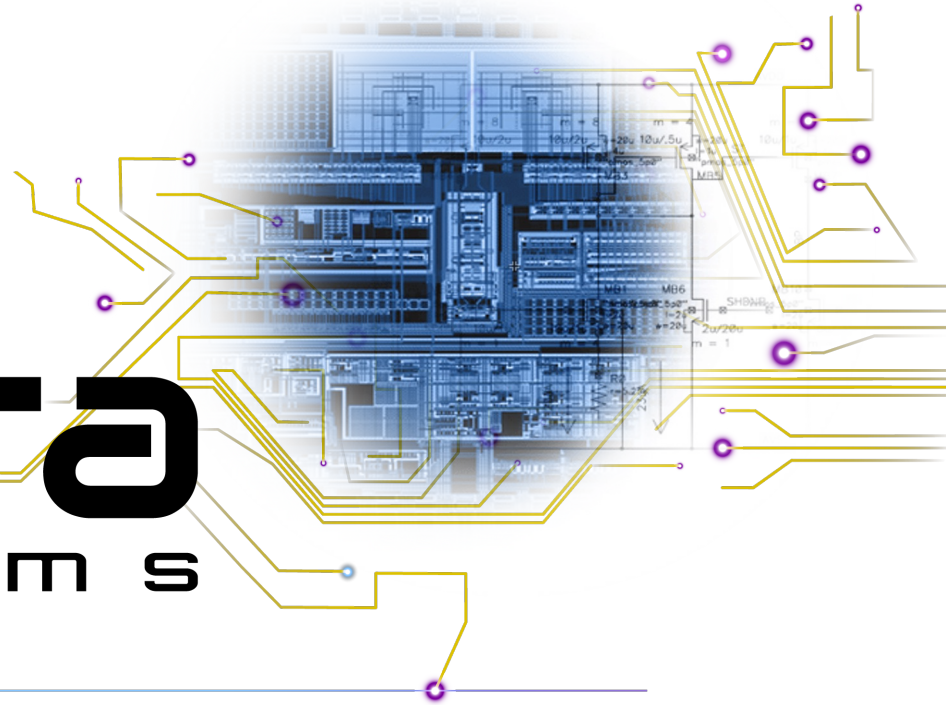




Piera
systems



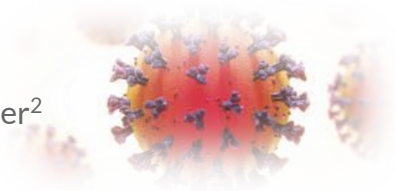
What's in your Air?

Air Pollution Affects Everyone



Causes lung cancer, alzheimer's, and cardiovascular diseases¹

Allows Covid-19 and other respiratory diseases to spread faster²



Debilitates people with respiratory issues³



Severely reduces cognition affecting health & productivity⁴

Indoors 2-5X worse than Outdoors and as much as 100x⁵



8 million deaths/year, \$5 trillion in welfare costs, \$225B in lost income⁶

Particles are the biggest source of air pollution; the smallest particles are the most dangerous

The Problem

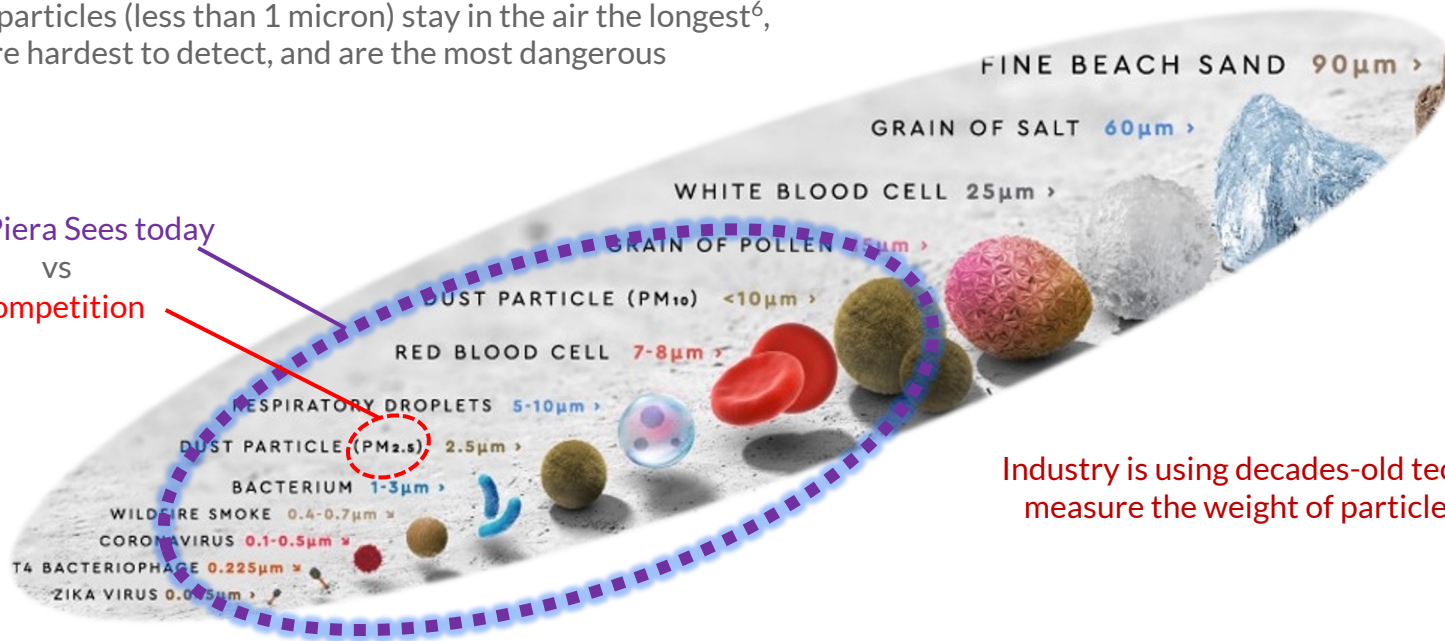
Air Quality most impacted by the smallest particles
There has not been a cost-effective solution to detect them

Smallest particles (less than 1 micron) stay in the air the longest⁶,
are hardest to detect, and are the most dangerous

What Piera Sees today

VS

Competition



Industry is using decades-old technology to
measure the weight of particles (PM_{2.5})

The Solution

Revolutionary technology identifies 'What's In the Air' to provide actionable insights and reduce energy costs



Particle Sensors, Air Quality Monitors



Air quality data aggregated in the cloud



Software and services provide real-time alerts, insights, mitigation



AI/ML models classify pollutants for smart, healthy spaces

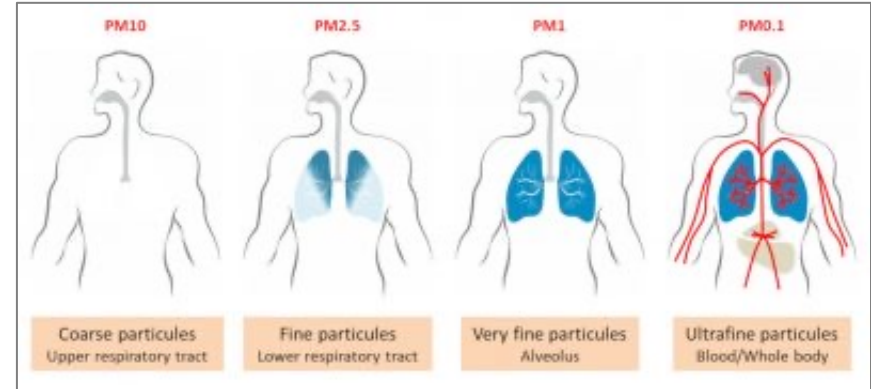
Accurately measure particles as unique signatures,
identify pollutants at a scalable price, monitor compliance to ASHRAE 241

Particle Count or Mass?

PC, PM both provide valuable information



- PM inexpensive, only useful when air quality is harmful
- < PM2.5 is harmful but very fine and ultrafine is worse
- < 1 micron particles stay in air longer, have much less mass
- PC data can be used to calculate mass
- PC technically challenging, expensive
- Piera's technology delivers PC and PM affordably



“Among the various air pollutants, fine suspended particles are the main cause of the health effects of pollution.”

PC data can give more insights about the nature of pollutants and how to mitigate

ASHRAE, CDC is Rolling Out IAQ Standards

Requires measuring PC < 1.0 um in real-time

GOVERNMENT & PUBLIC HEALTH

Building Standard ASHRAE 241 For Infection Control

A once-in-a-generation change in building code, raising the bar on indoor air safety.

Defining new requirements for all building types

- Minimum requirements for control of infection aerosols
- Defines amount of clean indoor air needed per person
- Building Readiness Plan & Infection Risk Management Mode documentation for facilities
- Equivalent Clean Airflow Rate based on size & occupancy

ASHRAE Completes Draft of First-Ever Pathogen Mitigation Standard

FOR IMMEDIATE RELEASE MEDIA CONTACT:

Karen Buckley Washington
Senior Public Relations Specialist
kbwashington@ashrae.org

ATLANTA (May 15, 2023) – ASHRAE announces the completion of the first draft of its standard maintaining healthy indoor air quality (IAQ), will final approval expected in June and publishing anticipated in July.

ASHRAE Standard 241P, *Control of Infectious Aerosols* provides minimum requirements for HVAC-related measures to reduce the risk of transmission of COVID-19, influenza, and other airborne viruses in homes, offices, schools, hospitals during periods of high risk. The standard offers guidance for creating healthier environments in the buildings where we work, live, and play.



Suberculetic patients recovering in open air along the River Thames in London in 1936. Fox Photos/Getty Images

The New War on Bad Air

A century ago, a well-ventilated building was considered good medicine. But by the time Covid-19 arrived, our buildings could barely breathe. How did that happen? And how do we let the fresh air back in?

By Emily Anthos
June 17, 2023

10 APPLICATIONS COLUMN

Impact of New Ventilation Guidance, Standard 241 on Energy Costs, Carbon Emissions

Why Equivalent Clean Airflow Doesn't Have To Be Expensive

BY MARINA JACOBUS, P.E., ASSOCIATE MEMBER ASHRAE; JARON HILL, ASSOCIATE MEMBER ASHRAE; JOSEPH WILSON

In May 2023, the U.S. Centers for Disease Control and Prevention (CDC) updated its ventilation guidance to reduce the airborne transmission of viruses that cause diseases like COVID-19 and recommended at least five air changes per hour (ach) of clean air in occupied spaces.¹ ASHRAE recently issued the first pathogen standard, ASHRAE Standard 241, *Control of Infectious Aerosols*, which included minimum equivalent clean airflow (ECA) in cubic feet per minute per person (cfm/person) for commercial, residential and health-care space types.² Both the CDC and ASHRAE recognize that the recommended clean air targets can be reached using a combination of outdoor air and air cleaning. This column is a detailed review of simulation results that looked at the energy and carbon impacts of outdoor air ventilation versus hybrid strategies that combine outdoor air ventilation with air cleaning to meet the newly established CDC target (ach) and the Standard 241 ECA.

The objective of this column is to discern how compliance with CDC ventilation guidance and Standard 241 impacts energy use and carbon emissions in existing and newly constructed commercial buildings in the U.S. To do this, we consider different ventilation design approaches that comply with the new CDC and ASHRAE Standard 241 targets as well as ASHRAE Standard 62.1-2022. These design approaches include multiple "hybrid ventilation" strategies that combine

air cleaning of recirculated indoor air with outdoor air. These hybrid ventilation strategies can be used in Standard 241's infection risk management mode (IRMM) and in normal mode to control gaseous and particulate contaminants using the Indoor Air Quality

Marina Jacobus, P.E., is chief science officer of Delta Partners, LLC in Austin, Texas, and a member of the International Health Care Society, a society member of ASHRAE, and Standard 241. Jaron Hill is director of sales and application engineering, and Joseph Wilson is product manager of related systems in Woodstock, Mass.

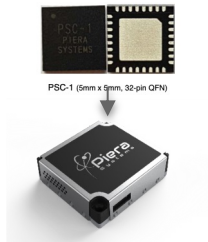
10 ASHRAE JOURNAL | ashrae.org | SEPTEMBER 2023

POPPY

Break-through Air Monitoring Technology

World's only low-cost sensor comparable to a reference instrument

Custom Particle Processor

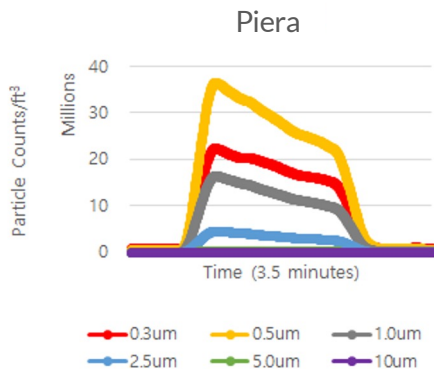


IPS PM Sensors

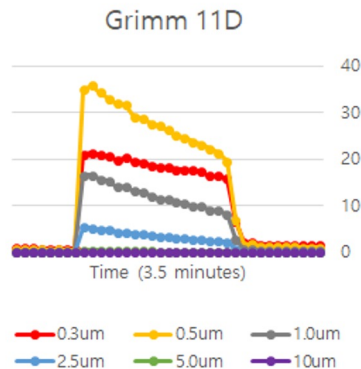


Canaree Air Monitors
(PM, CO₂, TVOC, T, H)

\$50 - \$350



\$22,000

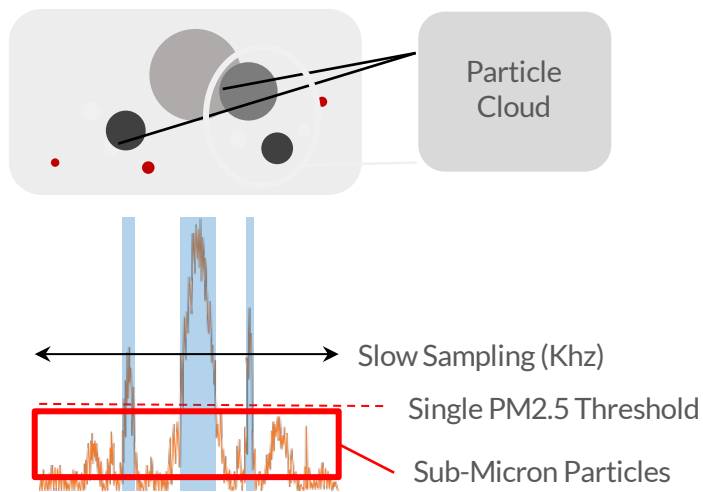


Independent particle count data a must for classification of pollutants, improving human health, and ASHRAE241

Custom Photon Counting Processor: PSC-1

Measures Particle size and count in unique 'bins'

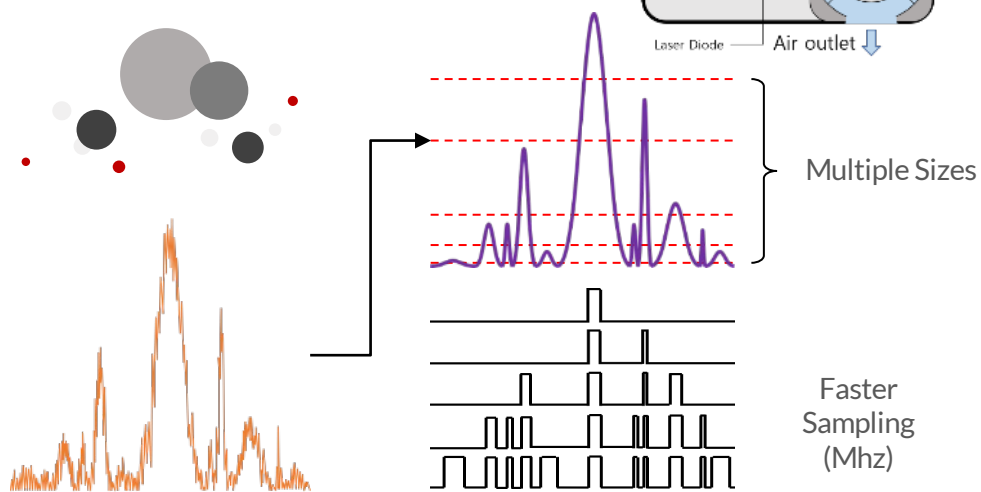
Competition



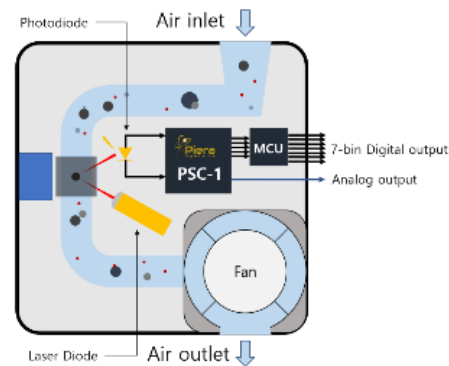
Estimated Mass PM2.5



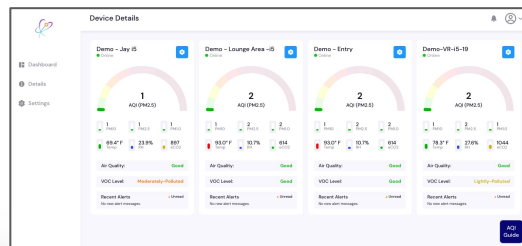
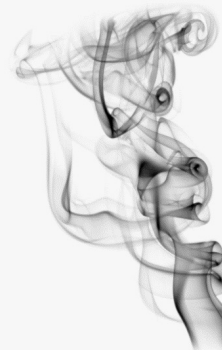
Piera



Accurately count particles for 7 different sizes at same time like reference instruments



Products and Services



Pollutant Models

- Licensable, subscription service provided by Piera
- Customer developed in partnership with Piera
- OTA updates

SenseiAQ Software and Services

- Air quality monitoring subscription service
- Data and insights from SenseiAQ software
- Stand-alone application or connected to Piera MS Azure Cloud
- API for integration with third party applications
- Software updates

Canaree Air Quality Monitors

- Easy to deploy in Smart Spaces, Hospitals, Schools, and other verticals
- Wireless Access Points (HPE/Aruba)

IPS Particle Sensors

- Integration into air quality monitors, air purifiers, and HVAC equipment

IPS: A Software Defined Sensor Family

IPS Family			Eval	Series 5			Series 7
			PEK	Piera-525	Piera-5100	Piera-5500	Piera-7100
# of Particle Bins			7	5	5	5	7
Dynamic Range	Binning Output in PC and PM	<0.1	X*	X			X
		0.3	X	X			X
		0.5	X	X	X		X
		1.0	X	X	X	X	X
		2.5	X	X	X	X	X
		5.0	X		X	X	X
		10	X		X	X	X
Features	Output in Particle Counts		X	X	X	X	X
	Serial Key for Networking		X	X	X	X	X
	Firmware Upload Capability		X	X	X	X	X
	Limited Programmability		X		X	X	X

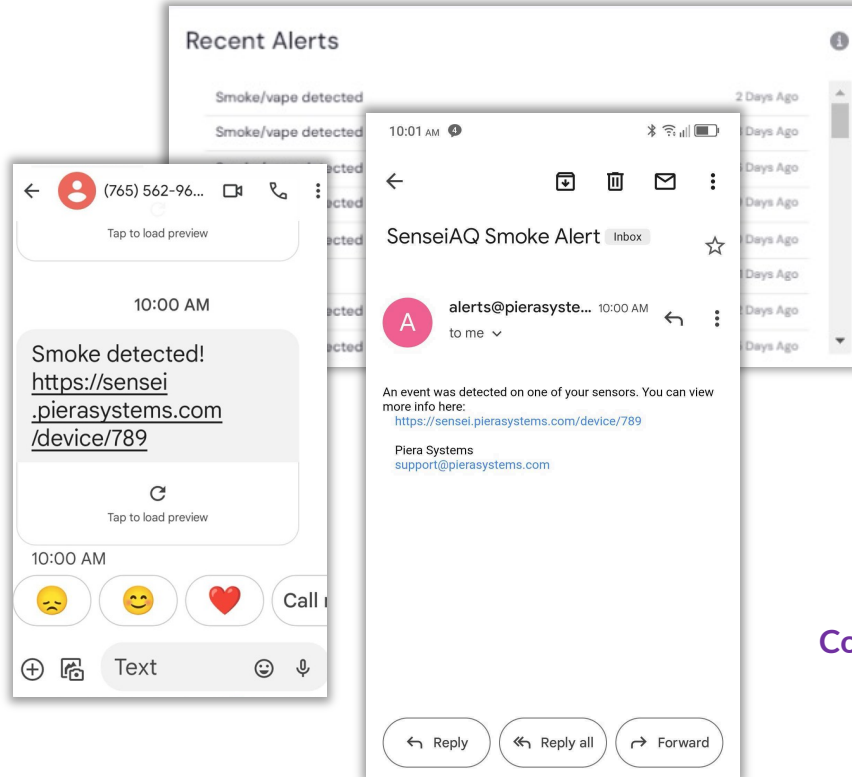
Canāree Family of Indoor Air Quality Monitors



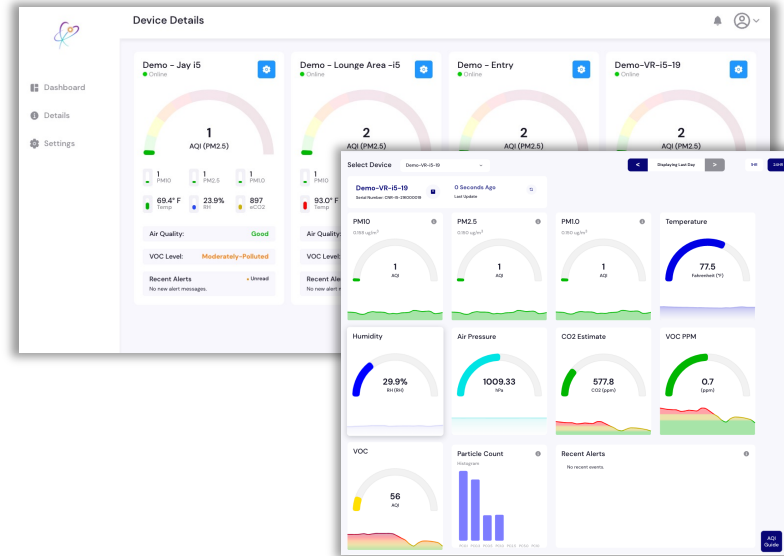
Canāree A1	Canāree I1	Canāree I5
Plug-n-Play Air Quality Monitor Measure particulates from PCs, mobile devices, and wireless access points USB powered Weight 42g	Standalone Air Quality Monitor Monitor particulates anywhere using WiFi, bluetooth, or ethernet & all features of A1 USB or external power Weight 42g	Comprehensive Environmental Monitor All features of I1 & temperature, pressure, humidity, & TVOCs USB or external power Weight 50g
Measure across entire PM range – PM0.1 to PM10 Built-in Vape/Smoke Detection Fully integrated with the cloud. Intuitive UI included Seamless integrations to BMS / BAS solutions Dimensions: 8.98cm x 6.13cm x 2.06cm Covers 100m ² , 1,000ft ²		

Actionable Data and Alerts

Real-time text / email alerts and alert logs

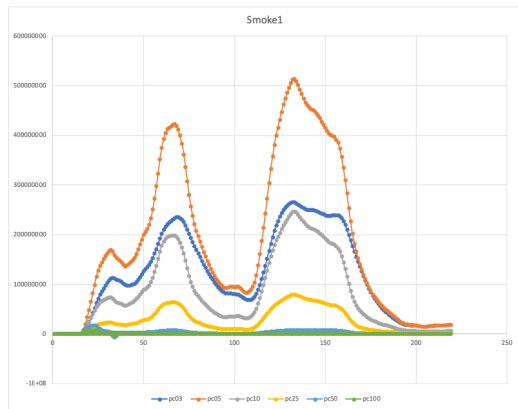


SenseiAQ Software and Dashboard

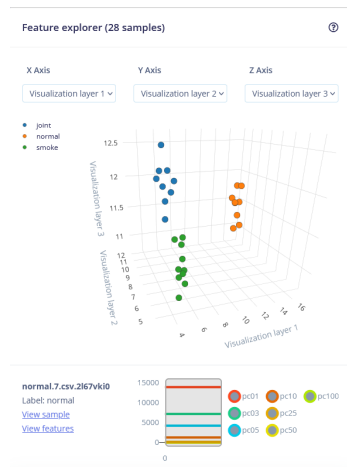


Comprehensive environmental data delivers healthy, energy efficient indoor spaces

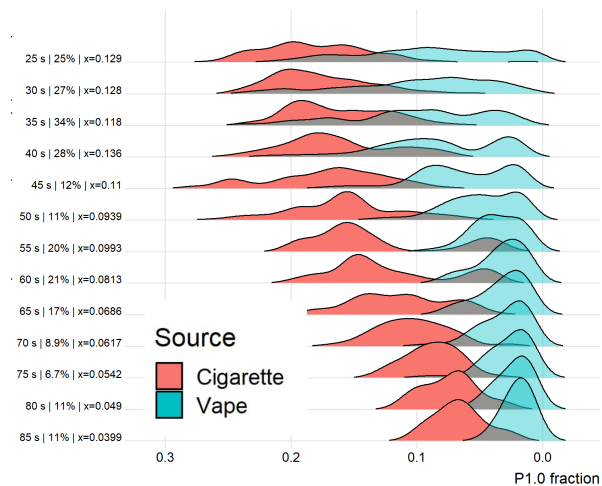
Classifying Pollution Sources with AI



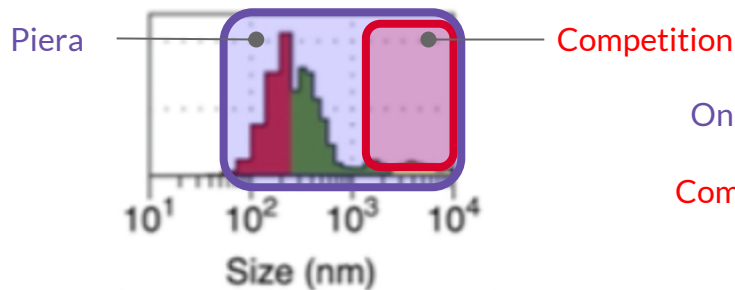
Classification requires accurate particle count and size data, from multiple 'bins', over time



ML/AI Model for Vape, Tobacco Smoke and Good Air



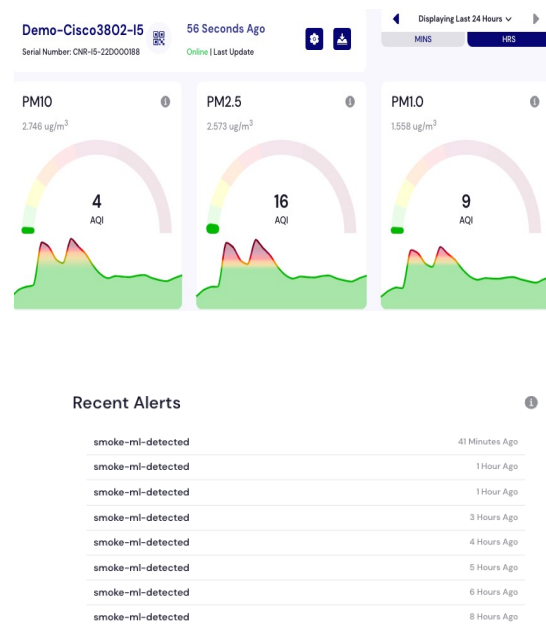
Time-Evolution of Size Fraction by Source [~5s intervals]



Only Piera can measure PM0.1-1.0
with 7 distinct particle sizes
Competition cannot classify particles

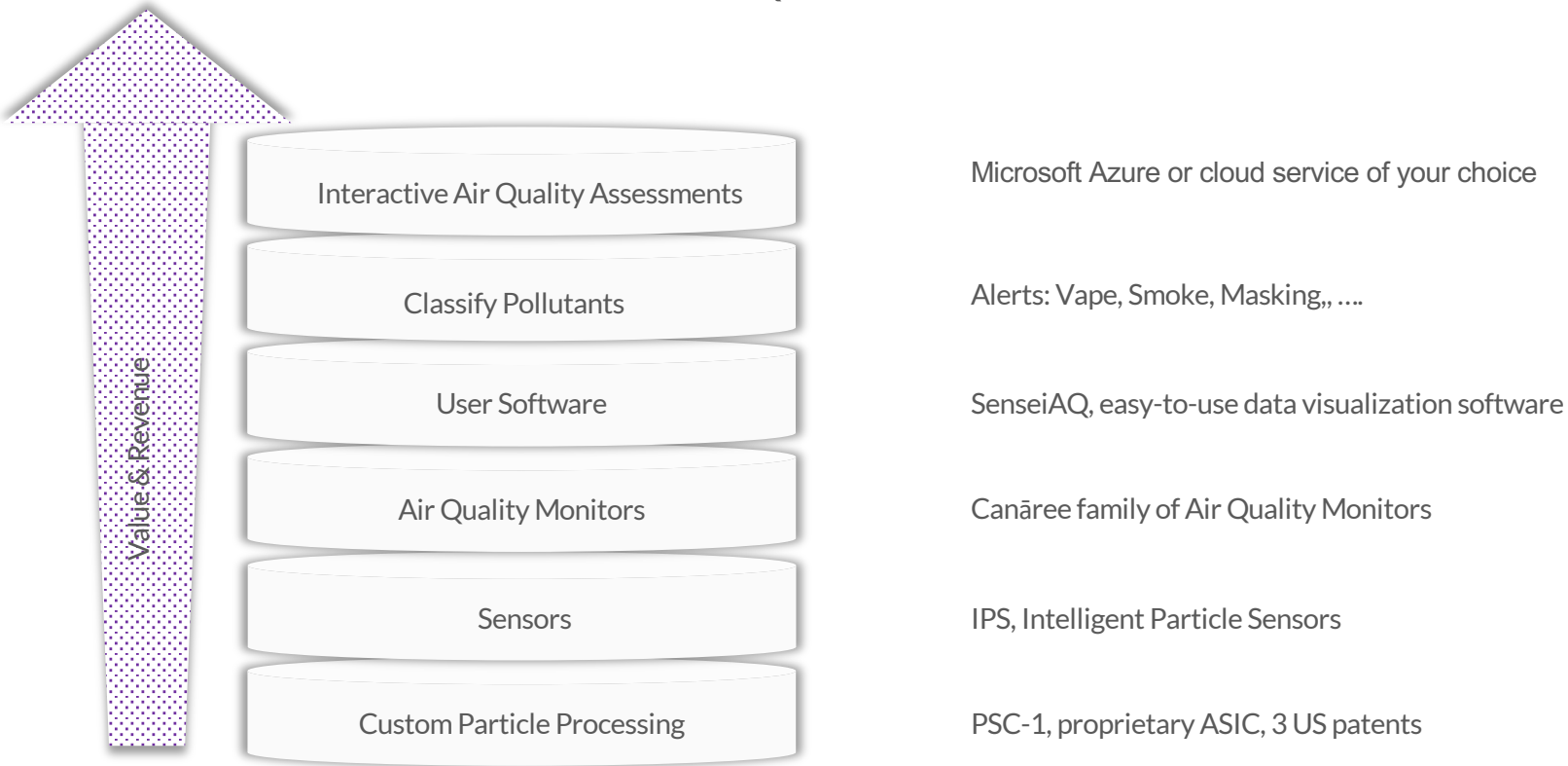
Vape/Smoke Detection

- Highly accurate event detection; within 30 seconds
- Identify smoke or vape from 'masking' (air fresheners, AXE) and 'normal' using ML/AI
- SenseiAQ displays events as they happen, sends alerts, logs them
- LED on Canaree flashes **red** for smoke and **purple** for vape

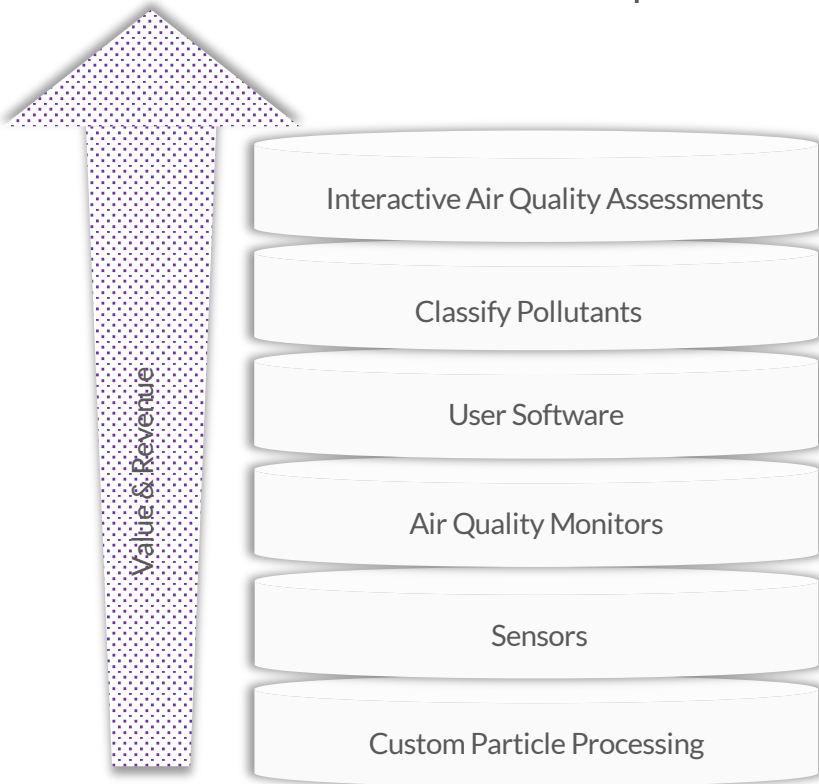


SenseiAQ Cloud Dashboard enables event detection from remote sensors

The AQM Solution Stack



The Competition



Sensor Companies



AQM Companies





Diverse Markets & Applications



Healthy Bldgs



AUHSD



Avon Maitland District School Board



Vape/Smoke, Schools

Industrial



Outdoors



Energy Efficiency

Healthcare



Customer Spotlight: Poppy IAQ Solution

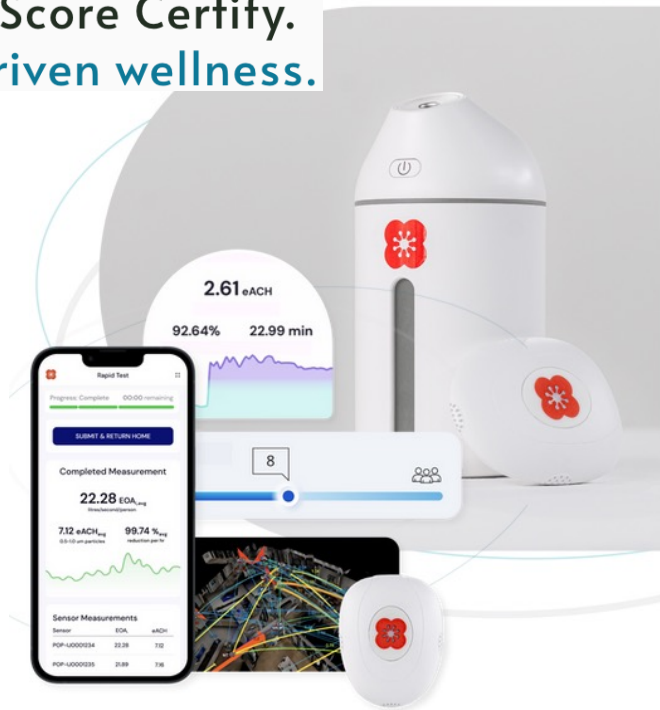
Meets ASHRAE 241 Standard

Measure indoor airflow instantly for energy savings, sustainability and occupant health.

Everything a Field Tech Needs.



BreatheScore Certify.
Data-driven wellness.



Customer Spotlight: Trolex



APPG Report

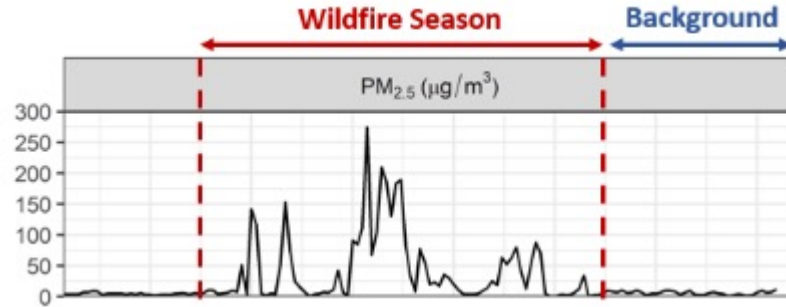
Improving Silicosis
Outcomes in the UK



“We have picked Piera as our long-term partner to attack a vastly untouched sector with a huge demand for robust industrial sensing technology”
- CEO, Trolex, Mining and Industrial Solutions

Protect Buildings during Wildfire Smoke Events

Focus on Fine Particulate Matter (<PM_{2.5}), establish background levels before wildfires arrive




PM_{2.5} Should be as Low as Reasonably Achievable (WHO <15 μg)

"Low-cost PM_{2.5} sensors are increasing in availability so are highly recommended to be considered in new designs or added to existing buildings where practical. These sensors can act as one of the indicators of the effectiveness of any adaptations or design features of the HVAC system to reduce the impact of smoke on IAQ. They can also give information on when to trigger the Smoke Readiness Plan. In addition to measuring PM_{2.5}, some instruments include additional sensors such as for CO, CO₂, relative humidity (RH), or temperature"

Canaree





ASHRAE Guideline 44P

Public Review Draft

**Protecting Building Occupants from
Smoke During Wildfire and Prescribed
Burn Events**

First Public Review (August 2023)
(Draft shows Proposed New Guideline)

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at www.ashrae.org/standards-research-technology/public-review-drafts and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at www.ashrae.org/bookstore or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

<http://www.ashrae.org/bookstore>

This standard is under continuous maintenance. To propose a change to the current standard, use the change submittal form available on the ASHRAE website, www.ashrae.org.

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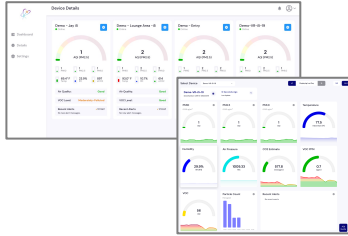
ASHRAE, 180 Technology Parkway, Peachtree Corners GA 30092

Indoor Spaces

Optimize Energy, Health, Occupancy, Usage



- Monitor accurately measure the air quality
- Inform derive insights, identify pollutant sources
- Mitigate energy-efficient methods to clean the air



Install Monitors, collect data before investing in mitigation and committing to Sustainability or ROI goals

An aerial photograph showing a dense, vibrant green forest that meets a calm, turquoise body of water. The forest covers the majority of the frame, with the water occupying the lower-left portion. The text is overlaid on the left side of the image.

No more guessing, know exactly ‘What’s in your Air’

- Most accurate, affordable sensors and air quality monitors

Gain Insight into your Air Quality

- Fine, Very-Fine and Ultrafine particle data needed to identify sources
- Measure effective Air Changes per Hour to reduce infection risk

Let’s partner on new possibilities

- Our disruptive technology empowers new markets and applications
- www.pierasystems.com