

## Indoor Air Quality: New Fluke Tools promise to help diagnose and fix an ancient problem

### Technology at Work



It's been a problem for tens of thousands of years. Maybe it's time to fix it.

From the Padahlin caves in Myanmar to New Mexico's Tsankawi Mesa pueblos, ancient human dwellings are stained with soot from cooking fires. Paleolithic people had problems with air quality indoors before they even had doors.

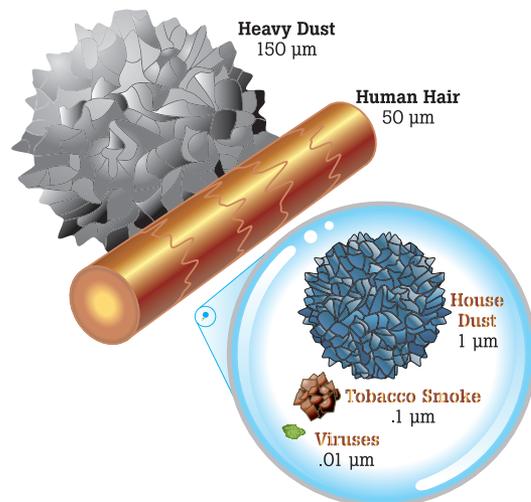
Fast forward forty millennia – we've quit barbecuing cave bear in the living room, but indoor air quality (IAQ) is still an issue. Problems appeared to increase after the 1970s energy crisis, when architects and owners redesigned HVAC systems, adjusted operations and sealed buildings more effectively in an effort to conserve energy.

Publicity about second hand tobacco smoke, mold, asthma, Legionnaire's disease and "sick building syndrome" has focused increased attention on the problems caused by poor IAQ – and on the need to diagnose and remediate air quality issues.

The term "sick building syndrome" (SBS) describes situations when building occupants experience health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be found. Professionals use the term "building related illness" (BRI) when symptoms of diagnosable illness can be attributed directly to airborne building contaminants.

### High stakes for people and companies

The stakes can be very high. For building occupants, IAQ problems can cause discomfort, lost productivity, illness and even, for some victims of Legionnaire's disease, death. Air contamination can bring production lines to a stop. Clean rooms, where workers in white bunny suits pad about in electrically grounded slippers to fabricate silicon integrated circuits, show how vital pristine air quality is for some manufacturers.



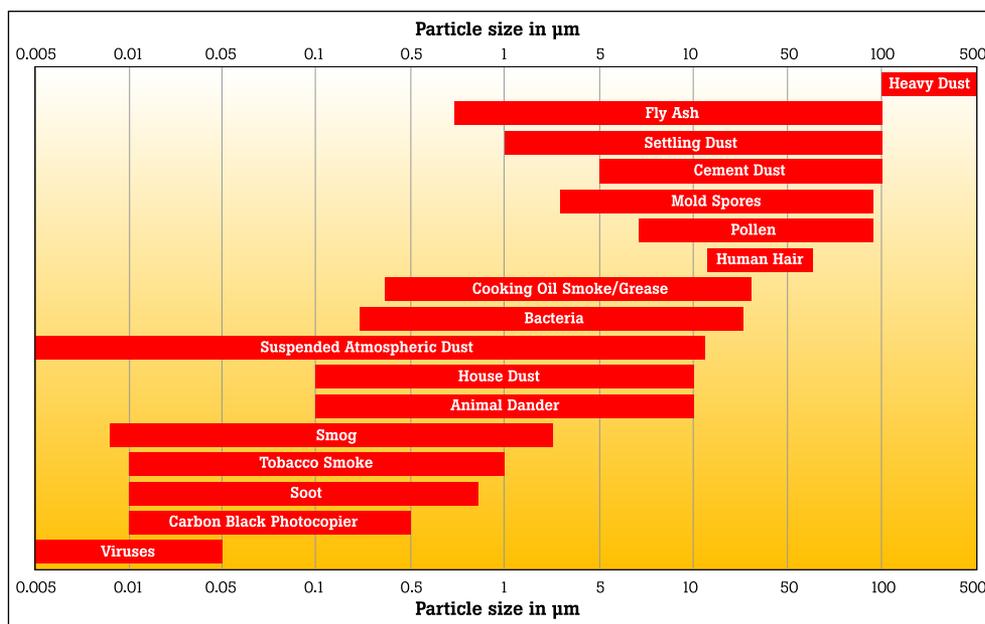
Specific numbers on the cost of poor IAQ are elusive. A 1997 study by William Fisk and Art Rosenfeld estimated that the potential annual savings and productivity gains from reduced respiratory diseases could reach \$6 to \$19 billion; from reduced allergies and asthma, \$1 to \$4 billion; and from reduced sick building syndrome, \$10 to \$20 billion. And anecdotal information on cost and liability is sobering:

- One of the first winning IAQ lawsuits was filed, ironically, over conditions at the headquarters of the U.S. Environmental Protection Agency (EPA).
- A lawsuit over air quality problems allegedly caused by the HVAC system in the new Polk County, Fla. courthouse led to a 1995 jury award of \$25.8 million.
- In 2002, Hilton closed 453 guest rooms at its \$95 million Hilton Hawaiian Village resort and spent \$55 million to rectify a mold problem, then sued its contractors for flawed construction.

Many HVAC professionals are already involved in diagnosing and solving such problems, and they're using Fluke tools to do it. Even the best-designed HVAC system won't deliver the required IAQ results unless the system is properly maintained and adjusted. So Fluke electrical testers, digital multimeters, thermometers and calibrators are essential components of the HVAC technician's toolkit.

### What do we mean by indoor air quality?

Humidity and temperature are important comfort factors, and failure to manage them can create other problems — allowing the growth of mold, or turning chillers into biology experiments.



Common indoor air pollutants include tobacco smoke; biological agents like animal dander, bacteria and mold; airborne particulates; volatile organic compounds like glue, solvents, cleaning agents; carbon dioxide and carbon monoxide; and pesticides.

Many of these materials will be found in minute amounts in most indoor environments. When concentrations or combinations of pollutants rise excessively, however, IAQ deteriorates. IAQ problems can result from a host of factors.

### Keys to IAQ: design, operation and maintenance

Poor design of buildings and HVAC systems is one cause. An air intake located above a loading dock, for instance, could draw in vehicle exhaust and distribute carbon monoxide, oxides of nitrogen and diesel soot to every cubicle. Systems without sufficient fresh air exchange can allow CO<sub>2</sub> and volatile organic compounds to build up. The wrong construction materials can emit excessive chemicals from glue and paint.

Another big factor is system operation and maintenance. Air pressure, temperature, humidity and operating cycles must all be properly adjusted to balance operating efficiency with the comfort of building occupants.

Leaving systems off until occupants arrive in the morning might save money, for instance, but allow pollutants to build up in the air. Better to start systems early and condition the air *before* people show up. Leaving doors or windows open between office space and a shop floor could virtually guarantee IAQ problems.

The third big IAQ determinant is system maintenance. Even the best building and HVAC design won't deliver the results it should if electrical systems or vents fail, fan and compressor motors malfunction or controls fail to perform.

It's in system operation and maintenance that Fluke plays a major role today. Techs rely on Fluke thermometers, electrical testers, DMMs, pressure and vacuum modules and CO testers and accessories to check system performance, diagnose problems and make necessary adjustments.

**Fluke introduces new IAQ tools**

Yet there's an unmet need for Fluke quality in tools specifically designed for indoor air quality diagnosis. Now Fluke is moving to fill the gap with new air quality measurement tools designed for professionals in the fields of HVAC, building operation and maintenance and corporate industrial hygiene. Additional new air diagnosis instruments will follow the new Fluke 983 Particle Counter, announced in January 2005.

These tools will provide outstanding value to three groups of users:

**HVAC Technicians** know and use Fluke tools today. The new air diagnostics test tools will enable these techs to extend their expertise into the field of indoor air quality testing and remediation – an area closely aligned with their area of expertise, and potentially profitable.

**Building Operations and Maintenance Professionals** can get ahead of the IAQ game by performing their own air quality testing and diagnosis. They will be able to find and solve air quality problems before they affect building occupants and create the potential for regulatory intervention or litigation.

**Certified Industrial Hygienists** will discover the values traditionally delivered by Fluke tools: ease of use, accuracy and rock solid durability. These are tools that industrial hygienists can rely on to help them do their jobs.

**Few U.S. regulations**

Though most people spend 90 percent of their lives indoors, the rules and standards governing indoor air quality are remarkably sparse. A 1998 study by the Lawrence Berkeley National

Laboratory found that IAQ standards are few, and little has changed since. An IAQ rulemaking proposal placed before Congress by the Occupational Safety and Health Administration (OSHA) in 1994 was withdrawn in 2001.

OSHA enforces specific standards for high-hazard workplaces, such as industrial locations where abrasive blasting, grinding, polishing and spray finishing operations are performed. The agency has established exposure limits for a long list of chemical agents, but those limits apply in industrial settings – not in office buildings.

The EPA, OSHA and NIOSH (National Institute of Occupational Safety and Health) provide useful information on IAQ, the management of large buildings and the diagnosis of IAQ problems.

But the closest thing to a national rule governing indoor air quality in the U.S. is a voluntary industry standard, ANSI/ASHRAE 62-2001, "Ventilation for Acceptable Indoor Air Quality," which sets guidelines for "minimum ventilation rates and indoor air quality that will be acceptable to human occupants and are intended to avoid adverse health effects."

The American Conference of Governmental Industrial Hygienists (ACGIH) has also developed guidelines. Threshold Limit Values (TLVs®) and Biological Exposure Indices (BEIs®) represent the opinion of the scientific community that exposure at or below the level of the TLV® or BEI® does not create an unreasonable risk of disease or injury.

TLVs® and BEIs® are not standards. These are guidelines designed for use by industrial hygienists in making decisions regarding safe levels of exposure to various chemical substances and physical agents found in the workplace.

**Conclusion**

In an environment where so many people are affected, yet rules and standards are few, the diagnostician who has accurate data will hold a clear and convincing advantage. Fluke IAQ test tools are designed to help professionals measure air quality, identify problems and – decisively and convincingly – solve them.



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