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Erik Malmstrom
Christian Weeks

How to Achieve Sustainable Indoor Air Quality: Part 2
A Roadmap to Simultaneously Improving Indoor Air Quality & Meeting Building Decarbonization and Climate Resiliency Goals

This week we welcomed Erik Malmstrom and Christian Weeks to discuss a new document on How to Achieve Sustainable Indoor Air Quality: Part 2 A Roadmap to Simultaneously Improving Indoor Air Quality & Meeting Building Decarbonization and Climate Resiliency Goals. This multi layered "Clean First" approach to IAQ which they feel is the key to the low-energy, high-IAQ, climate resilient buildings of the future.

Erik Malmstrom is CEO of SafeTraces, a Bay Area-based provider of the only indoor air quality verification that actively measures pathogen risk, via patented aerosol tracing technology, in order to optimize safety and sustainability for enterprise real estate clients. Previously, he held senior roles at the White House, Farmers Business Network, and Cargill, is a co-founder of CrossBoundary - a leading frontier market investment advisor, a combat veteran and graduate of U.S. Army Ranger and Airborne Schools. He received his undergraduate degree from the University of Pennsylvania and a joint M.B.A. – M.P.P. from Harvard Business and Kennedy Schools.

Christian Weeks is the CEO of enVerid Systems, a leading provider of sustainable indoor air quality (IAQ) solutions. Christian has over a decade of experience in energy efficiency and IAQ. Spurred by the lessons gleaned from the pandemic and the pressing need to reduce carbon emissions and make buildings more resilient. Christian is passionate about helping commercial buildings attain the traditionally conflicting goals of healthy indoor air and energy efficiency.

Christian advocates that buildings take a system-level approach to achieving these goals, what he terms Sustainable IAQ. He recently spearheaded collaboration with other leading IAQ and energy efficiency organizations to detail the Clean First framework, a four-step process for achieving low energy, high-IAQ, climate resilient buildings. The seven collaborators – 75F, Awair, enVerid, GIGA, Oxygen8, Planled and SafeTraces – published in August 2022 a white paper geared for building owners and operators, architects, energy efficiency consultants, mechanical engineers and contractors called: "How to Achieve Sustainable IAQ: A Roadmap to Simultaneously Improving IAQ, and Meeting Building Decarbonization and Climate Resiliency Goals."

Link to Document

Nuggets mined from todays' episode:

Erik Malmstrom was not originally an IAQ guy. He spent time in the military, government service and in startup technology. He is concerned about safety, security and sustainability. The fundamental research and development that underpins SafeTraces' commercial offerings was originally developed at Lawrence Livermore National Laboratories for biosecurity purposes as a surrogate for weaponized anthrax spores. Many food and water standards exist and those were the industry sectors on which the firm was focused until COVID changed everything. Food and water have been set aside and now the firm is focusing on IAQ. Compared to the transparency of the food and water sectors, IAQ is like the Wild West.

According to Christian Weeks, outside air ventilation is needed in buildings for 2 reasons: to maintain pressurization and to maintain indoor air quality by diluting contaminates generated indoors. In hot and humid and in cold climates conditioning outside air to maintain good IAQ is energy intensive.

He recommends a layered approach of saving energy and improving IAQ by using the required amounts of outside air to maintain pressurization and then adding air cleaning for particles, pathogens, and gases to clean the indoor air. ASHRAE Standard 62.1 provides 2 procedural standards for determining ventilation rates: a prescriptive based standard and a performance based standard. The prescriptive standard which relies upon ventilation only is more well known. The performance

based standard which is less well known is more flexible because it allows for source control and removal measures to replace a portion of the outside air ventilation requirement under the prescriptive approach.

Step 1: Define IAQ Goals

1. Define IAQ goals for PM2.5, ozone, carbon monoxide, and formaldehyde that meet or exceed the "acceptable IAQ" design limits provided in Addendum aa to ASHRAE Standard 62.1-2019.
2. To reduce the risk of airborne transmissions of viruses, also set a target of 6 equivalent air changes per hour (eACH).
3. Do not rely on CO2 as the main indicator of good IAQ.

Step 2: Clean Indoor Air

4. For particle and pathogen filtration, deploy MERV 13 filters in HVAC systems.
5. For gaseous contaminants, use sorbent filters that address the full range of contaminants defined by ASHRAE Standard 62.1.
6. Add in-room HEPA filters or germicidal ultraviolet light during pandemics for added risk reduction in high-risk areas and any space where the base HVAC system cannot deliver 6 eACH.

Step 3: Optimize Ventilation

7. Combine layered air cleaning technologies with optimized ventilation rates using ASHRAE's IAQ Procedure to achieve IAQ targets energy efficiently and cost effectively.
8. Add high efficiency energy recovery for optimized ventilation to further improve energy efficiency and reduce operating costs.
9. Combine air cleaning with optimized ventilation rates to enable all-electric designs utilizing smaller energy recovery and heat pump systems that perform better in colder climates.

Step 4: Validate, Monitor & Control IAQ

10. Use continuous monitoring with third-party validated sensors to track CO2, PM2.5, TVOCs, and ozone and conduct point-in-time testing for formaldehyde and carbon monoxide twice a year.
11. Use aerosol tracers to test the combined effectiveness of ventilation and filtration systems for airborne pathogens.

12. Integrate IAQ sensor data with building management systems and automate the optimization of air cleaning and ventilation for IAQ, efficiency, occupant comfort, and resiliency.

Erik Malmstrom - SafeTraces is not a product, it is a platform. The SafeTraces aerosol technology safely simulates pathogens by attaching unique, safe DNA tags to a water-based aerosol and then using a pneumatic nebulizer to disperse them within a building. The particle size of the droplets is patterned on human respiratory discharges (sub-micron-larger droplets). Unlike tracer gases which pass through filters, SafeTraces aerosols can be captured by higher efficiency air filters. Using pump-based air samplers, SafeTraces's aerosol can be tracked in buildings, measured in breathing zones, with results visualized in heatmaps and other easy-to-understand graphics. Release of samples represents events and aerosol capture represents human exposures. SafeTraces can use up to 24 unique DNA tags.

Christian Weeks- enVerid's technology fills a technology gap by removing gases through use of a proprietary sorbent. The sorbent is packed into filters which have a MERV 11 rating. The firm provides both equipment (aka HVAC Load Reduction Modules) and sorbent filters. The firm's sorbent filter efficiency has been determined based on ASHRAE 145.2 test methods.

Erik Malmstrom recommends sensors that meet 3rd party accreditation standards such as UL2905 or RESET (which sets standards for IAQ sensor performance, maintenance, and calibration). RESET is a unique data standard focused around long-term monitoring and performance targets rather than being a design standard. https://reset.build/standard/air

Erik Malmstrom- With experience gained in the biosecurity world, anthrax space and through field testing SafeTraces works with: EHS professionals, HVAC system designers and engineers.

Field staff are certified though an online examination. Data collection is based on cloud-based software. Services are offered to existing buildings or as part of new building commissioning. Deficient areas are remediated. Compliant properties that achieve a 99% removal rate are eligible for an annual verification issued by UL, the global safety science leader. https://www.ul.com/services/ul-verified-ventilation-and-filtration

Erik Malmstrom

- Overventilation has diminishing returns.
- Setting accurate goals is important.
- Is encouraged by sensing systems which are better at integrating data into the buildings management system.
- IoT (Internet of Things)-native BMS' like those sold by 75F are designed with sensors, equipment controllers, and software that automatically optimize a building for IAQ, efficiency, and comfort based on simple user configurations without the need for extensive integrations or paying controls vendors to update sequences of operations are the next frontier.
- Field validation, continuous monitoring using RESET and Optimizing outside ventilation for cleaning and resiliency.
- Integrating sensors with building management systems to improve things is the holy grail.
- Has learned from field inspections of Fortune 500 buildings that damper set points are often not what the building management system is indicating.
- Simplification is needed, building owners want buildings to operate on autopilot and when something is amiss, be able to fix it by pushing a button.
- Smart buildings are really dumb and need to get much smarter.

Roundup

Christian Weeks-

Opportunity now exists for IAQ and ventilation goals to harmonize and no longer be in conflict.

Erik Malmstrom-

An opportunity for health and safety improvement was missed after 9/11. COVID and climate change have created a big opportunity that isn't going away. People want to improve energy efficiency and building health and the funding is here.

Z-Man signing off

Trivia-

What term is used to refer to the group of elements listed in Group 18 of the periodic table?

Answer:
Noble gases
Answered by: Neil Zimmerman