

Ultra-Low SWaP CO₂ Sensing for Demand Control Ventilation

PARC (A Xerox Company) and Energy ETC

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Ultra-Low SWaP CO₂ Sensing for Demand Control Ventilation

Team



open innovation, printed & flexible electronics, ML, sensor systems, RF

Clinton Smith, Ph.D. (PI, sensor systems, spectroscopy)

Austin Wei, Ph.D. (materials)

Mahati Chintapalli, Ph.D. (materials/characterization)

Elif Karatay, Ph.D. (thermal modeling, design)

Eric Cocker, Ph.D. (data analytics, DoE)



efficiency - technology - connectivity
Supplier-agnostic BMS integration leader

Rick Costanza (co-owner, VP Operations)

Brian Schroeder (Director of Engineering)

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To ensure healthy air quality, buildings are over-ventilated by 6 × required rates*

Up to 18% energy savings are available with building occupancy sensors: up to 0.4 Quad/yr

BUT

Gas (CO₂) sensors are expensive; occupancy sensors are unreliable or violate privacy

AND

No low-cost platform can measure indoor conditions *en suite* to ensure comfort



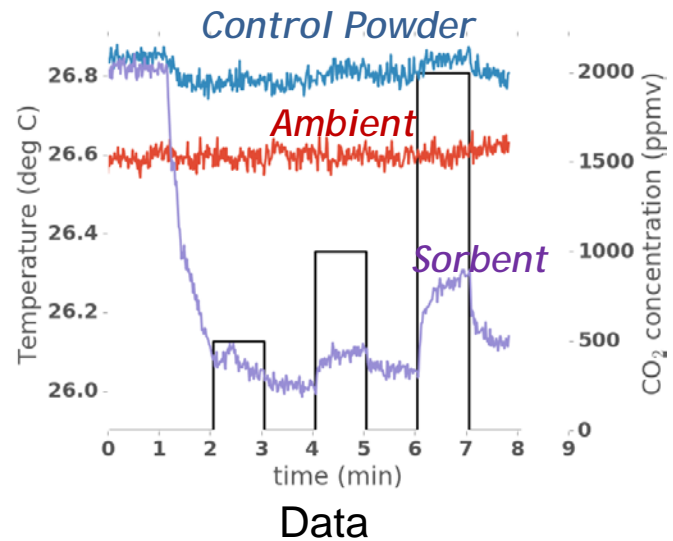
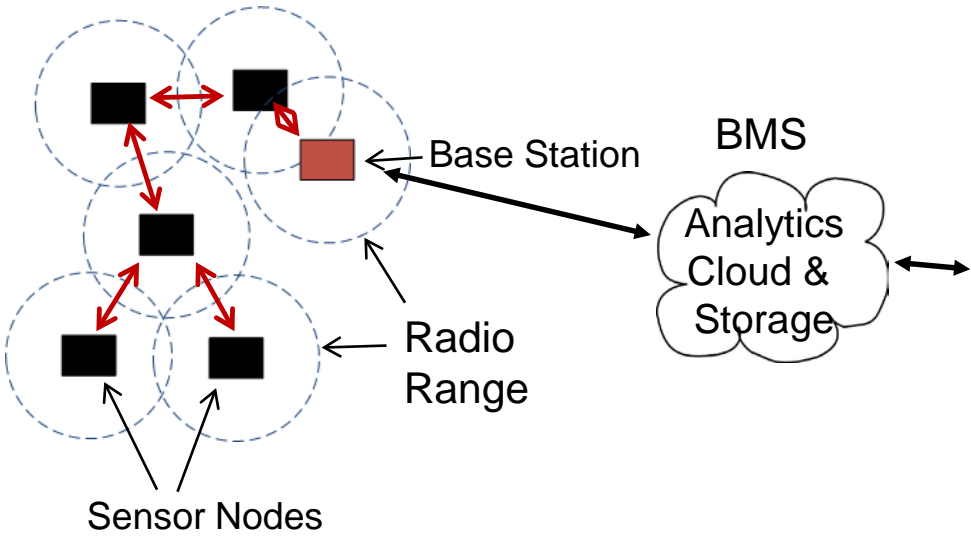
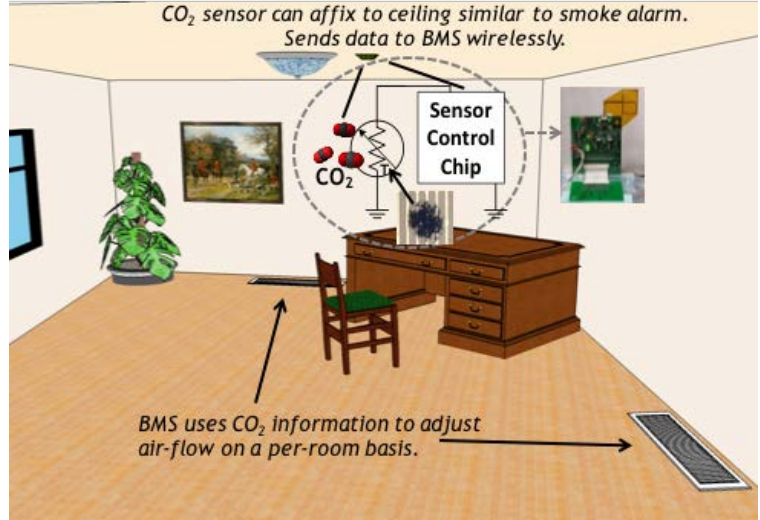
Solution: Printed CO₂ sensor to enable per-room feedback of indoor air quality to BMS for DCV

*Persily, A. et al. Analysis of Ventilation Data from the U.S. Environmental Protection Agency Building Assessment Survey and Evaluation (BASE) Study (2004).

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The Solution

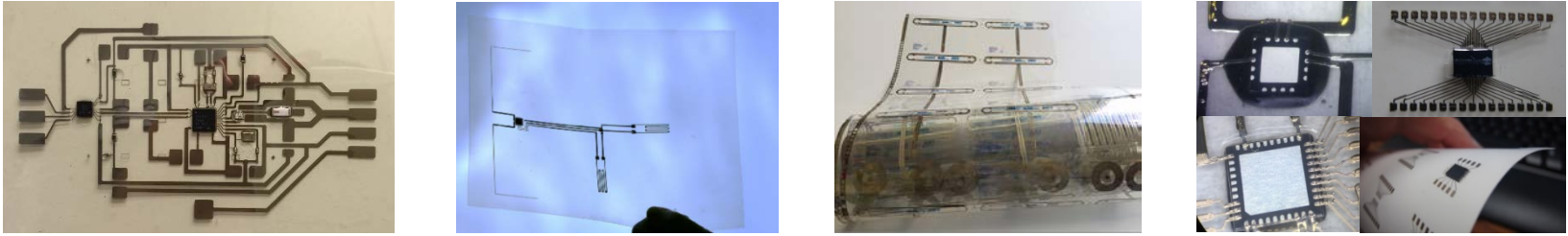
- Printed sorbent detects ppm-level CO₂
 - Costs pennies
- Technology platform extends from molecules to cloud analytics
- Interoperable with many building management systems



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Advantage, Differentiation, and Impact

- Low cost (\$15/node), flexible form factor



- Platform extensible to overall indoor air quality monitoring without added cost

- Healthier environment, increased comfort

- Expected 1.2 year payback based on energy cost savings

- Integration into the BMS at PARC's facility for prototype validation

Commercial	
	HVAC
Cost/sensor tag (\$)	\$15.00
Area covered by base station (sq. ft.)	2000
Sensors/base station	20
RF hub installed cost (\$)	\$80.00
System installed cost (\$/sq. ft.)	\$0.19
Baseline energy use (kWh/sq. ft./y)	8.0
Energy cost (\$/kWh)	\$0.11
Projected energy savings (%)	17.8%
Energy cost savings (\$/sq. ft./y)	\$0.25
Simple payback (y)	1.2



Thank You

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