Fact Sheet

Understanding Fine Particulate Measurements

Air Quality Monitoring
DEQ State of Oregon

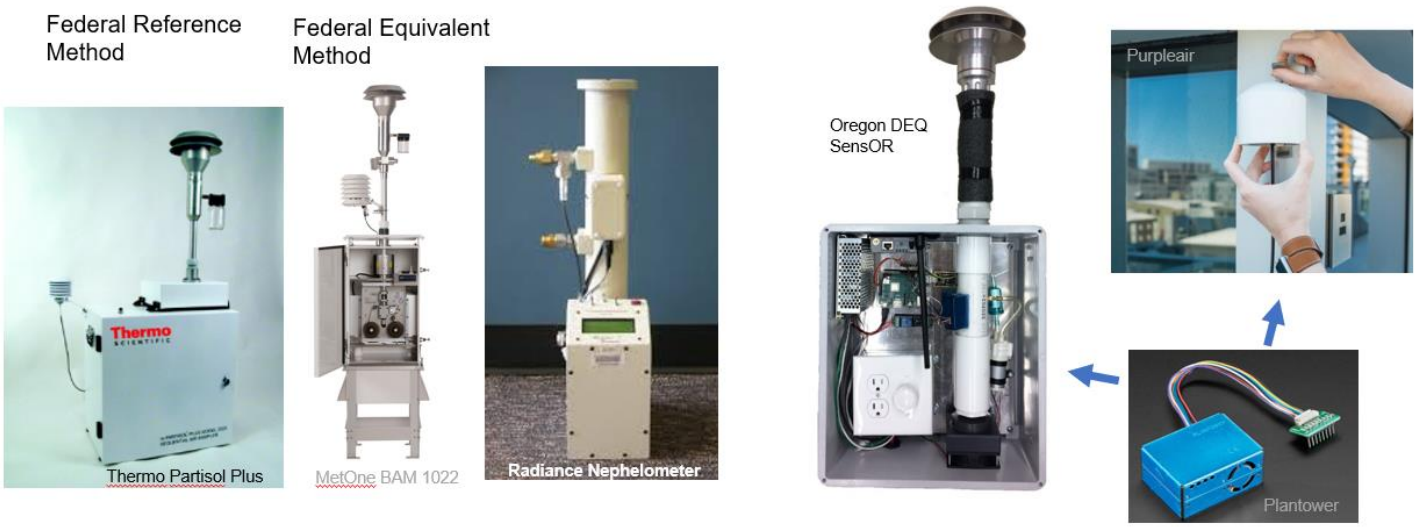
This fact sheet shows the different types of $PM_{2.5}$ monitoring methods and how they are used for different air monitoring quality objectives. The information is being published specifically to explain why we are installing more Federal Equivalence Method monitors around the state, and how we are using these to improve the accuracy of our data.

About fine particulate matter

One of the Criteria Air Pollutants affecting our health is fine particulate matter, or $PM_{2.5}$. In Oregon, $PM_{2.5}$ is mainly produced from wildfires, field burning, forestry burning, residential wood combustion, transportation, and commercial and industrial operations. DEQ operates more than 60 air monitoring sites around the state which use select technologies to measure the concentration of $PM_{2.5}$ in the air. This data is communicated to the public through its AQI website and Oregon Air mobile apps for Android and iOS.

How do we choose different methods to measure $PM_{2.5}$?

Highly accurate and expensive → **Lower accuracy and cheaper**



Cost and accuracy of different air monitoring methods

Translation or other formats

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State of Oregon DEQ Department of Environmental Quality

We choose the type of air monitor to be used based on the intended purpose of the monitoring. For regulatory compliance, the Clean Air Act requires specific types of air monitors and operating procedures, known as Federal Reference Methods, and Federal Equivalent Methods. This equipment is generally expensive to purchase, operate and maintain, but provides high quality, scientifically defensible data.

The FRM draws sampled air across a filter for a 24-hour period which is then weighed in a laboratory to determine the mass of $PM_{2.5}$ in the air. This is a labor-intensive process and takes several weeks to get results but is considered the "gold standard".

FEMs use methods demonstrated to match the FRM in different environments, locations and seasons. They measure by continuous weighing, beta particle attenuation, or light scattering and have the advantage of providing short-term averages for real-time output. Other instruments can be used to provide information for special studies and real-time public health guidance, as in the AQI website. These include the Radiance Nephelometer and DEQ's SensOR™, which have a lower cost and smaller footprint, while providing accurate, reliable estimates of $PM_{2.5}$.

Low-cost air quality sensors also play a role in the modern air monitoring program. Their portability and ease of operation makes them optimal for research, personal exposure monitoring, increased monitoring coverage, source identification, emergency protection, education and community engagement. Learn more regarding the performance of a variety of sensors at South Coast Air Quality Management District's AQ-SPEC website.

How do we verify the accuracy of our measurements?

Collocated testing

FRMs, FEMs, nephelometers, and DEQ SensORs provide DEQ with a complementary system for measuring air quality. DEQ operates these monitors with a commitment to data integrity and public health guidance, and supports this with a program of quality control and quality assurance. The quality assurance process includes comparison of the nephelometer and DEQ SensOR to the FEMs under real world conditions. This is known as *collocation*. Data from collocation are used to verify the accuracy of measurements and to calibrate the nephelometers and DEQ SensORs to the reference samplers, and are not intended to be used for regulatory compliance. DEQ is currently collocating nephelometers and SensORs with FEMs at ten sites to ensure that our data meet established quality assurance targets. We plan to add more collocated sites in areas without FEMs to improve our accuracy across the state.

For more information

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