

# Entegris Analytical Services

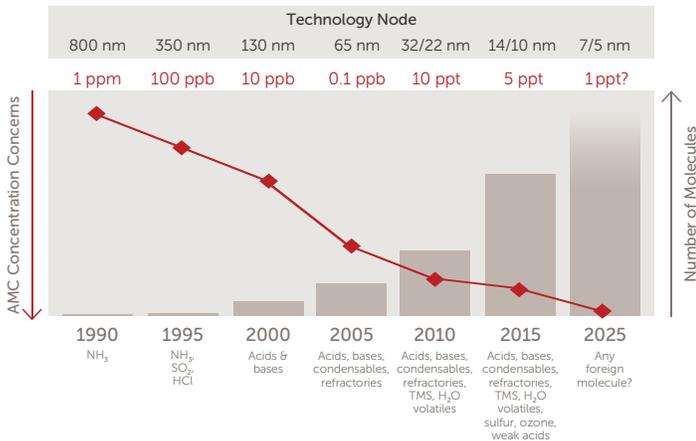
*Accurate contamination measurement is essential to control environments*

## AMC MEASUREMENT AND CONTROL

Today's technology, service, data storage, and health industries are operating in cleaner environments that are more sensitive to airborne molecular contamination (AMC), and there is a greater awareness of AMC impact on equipment, products, environments, and human health.

Early AMC concerns may have focused on a few molecules at the parts per million (ppm,  $10^{-6}$ ) level, but over time, more and more chemicals are causing concerns. Depending on industry or process, most reactive gases can have an impact in certain situations.

At the same time, the concentrations of AMC causing concern or affecting environments diminished. Many high-tech industry cleanrooms (semiconductor trend shown below) operate at AMC concentrations of less than 10 parts per billion (ppb,  $10^{-9}$ ), with many areas in the 1-2 ppb range or less, and frequent concerns about concentrations in supply gases are at low parts per trillion (ppt,  $10^{-12}$ ).



AMC measurement and control now requires advanced analytical capabilities and extremely clean materials to determine AMC in a large variety of air streams.

## ANALYTICAL SERVICES

Entegris Analytical Services is one of more than 30 Entegris laboratories and provides a worldwide commercial AMC sampling and analysis service.

The services are provided both with trained, worldwide operators taking samples onsite, or by deploying automated, customer-operated gas samplers.



Both service types measure most AMC classes in the shortest sampling time (4 – 6 hours), providing ppt-level results for sensitive environments and AMC filter installations. Clean sample handling and correct placement of sample probes upstream and downstream of AMC filters are essential for accurate filter performance measurements, and are part of the sample operator training for in-field service.

Entegris Analytical Services is one of very few commercial laboratories specializing in high-technology environments. Analytical Services is approved for ASML™ and Nikon™ scanner OEM validation and has worked with process tool OEMs to define AMC guidelines and measurement practices.

Environmental characterization, equipment installation, and AMC filter validation as well as AMC control monitoring are provided.

Analytical Services develops industry-leading analytical<sup>1,2</sup> and sampling<sup>3,4</sup> methods and provides consulting to internal and external laboratories on sampling approaches, best practices, and in-context data analysis.

Most of the Analytical Services test methods are accredited for ISO 17025, a competence standard for test laboratories. Traceability of measurement standards, proficiency test comparisons to other labs, and rigorous quality control are all requirements for this standard.



## AMC SERVICES

Analytical Services operates 3,000 square feet of laboratories exclusively for the development and support of AMC filters. The facility houses both R&D and Analytical Services labs in Massachusetts, USA. R&D develops and tests the original filter adsorbents, media, and prototype filters. Analytical Services supports quality, manufacturing, and customer installations. The co-location of labs, engineering, quality control, and manufacturing ensures that Entegris AMC filters and all materials are validated by our analytical experts at every step from idea to deployment and installation support.

In addition to the Massachusetts location, Entegris operates a laboratory in San Luis Obispo, California.

### Onsite AMC Measurements

- Ambient environments, data centers, cleanrooms, sub-fab and plenum levels, air handlers, and surrounding atmosphere
- AMC filter performance (air handlers, FFUs, tools): upstream and downstream
- Filter cabinets (e.g., Entegris E2600, E1250) using dedicated AMC sampling ports
- Inert supply gases (XCDA®, CDA, OFA, N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, Ar, He...)

### Laboratory Based Services

- Post-mortem AMC filter testing
  - Physical tests (pressure drop, outgassing, particle shedding)
  - Current removal efficiency
  - Remaining lifetime/capacity
  - Captured content on the adsorbent
- Material and gas testing
  - Material outgassing
  - Particle shedding
  - Gas purity

- Consulting
  - Data analysis and in-context interpretation
  - Method development
  - Detection limit determination

Entegris provides annual measurement programs for tool and environment operation compliance as well as on-request sampling support for troubleshooting, environment characterization, and filter performance evaluation.

### Methods Developed by Entegris Analytical Services

In 2009, the only commercially available method for measurement of volatile silicon compounds (TMS, HMDSO, D<sub>3</sub>) was published because standard trap technologies do not capture these compounds or do not release them for thermal desorption analysis.<sup>1</sup>

The laboratory further developed the TruTOC® method for the combined sampling and analysis of volatile and condensable organic AMC in one step<sup>3</sup> as well as a dry trap method for sampling acids and bases that does not require water-filled impingers or bubblers.<sup>4</sup> Both methods are new industry standards and may be available for licensing by other laboratories. Please inquire for licensing at [amc@entegris.com](mailto:amc@entegris.com).

### References

All publications can be downloaded at [www.entegris.com](http://www.entegris.com).

<sup>1</sup> [Lobert et al. Proc. SPIE Vol. 7272 727222, 2009](#)

<sup>2</sup> [Lobert et al. Proc. SPIE, 7638, 7638110, 2010](#)

<sup>3</sup> [Miller et al. Proc. SPIE 9050 90502D, 2014](#)

<sup>4</sup> [Moulton et al. Proc. SPIE 9050 90502B, 2014](#)

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