FROM THE AIR PROGRAM

Making Sense of Sensors

Photo: US EPA

You may have heard of some types of air quality sensors you can by on Amazon or other stores, or even use on your phone. They are known by air agencies as "low-cost" sensors (LCS's), and this name says it all. The buy-in for a sensor can be as little as <$200 (though the name typically applies to sensors <$2,500) and they're commercially available. So how do they fit in with air quality science, especially with the rapid modernization of big data, mobile use of air data, and global market for consumer goods? It's hard to say a bottom line, as they are currently under heavy scrutiny with air agencies and EPA, which involves a LOT of testing, testing and more testing, with all the results archived for shared use. So here are some basic conclusions that can be made *at this point in time,* though the evaluations continue even as new sensors hit the market.

Who makes sensors? Companies that can manufacture "widgets", or engineering professionals and students.

Who can use them? Anyone can use them for real-time or near-time data. Only users with digital capacity to store and manipulate millions of records of data points are able to analyze large data sets.

Are there any certifications? EPA is currently designing what will likely be the future QA/QC specifications for EPA certification, and doesn't endorse any particular sensors, though they are involved with R&D.

Are they safe to operate? Battery size/type, sensor (chemical) type, placement, and length of operation time are primary safety concerns like other electronic devices.

Do they work? Because there are hundreds of different designs and products, there's no single answer. Sensors are always generating a number, so the question is- is that number "right"? It takes a lot of testing against other like units, and against a regulatory monitor, and with the official tests that have been done so far, results have varied. No sensors have been able to exactly match the data out of a regulatory monitor, though some have achieved the ability to track them within ~30%. (not always consistently – test run averages can vary significantly.) It's also been found that sometimes single units are "duds" and just don't track well with the others.

How long do they work for: Best case is anywhere from several months to a couple of years.

Are sensors being used officially? Air agencies including tribal air programs are piloting them, and often are able to compare their data with the regulatory monitor data. This has led to some community-scale deployment of sensors, but it has also led to efforts to scrutinize and tighten the quality standards going into the manufacturing of some of the more trustworthy models, so that the data they generate can more "officially" benefit the public.

There are many variations in data quality due to type of pollutant, temperature and humidity, weather, exposure, and sensor material "poisoning" (degradation) drift of concentration and timestamp. Though it's hoped that useful air quality data could be more widely and rapidly available, for now, sensors are most useful when the user has a specific question or purpose in mind for a place and time, has identified a suitable sensor and designed the operation of the sensor to match that, and can still make use of data that may be biased or inaccurate. **Stay tuned for sensor updates!** ***For questions call the Air Program 873-3584 x. 2110***