement to transform our buildings and communities in ways that help people thrive.

Exclusively focused on the ways that buildings, and everything in them, can improve comfort, drive better choices, and generally enhance, not compromise, our health and wellness.
A Comprehensive Approach to Well-being

The WELL Building Standard is made up of features that address ten concepts:

- Air
- Water
- Nourishment
- Light
- Movement
- Thermal Comfort
- Sound
- Materials
- Mind
- Community
WELL Certification Scoring

Core projects are the foundational tier of certification
THE GLOBAL WELL MOVEMENT

3,537 WELL Projects
434M+ Square Feet
55 Countries
8,722 WELL AP Community

As of August 8, 2019
Cundall Engineering reported experiencing a **27% reduction in employee turnover** compared to the previous year. **Creating Positive Spaces: Using the WELL Building Standard**

“In the WELL Certified offices, the total employee turnover rate has fallen by almost a third, and the hiring rate for new talent has doubled.” - Ashley O’Neill Vice President of Corporate Strategy and leader of CBRE Canada’s Healthy Workplace Initiative. **The Business Case for Healthy Buildings, Insights from Early Adopters**

Symantec reported that **77% of employees feel their WELL Certified space fosters more collaboration and socialization**, a 28% increase over their views toward their previous space. **Symantec’s WELL project profile**
INVESTING IN EMPLOYEE WELL BEING

- Talent Attraction & Retention
- Comfortable Airflow
- Better Cognitive Function
- Safer Environments - Healthier Spaces
Healthy and Productive Building Studies

June 2016

Joseph G. Allen, Piers MacNaughton, Usha Satish, Suresh Santanam, Jose Vallarino, and John D. Spengler

Harvard T.H. Chan School of Public Health, Boston, MA
21% decrease in productivity*
For every 400ppm increase in CO₂

13% decrease in productivity*
For every 500µg/m³ increase in VOC

*Harvard School of Public Health; Associations of Cognitive Function Scores with CO₂, Ventilation, and VOC Exposures in Office Workers; J.G. Allen, P. MacInnes, U. Satish, S. Santamam, J. Vittorio, J.D. Spengler
Notice: In the revision on **April 24, 2020**, we have updated our analysis using data up to April 22…. Consequently, we have revised our finding as that an increase of $1 \, \mu g / m^3$ in PM$_{2.5}$ is associated with an 8% increase in the COVID-19 death rate (95% confidence interval).
Infection Rates Lowest when Indoor RH = 40 to 60%

avg # of infections

Respiratory (bacterial & viral)
Gastrointestinal (Noro-virus, C diff)
Urinary tract infections
Cellulitis
Eye infections

Stephanie Taylor, M.D., M. Arch.
CEO Taylor Healthcare Consulting
Healthy Buildings in the News

The Coronavirus is Going to Change How we Think About Design

Your Building Can Make You Sick or Keep You Well

How Buildings, Masks Can be Barriers to the Coronavirus

Someday We Will Return to the Office. It’ll be Nothing Like We’ve Seen Before
WELL & Post COVID Design
WELL Market – Air Quality Requirements

• Occupant Health & Wellness → Healthy + Better IEQ + Information + Energy Savings

• Air Quality Category Requires Multi-parameter DCV = at least 3 parameters
  • CO2
  • Particles
  • TVOC
  • CO

• Requires Annual Calibration + Data Analyzed → submitted annually

• Requires Data Hosted on Website or Phone Application

• Humidity operating at 40%-60% during occupied hours
Post COVID-19 Design Strategies

- Safe, Healthy, Smart Buildings → **Safety + Better IAQ + Information + Energy Savings**
- Safety has become Owners Major Concern after COVID-19
- **Key HVAC Design Features (numerous articles)**
  - Better Filtration (MERV13/14)
  - Virus Mitigation (Bi-Polar Ionization, UVC)
  - Cleaning Strategies (>TVOCs?)
  - Particle Measurement & Control
  - Demand Control Ventilation (>cfm/p)
  - Humidity Control
  - Feedback & Insight

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**BISNOW**
The Coronavirus Is Going To Change How We Think About Design

**HVAC Design Considerations: COVID-19 Crisis brings new visibility to IoT and Building Air Quality**

*by Mary Shacklett -- Internet of Things* -- April 8, 2020

IoT devices can help detect pollution and particulates in indoor air.
Measure, Manage, and Communicate Air Quality

A data driven approach to a Healthy Building

• Accurate **measurement** of science based healthy building parameters

• Integrate to the building automation system for precise **management** 24/7

• Cloud-based **communication** platform with intelligent analytics.
### CONTROL THE BUILDING TO SCIENCE-BASED IAQ STANDARDS*

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Volatile Organic Compounds</td>
<td>&lt; 500 ug/m³</td>
</tr>
<tr>
<td>Particulates – Large &amp; Small</td>
<td>&lt; 15 ug/m³</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>&lt; 9 ppm</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>&lt; 900 ppm</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>40-60%</td>
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</tbody>
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“Can’t Control if You Don’t Measure”

RESET – [https://www.reset.build/standard](https://www.reset.build/standard)
1. Verify fresh air supply.
2. Control based on outdoor air conditions.
3. Manage other air quality improvement strategies.
4. Provide more air where and when needed for real-time IAQ control.
5. Communicate healthy building insights.
6. Comprehensive air quality platform.
Commercial Office IAQ Strategy

**Step #1: Validate core + shell air quality**
- Does it meet best in class standards?
- Based on data, what strategies should be pursued, if any?
- Protection from **inaccurate tenant data**

**Step #2: Engage tenants**
- What is the air quality communication strategy?
- How can you enable tenant success?
- Advanced ventilation and controls sequences
AHU Measurement

Sampling Location
CO2, CO, TVOCs, Particles, RH

Measure supply air to validate air delivered to tenant spaces

Measure OA, after filter bank #1 (if applicable), and after filter bank #2 to validate and report on AHU filter effectiveness

Measure return air for overall IEQ parameters

SX-2-1
(22,000 CFM)
Tenant Floor Return Monitoring

Measure return air per floor to localize + report on tenant IEQ issues
#2: Tenant Fit Out

**Locations:** Measure open office, conference rooms and other critical zones. One sampling location every ~2,500 - 3,500 square feet.

- CO2, TVOCs, Particles, CO, Dewpoint
Discrete Sensing or Multiplexed Sensing?

Multiplexed replaces distributed discrete sensors with centralized Sensor Suites.

*Either one REQUIRES regular sensor calibration!*

40+ Discrete Sensors

Or

1 Sensor Suite

Available Sensors
- Carbon Dioxide (CO₂)
- Total Volatile Organic Compounds (TVOC)
- Particles – laser-based particle counter
- Dewpoint / Humidity
- Carbon Monoxide (CO)

*Sensor cards replaced every 6 months*
Discrete Sensing

**Locations:** Each “space” is a sensor or 4 or 5 sensors. Some discrete sensors may measure more than one parameter.

- CO2, TVOCs, Particles, CO, Dewpoint

Example Floor Layout
Aircuity Calibration Services

- Clean the Sensor
- Replace the IR lamp (2 years)
- Calibrate over multiple values
- Warranty on all Sensors
Calibrating Discrete Sensors

- **Calibration** – The act of comparing an instrument’s measurement to a known standard.
- **Adjustment** – The act of adjusting an instrument to match a standard.
- **Calibration interval** – The time elapsed between successive calibrations of an instrument.
- **Working standard** – An instrument calibrated against either a secondary or primary standard and used to calibrate other instruments.
You can’t manage what you don’t measure.
Safe, Healthy, Smart and Energy Efficient

✓ We know we need to design & provide Safe, Healthy, Energy Efficient Buildings
✓ This will drive us “collectively” to deliver improved strategies and performance to the “commercial” built environment…
✓ Requires Design, Operations & Intelligent Systems working together
✓ No one technology is a silver bullet
  ❖ Requires a comprehensive collection of solutions
Providing Measurement and Control of IEQ

Aircuity has been leading the world in Measurement & Control of IAQ, delivering Airside Efficiency in the commercial environment for 20 years!

We can help you deliver a Safe, Healthy Building!
Thank You!

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Creating Measurably Better Environments
QUESTIONS?

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Healthy Buildings Webinar Series

Reach Zero Carbon through Michigan 2030 Districts and DTE Incentives

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