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Kevin R. Hart, CEO, HAVEN IAQ

Linking HVAC & IAQ with Sensor Technology

This week on IAQradio+ we welcomed Kevin Hart, Haven IAQ CEO to continue our discussion on HVAC and IAQ. The discussion focused on using sensor technology to optimize HVAC effect on IAQ. Kevin is the founder of Haven IAQ and is doing some very interesting work linking HVAC and IAQ.

Kevin founded HAVEN IAQ (TZOA) at the age of 23, after experiencing high levels of carcinogenic crystalline silica dust on industrial worksites. He conceptualized a wearable air quality monitor for global citizens that could crowdsource outdoor pollution data from thousands of devices onto city-wide maps in real-time, a product that won 'best inventions of 2015' awards from Time Magazine and Popular Science. Their product line HAVEN has been granted multiple patents and patents pending on its in-duct sensing and IoT controls; and pursuing the mission of transforming millions of homes into safe havens.

Nuggets mined from today's episode:

As a high school student, Kevin had the opportunity to also learn a trade and became a journeyman electrician. He worked a variety of jobs on construction sites and became aware of governmental regulations regarding crystalline silica while drilling concrete. He envisioned a wearable air monitor that could be worn on jobsites. Thinking bigger he envisioned urban populations wearing air monitors and uploading data. He described the device he invented as a better, smaller, smoke detector which could be worn. He categorized his invention as a “bad news product” which gave the device wearer the bad news that the air quality was poor and is something that the wearer couldn't do anything about.

Wearables was a smaller business opportunity. The bigger opportunity is to build sensors into buildings that solved problems for building occupants.

Kevin has been on an entrepreneurial journey. Kevin leads the business side of HAVEN IAQ. For the tech side, he hired engineering physicists from the local university to collaborate with experts in: optics, fluid dynamics, miniaturization, radio antennae, etc.

Particle sensors rely on pumps or fans to push a known quantity or velocity of air across the sensor. Particle counters sense fine particles (PM2.5) in the air, place them into different size ranges and then rank them. The fans and pumps within particle counters inevitably get contaminated with accumulated particles and lose accuracy. HAVEN designed the first air velocity sensor that doesn't use a fan or pump. Their particle sensor was designed and built from scratch. Their device has no internal obstructions for contamination to stick on. Their sensor measures airflow and particle size in the same place. Their sensor is easy to clean and maintain and does not need routine calibration due to "unity invariability". Their sensor is novel and patented.

IAQ has been integrated into the controls of automated building management systems. CO² is the most common gas monitored with control programmed to trigger ventilation. COVID changed that dynamic; exhaled breath is now a proxy for what we want to get rid of. IAQ is more than CO². Automated building management systems place monitors in every zone which is very costly.

HAVEN's monitor installs into the return side ductwork. The monitor can be easily removed for periodic cleaning. The controllers can activate ERV or dehumidifier, measure temperature, RH & airflow and trigger low voltage controls. The laser sensor monitors PM2.5, volumetric concentrations of VOCs, temperature, RH, pressure, functioning as a 'tricorder' in a single device. Air changes can be programmed.

The best air filter needs moving air to work.

Humans create IAQ issues. An IAQ monitor sitting on a desk will react to the "hyper local events" (e.g. activities of humans nearby often resulting in false positive readings such as making popcorn). Return air duct monitoring most accurately reflects the average of what is going on within a building, i.e. "homogenous

contamination". It only takes 30-60 seconds for a 1200 cfm furnace fan to bring air from one end of a building to the other.

IAQ is not about one bad breath. In duct monitoring is more reliable.

The product is designed to work in sealed ductwork. Leaky ducts and dirty ducts will create anomalies. The system can determine little things (e.g. the filter is not sealed properly) and/or big things (e.g. HVAC system was not designed and commissioned properly).

Fire restoration related HVAC system cleaning and sealing? The system can be installed to monitor conditions before and after cleaning and then decommissioned for use at another jobsite.

Owners of the product love the data: cooking events, day and night changes, seasonal changes, etc.

Indoor atmospheric components and characteristics include: gases, chemicals, physical solids, liquids, temperature, RH and pressure.

While some IAQ monitors take a narrow approach to sensing and speciate, HAVEN takes a broad approach to sensing and characterizes readings into 'buckets of stuff'. HAVEN opines that so long as things present there is a solution. Their business model is knowing and reaching the solution accordingly.

When purchased, the system and installation are most often bundled together. The cost for the system and installations varies due to differences in expenses, labor costs and travel time, usually less than \$1,000. The main customers for the products are HVAC contractors and homeowners. Pros when educated and trained can help millions of people.

In North America, 60% of homes have a forced air HVAC system. Kevin envisions creation of a new category of a whole home environmental systems combining the product ecosystem with the property's existing assets; built on the 3 Pillars of: Filtration, Ventilation, RH Control. The 3 Pillars sit on the foundation of air movement. Acute problems are solvable, chronic problems are missing a piece of the 3 Pillars in the home.

Some buildings are incapable of having good air. The occupants of these homes are living in a public health crisis and may not realize it. You don't have the potential for great air quality without air movement.

ROUNDUP

Energy efficiency is a big focus for building codes and governments. Passive house movement growing.

During wildfires negatively pressurized homes draw fire related contaminants in. You don't want to bring in outdoor air during a wildfire. Some ERV's can recirculate during a wildfire.

IEQ is a big data problem. Every home is unique and needs a custom solution.

Much IAQ data is the result of surveys asking occupants questions not measuring and monitoring.

Many schools, light commercial buildings, gyms and residences don't have forced air HVAC systems and lack safe havens for occupants. People need a safe haven!

Z-Man signing off

Trivia Question:

Name the method used for determining variable distance by targeting an object with a laser and measuring the time for the reflected light to return to the receiver.

Answer: LiDAR

Answered by: Don Weekes