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**Marwa Zaatari, PhD
Christian Weeks**

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

This week we welcomed Marwa Zaatari, PhD and Christian Weeks to discuss a new white paper on How to Achieve Sustainable Indoor Air Quality: A Roadmap to Simultaneously Improving Indoor Air Quality & Meeting Building Decarbonization and Climate Resiliency Goals. This document is a collaboration between a group of industry companies that want to promote a layered, system-level “Clean First” approach which they feel is the key to the low-energy, high-IAQ, climate resilient buildings of the future.

Dr. Zaatari is an ASHRAE Distinguished Lecturer, a member of the ASHRAE Epidemic Task Force Commercial team and will serve on the USGBC board of directors starting January 2021. She is a member of several ASHRAE Committees, voting member of Standard 62.1, Chair for TRG4 Indoor Air Quality Procedure, Vice Chair of MTG.HWBE Health and Wellness in the built environment, Vice Chair of TC2.3 gaseous removal contaminants, Voting Member Standard 145.2 laboratory test method for gas-phase air cleaning systems, IAQ2020 Conference organizer, LEED Committee member, and ex-Chair of LEED IAQP Working Group.

Dr. Marwa Zaatari is Partner at D ZINE Partners. She leads the research of “Air as a Service” around indoor air quality, filtration and air cleaning systems, and IAQ measurements to design and operate buildings for optimal energy and people efficiency.

Dr. Zaatari has extensive experience in identifying and quantifying the sources, fate, and transport of indoor air pollutants, building energy and environmental

management, assessing performance-based procedures of HVAC ventilation and air cleaning, and developing and applying models for energy efficiency, indoor air quality, exposure assessment, and economic impacts of indoor air pollution.

Prior to founding D ZINE Partners, Dr. Zaatari was Vice President of Building Solutions at enVerid Systems since 2015, and currently serves on the Board of Advisors. She leads the design of ventilation and filtration/sorption systems in buildings, integration into HVAC systems, and was responsible for managing customer-site installation and ongoing operations and field service.

Dr. Zaatari earned a PhD in Architectural and Environmental Engineering from the University of Texas at Austin with a focus on the built environment and a master's degree in engineering management from The American University of Beirut, Lebanon with a focus on energy management.

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 a 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 Indoor Air Quality: A Roadmap to Simultaneously Improving Indoor Air Quality & Meeting Building Decarbonization and Climate Resiliency Goals.

Link to the document: <https://whitepaper.enverid.com/sustainableiaq>

Nuggets mined from this week's episode:

- Before joining enVerid 3 years ago, Christian Weeks worked in energy efficiency and energy demand response.
- Before working with enVerid, Dr. Maarwa Zaatari studied mechanical engineering.

What was the impetus behind putting together this paper? Improving ventilation energy efficiency and improving IAQ have been at odds with one another because improving IAQ traditionally relied on bringing in more fresh air, which is expensive to condition in many climate zones. Using lessons learned from COVID, Marwa and Christian began thinking holistically and collaboratively spearheaded the creation of a white paper to show how it is possible to harmonize improved IAQ with improved energy efficiency. In addition to the collaborating firms, they sought review of the paper by Bill Bahnfleth and others.

What type of pushback did initial ASHRAE COVID guidance receive from building owners? The push back from building engineers and sustainability managers to initial ASHRAE COVID-19 guidance recommending maximum outside air arose from an immediate concern about surging energy usage. This pushback was validated by a series of Energy Efficient IAQ Studies sponsored by the New York State Energy Research and Development Authority (NYSERDA) and a report by a team from Johnson Controls (JCI) and the Massachusetts Institute of Technology (MIT) that confirmed the significant “energy penalty” associated with simply increasing outside air to reduce airborne infectious aerosol exposure risk and pointed to alternative strategies that could more efficiently achieve the same risk reduction goals.

- 100% fresh air is not feasible.
- Aerosol transmission is the mode of virus.
- Removing virus without added energy cost is the goal.
- Facilities should be guided by the precautionary principles, systems limitations and costs.

While historically the thought pattern was to ventilate first because *the solution to pollution is dilution*; ASHRAE found that high-efficiency filtration can be as effective and lowers cost versus ventilation and is often more feasible technically.

To some, a Clean First approach was somewhat controversial before the pandemic. But the focus of air cleaning and disinfection during the pandemic has validated a Clean First approach.

What is the metric equivalent air changes per hour (eACH)? eACH is a combination effect of outside air PLUS filtration and other air cleaning mechanisms such as UVGI (Ultraviolet Germicidal Irradiation). Some outside air will always be needed to provide pressurization.

How do you define the metrics of IAQ? Review existing recommendations and standards. We recommend defining IAQ goals for PM2.5, ozone, carbon monoxide, and formaldehyde (as a proxy for volatile organic compounds)

Who is the target audience for the paper? The whitepaper strives to serve as a practical guide and roadmap for building owners and operators, architects, energy efficiency consultants, mechanical engineers and contractors.

Is CO² a contaminant or a measure of ventilation effectiveness? CO² is occupant generated/related and therefore may be used as a proxy for ventilation effectiveness in spaces occupied by people. But CO² is not related to material or cleaning product emissions and ASHRAE does not consider CO² to be a contaminant at levels typically found in buildings.

Cost comparison between ventilation and filtration? Filtration cost is 3 cents per square foot while the ventilation cost is 55 cents per square foot.

Roundup

- As particle filtration (MERV, HEPA, etc.) only removes particles, a layered approach to filtration including both particulate and gas removal is recommended.
- Revised documents are planned.

Z-Man signing off