

What to do about IAQ?

RESNET Conference
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- BSME & MSME, PE
- Engineering, Marketing, Sales, Business
 - 86-88: Fisher Scientific
 - 88-98: Bacharach
 - 98-99: Superior Valve
 - 99-09: Testo
 - 09-present: Owner of TruTechTools & FieryChill
 - 11-present: William P. Spohn, LLC
- 3 Patents
- *Technical Committees:*
 - *BPI, RESNET, GAMA, AHRI, OMA, RSES, NATE, AGA, ACCA*

BIO: Bill Spohn

- A major opportunity for whole house auditing and retrofit work
- Growing consumer health concerns
- Epidemiological data
- Challenges
 - capturing IAQ leads
 - testing homes affordably
 - offering solutions

IAQ and YOU

“What do you do when you get the house too tight? Celebrate! And, introduce proper ventilation from a trusted source.”

- Joe Kuonen



Joe says.....

- Indoor Air
 - Where does indoor come from?
- Quality
 - What happens to the air?
 - Pollutants
 - Gases
 - Deadly or unhealthy gases
 - Objectionable odors
 - Regional factors - Radon
 - Particles
- Is comfort part of IAQ?
 - Stuffiness
 - Humidity or Temperature

Definition



The Four Ps

- Combustion sources
 - oil, gas, kerosene, coal, wood, and tobacco products
- Building materials and furnishings
 - deteriorated, asbestos-containing insulation
 - wet or damp carpet
 - cabinetry or furniture made of certain pressed wood products
- Products for household cleaning and maintenance
- Products for personal care, or hobbies
- Central heating and cooling systems and humidification devices
- Outdoor sources
 - radon, pesticides, and outdoor air pollution



**EPA says...many sources of Indoor
Air Pollution**

What bugs customers about their houses?







Not so many happy returns?





- What are customers expecting from their air quality?
 - comfort, health, safety
- What technicians can affordably* measure?
- What technicians can affordably* install or change to fix found issues?
 - *such that customers will pay for the service

The issues: as I see them

- Temperature
- Humidity
- “Fresh air”
 - usually via CO2 levels
- CO
- Possibly particulates
- An industrial hygiene specialist (IH) may find interest in monitoring tens of different parameters
 - particulates, biologicals, VOCs, light, sound, etc.

4 (or 5) core parameters

- What am I likely to find here?
- What could I possibly find here?
- Where & **when** you sample makes a difference
 - different rooms can have different levels of any measured parameter
 - And things change over time
 - CO Sleuthing
- Almost NEVER straightforward



Balance

- **EXPECTATIONS**

- Temp and humidity make good sense for basic human comfort and ASHRAE tables well define their bounds.
- Public is educated to acceptable ranges by the Weather Channel "feels like" temperatures which consider humidity. (actually dewpoint)

- **MEASUREMENTS**

- Measurement tools abound in features and costs (from well under \$100 to over \$1000)

- **FIXES**

- Properly sized and delivered output from heating and cooling systems, humidification and de-humidification.

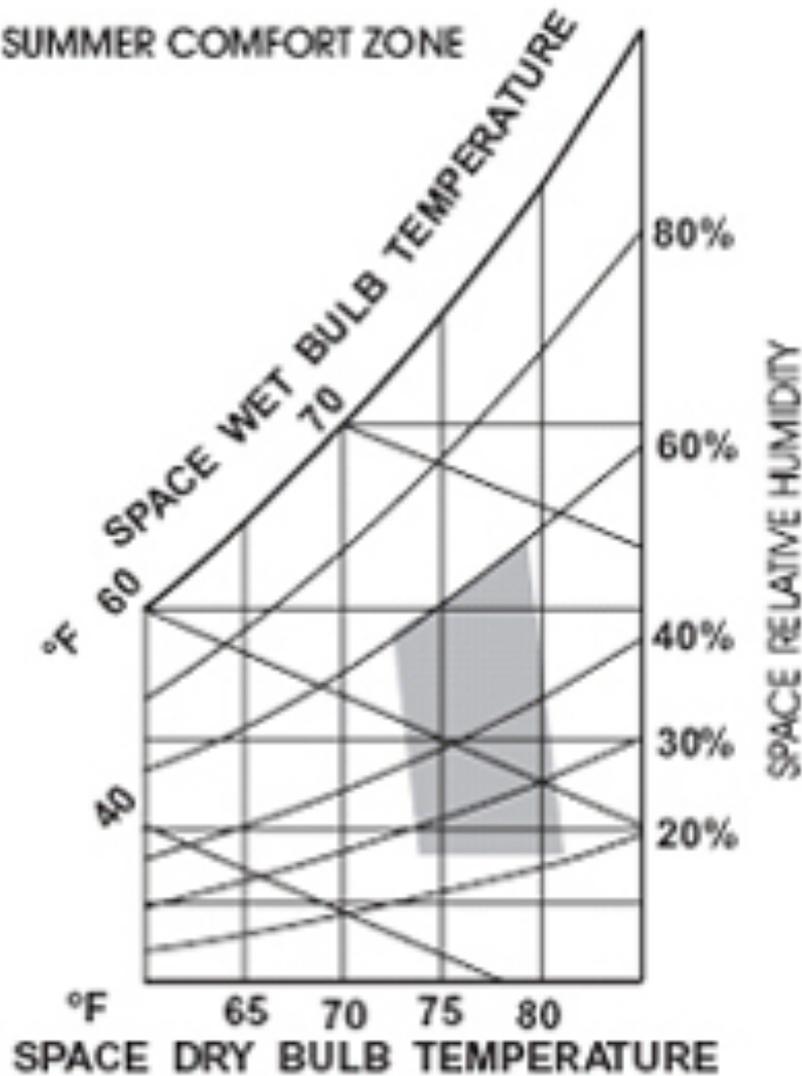
- **Mold & Biological growth: WWF**

- Warm enough, Wet enough, enough Food

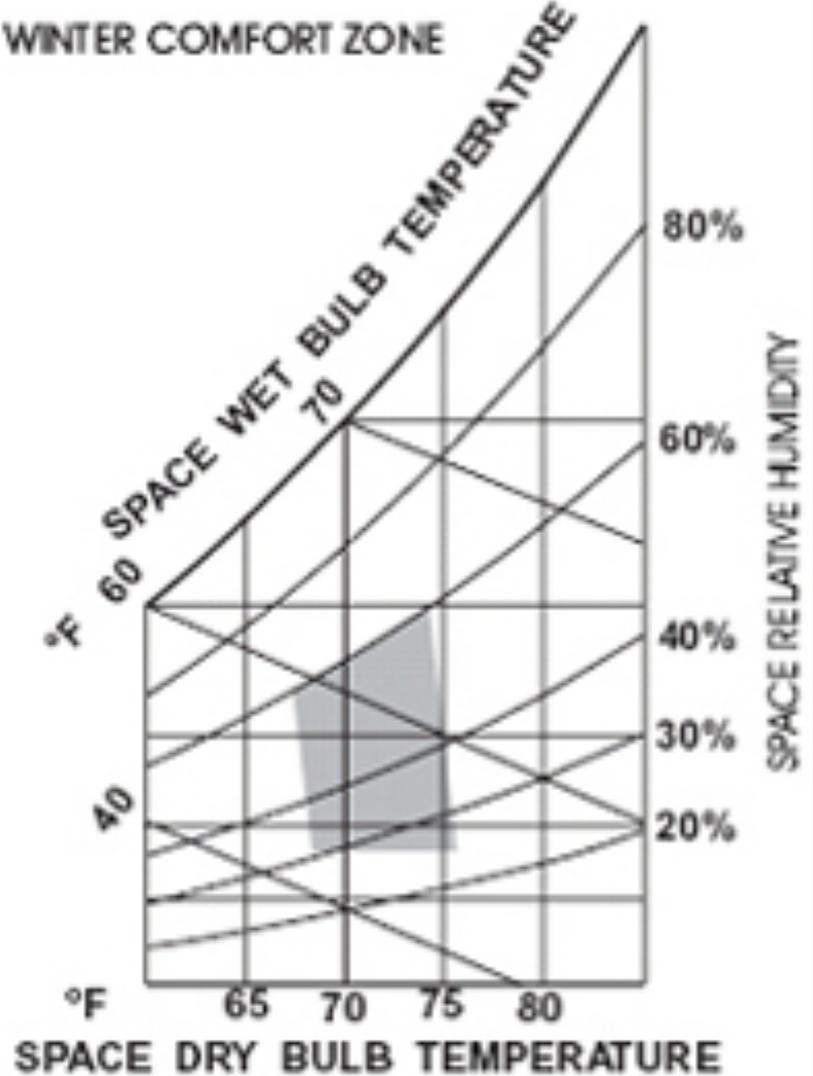
Temperature and Humidity



SUMMER COMFORT ZONE



WINTER COMFORT ZONE



ASHRAE Comfort Zones

- **EXPECTATIONS**

- Usually no expectation
- May "feel different" or be totally unaware.
- CO2 (ppm) surrogate indicator for fresh air
- As the indoor air concentration of CO2 rises above the outdoor air, ASHRAE actually defines stuffiness and impact on health factors.
- Locker room smell

- **MEASUREMENTS**

- CO2 Measurement devices start under \$400 and can go over \$3000
- Air changes per hour (ACH) as calculated by a blower door test
- Combustion levels and IAQ levels

- **FIXES**

- Bring in (and hopefully condition) more outdoor air
- HRVs and ERVs come into play.

Fresh Air



The former ASHRAE Standard “Ventilation for Acceptable Indoor Air Quality” (ANSI/ASHRAE 62-1989) references the term 1,000 ppm CO₂ as a surrogate for where human **bioeffluents** (odors) may be at levels not acceptable for human comfort.

Further, this value of 1,000 is a guideline value only and not considered a regulated standard.

ASHRAE on CO₂ LEVELS

- **EXPECTATIONS**

- Public awareness CO and CO alarms
Health impact over exposure concentrations and times is well known.
- A cumulative poison: time and concentration play equal roles

- **MEASUREMENTS**

- CO alarms warn to life safety issues for well under \$100, and Low-Level types for under \$200, with analyzers range from \$200 to \$500
- Personal monitors
- UL 2034 alarms vs. low level alarms vs. commercial alarms

- **COMPLICATIONS**

- Has many sources in a home or office

- **FIXES**

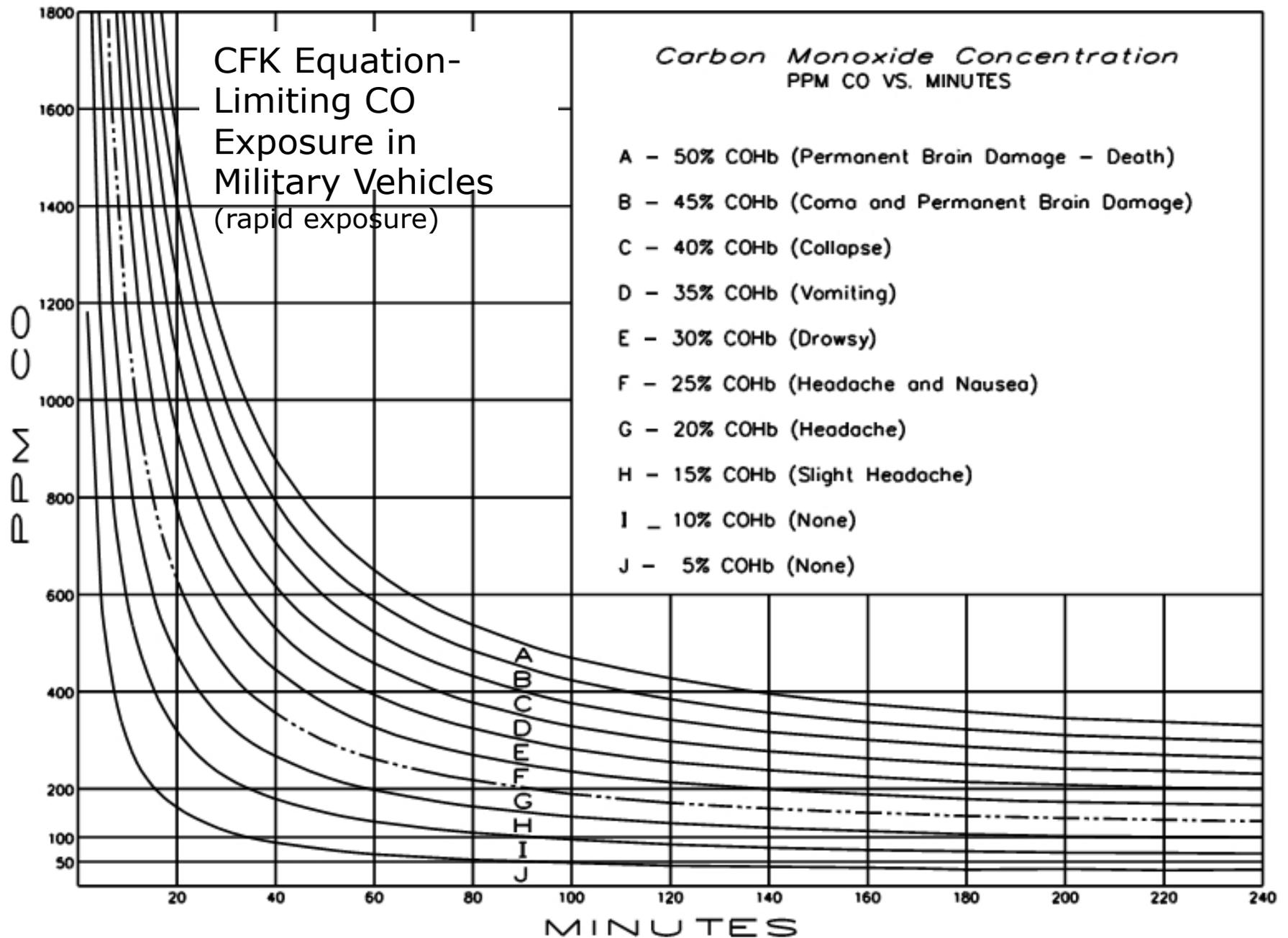
- Locate CO emitting appliance/source or pathway
- CO filter? Hopcalite®



CO - an extension of fresh air

Carbon monoxide concentration (ppm CO) versus time (minutes)

Figure 38.1 revised October 15, 1997



- **MEASUREMENTS**

- Particulate Meters - \$1800 and up

- **FIXES**

- Electronic and media filters up to HEPA filters

- **Austin Air - \$649**

- Cleans benzene, wood smoke, formaldehyde and other volatile organic compound (VOCs)
- Capable of trapping 99.97% of particulates down to 0.3 microns
- Effective for areas up to 1500 sq ft.

- **Cirrus Air - \$500?** Electro-coagulation

Particulates



 CosaTron®



Smoke Test

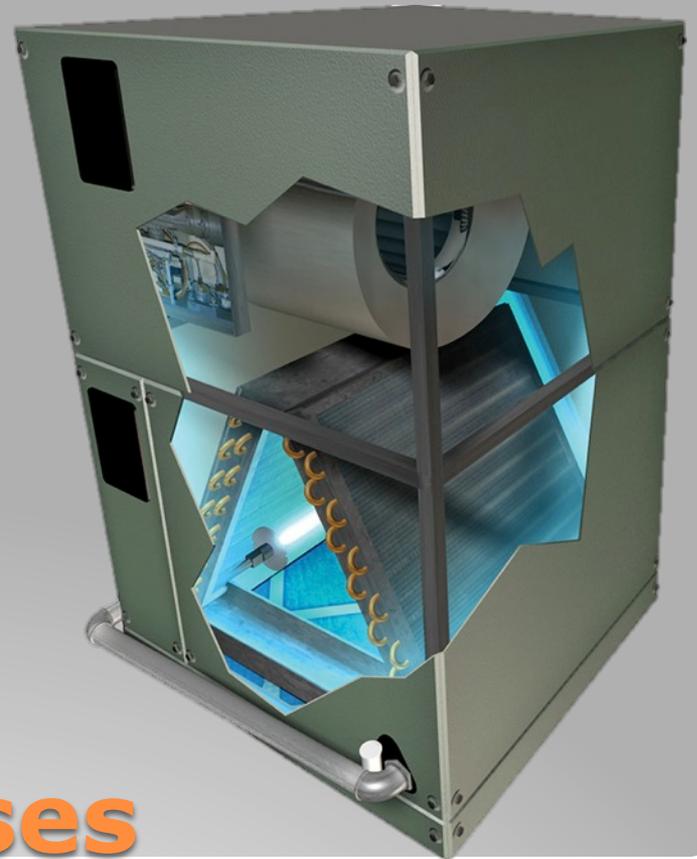
Electrocoagulation

- **MEASUREMENTS**

- Some portable & special lab testing here

- **FIXES**

- UV (AC) coil lights
- "\$ hundred and up"



Microbes and viruses

- ***SystemSURE Plus ATP***

- Hygiene Monitoring System
- Micro-swab the surface with sampler
- Inject luciferase reagent and swirl to mix
- Insert in meter for read out
- Measures relative ATP concentration:
- Adenosine Triphosphate: universal “energy molecule” in all animal, bacteria, plant, mold and yeast cells.
- ~\$1500 plus reagent tubes (\$3 each)



Biologicals....the next frontier?

- **MEASUREMENTS**

- sophisticated testing or
- "gut reaction" = it smells!

- **FIXES**

- Air Cleaners and Air-treaters
- (including **ozone-ators**)

- **Personal View**

- Don't fully appreciate
- Gives me headaches
- And the EPA sez....



Stale air and odors

- OZONE : O₃
 - Alters chemical composition in the body
 - Can damage the lungs
- Low amounts
 - chest pain, coughing, shortness of breath, throat irritation
- May worsen chronic respiratory diseases (asthma)
 - Compromise body's fight of respiratory infections.
- Varying impact on people's susceptibility
- Healthy and respiratory compromised
 - can experience breathing problems when exposed
- Exercise during exposure
 - Increases risk of harmful respiratory effects
- Recovery
 - can occur following short-term exposure to low levels
- At higher levels or longer exposures
 - health effects may be more damaging
 - recovery less certain
- SHEESH!

EPA on Ozone - Generators

- **Bactronizing™**
- Sanitizing solution to eliminate mold, mildew, food-related illnesses and other harmful viral/bacterial infections for all types of environments.
- Proven safe and effective for human and animal environments.”

Bactronix

- Can help raise customer awareness to need for your product or service.
- A mature product offering especially in the larger building environment.
- HomeAdvice product covers Temp, rH, CO and particulates and perhaps VOCs (volatile organic compounds)
- Local Home Show experience
- The WHEN factor



AirAdvice – “all” in one

*IAQ is
STRONGLY tied
to good building
performance*

**A 67% decline in
emergency room
visits due to
energy retrofits!**

**Aetna: Savings of
over \$600 for
each asthma-
related ER visit
(\$6,600 for a
hospital stay).**

Home energy retrofits reducing healthcare costs

By David Worthington | December 7, 2012, 5:32 AM PST

Wegowise, a start-up that identifies energy efficient homes by analyzing utility data, has partnered with a national non-profit to upgrade low-income housing around Baltimore, Maryland. A recent pilot project produced an unforeseen result: emergency room visits among residents who were helped fell by 67 percent.

The Environmental Protection Agency says that buildings in the U.S. waste an average of 20 percent of the US\$400 billion plus that's spent on energy annually, but not every building owner has the same resources to eliminate waste. Homes that aren't sufficiently weatherized can be hazardous to health. WegoWise and Green & Healthy Homes Initiative (GHHI), a national non-profit, are partnering to help economically disadvantaged families fix weatherization issues that negatively impact their household budgets and lives.

WegoWise provides a Web application to track and analyze utility data. Building owners would use its application to identify their most wasteful properties and greatest potential savings with upgrades. The entire process is automated by the application, which is available to anyone in the U.S. as a monthly subscription. WegoWise saved the GHHI from having to scour through spreadsheets to target homes that were in the greatest need of health and energy upgrades. 31 homes were selected for repairs.



Many incidents of asthma occurred with children and were attributed to insufficient home weatherization.

- Study up on one or two aspects that you believe
- Keep in mind you may need access/ license to sell and install the "fix" or can work with someone who will do so.
- Install the "fix" in your own house and see if you would stand behind it.



IAQ in your business

- www.IAQ.net
- www.epa.gov/iaq
- www.AirAdvice.com

RESOURCES

LINKING TO TruTechTools

TruNews Newsletter

www.bit.ly/TruNews

FREE Webinars

www.bit.ly/TTT-Webinars

FREE Video learning

www.bit.ly/TTT-VIDEOS

FREE Training materials

www.bit.ly/TTT-Training

Our EVENTS calendar

www.bit.ly/TTT-Events

TruTech Tools Blog

www.TruTechGuy.com

FaceBook Page

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Twitter

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LinkedIn

www.linkedin.com/company/trutech-tools-ltd

Pinterest

www.pinterest.com/trutechtools

GooglePlus

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Questions.....

