How to Measure Indoor Air Pollution

http://www.utne.com/environment/indoor-air-pollution-ze0z1512zbay.aspx
By Jessica Cohen, special to Utne Reader

Gas infrastructure will increase tenfold over the next ten years, according to the Clean Air Council, bringing gas pipelines, compressors, metering stations, and power plants to communities around the country. With them come emissions that have increased air pollution in rural areas to levels exceeding urban pollution, resulting in widespread adverse health effects, according to David Brown, environmental health consultant for Southwest Pennsylvania Environmental Health Project.

Making such invisible pollution problems visible and measureable to community residents, has become a

compelling project for Illah Nourbakhsh, professor of robotics at the Robotics Institute at Carnegie Mellon University in Pittsburgh.

“When fracking started, people didn’t know if they were being harmed by their water and air. Their tap water could be set on fire. Their horse’s hair might be falling out. People felt completely disempowered,” he said.

The Pittsburgh area was an early hub of fracking activity, and Nourbakhsh noticed discussions about it all over the city.

“We wanted to allow people to own the data and decide what to do,” said Beatrice Dias, project director at the Robotics Institute. “With air monitoring, an agency usually owns the data and makes decisions.”

Aided by grants from the Heinz and Fine foundations, they invented the Speck air monitor, size of a small clock, to enable people to monitor particulate matter at home. Increased pollutants from the gas industry include large quantities of fine particulate matter, also called PM 2.5, which creates inflammation throughout the body, particularly exacerbating lung and heart disease, according to Harvard Environmental Epidemiology Professor Joel Schwartz. In recent research, he found that even small increases in PM 2.5 levels raise mortality rates from all causes for people 65 and over, the population addressed by the study.

The Speck monitor has the capacity to collect data to be uploaded to the web at www.SpeckSensor.com, with an option to share data publicly and create sources of air quality information within communities and between cities around the U.S. The data is more specific in both location and content than the U.S. air quality index, which reflects a combination of particulate matter, ozone, and other pollutants, says Nourbakhsh.

Indoor readings are affected by both outdoor air and activities like vacuuming and cooking, potentially also providing information about triggers for personal health problems, like asthma, he says. Additionally, the Speck can indicate how well an air purifier is working.

To facilitate community access and collaboration, Nourbakhsh and his cohorts created a pilot public library program in Pittsburgh, donating several Speck monitors to be loaned like books.

“It’s become a popular program that got people involved in community advocacy,” says Dias.

Consequently, Nourbakhsh and Dias decided to launch Speck library programs nationally in 2016, providing the monitors to libraries at a discount.

In Minisink, the monitor was instrumental in identifying relationships between compressor emissions and symptoms experienced by people living in the community around it, when Brown and his SWPEHP colleagues conducted their health survey there. The monitors showed that the compressor tripled ambient levels of PM 2.5 within the 1.5 mile radius around the compressor. Ambient PM 2.5 rose from 6 micrograms (1/1000 milligram) per cubic meter, a typically low rural level, to 17, a level 50% greater than Environmental Protection Agency limits, with intermittent surges to levels 40 times the EPA’s limit.

Nourbakhsh and his colleagues also invented the Cattfish, a small $200 device that can be dropped in a toilet back tank to measure changes in total dissolved solids in well water. Although the Cattfish does not identify what chemicals the solids contain, a TDS increase indicates when contamination occurs, said Josh Schapiro, a robotics engineer at the Robotics Institute, who collaborated with Nourbakhsh on the project.

“The Cattfish provides easy access to well water TDS readings,” he said.

The Robotics Institute group is now working on technology that would monitor smaller particles that penetrate the lungs more deeply, as research published this year showed significant increases in babies with low birth weight, ADHD, and autism when mothers are exposed to high levels of fine particulate matter during pregnancy, Nourbakhsh said.

For information about the Speck library program, contact Sara Longo and Beatrice Dias at outreach@specksensor.com.