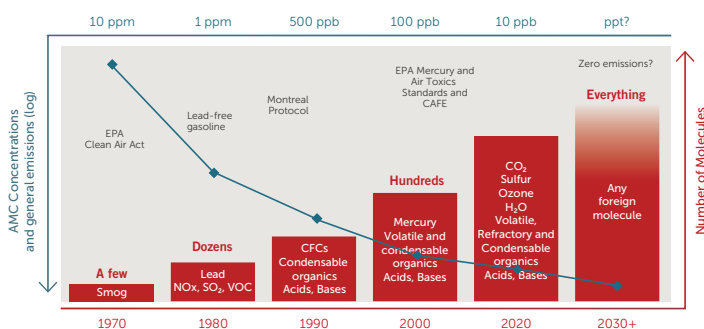


Entegris Analytical Services

Accurate AMC measurement is essential for controlling industrial environments

Today's industrial facilities are operating in cleaner environments that are more sensitive to airborne molecular contamination (AMC). There is a greater awareness of AMC impact on equipment, products, environments, and human health.

Early AMC concerns may have focused on a few gases at tens of 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 and environmental regulations became more restrictive. Health concerns are now in the parts-per-billion range (ppb, 10^{-9}), many cleanrooms operate at AMC concentrations of less than 10 ppb, with some areas in the 1 – 2 ppb range, and concerns about concentrations in supply gases at low parts-per-trillion (ppt, 10^{-12}).

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

ANALYTICAL SERVICES

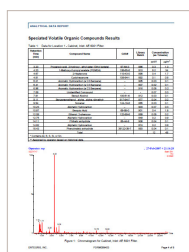
Entegris Analytical Services provides a worldwide commercial AMC sampling and analysis service to determine gas-phase contaminants.

Entegris Analytical Services is one of very few commercial laboratories specializing in low concentration measurements, providing quantitative results for individual contaminants down to the ppt-level. Corrosion strips or semi-quantitative micro balances no longer suffice to characterize sensitive environments and define AMC filter installations.

Based on decades of experience in the semiconductor industry, the service measures most AMC classes in the shortest sampling time (4 – 6 hours). That can only be done when using verified, chemically clean materials.

Our experience has shown that clean sample handling and correct placement of sample probes upstream and downstream of AMC filters are essential for accurate filter performance measurements. This is part of the sample operator training for in-field service.

The services are provided both with trained, world-wide operators taking samples onsite and avoiding guess work for our customers, and with automated, customer-operated gas samplers with one push button simplicity.



Environmental characterization, equipment installation, and AMC filter validation are provided in detailed reports, listing identified gases and their concentrations, instead of providing generalized air quality estimates like "low, moderate, severe" contamination.

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

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



AMC SERVICES

Entegris operates 5,500 square feet of laboratories exclusively for the development and support of AMC filters. The space 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 as well as end of life evaluations.

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 of the filter lifecycle.

Onsite AMC measurements

- Ambient environments, data centers, manufacturing floors, archiving spaces, cleanrooms, air handlers, and surrounding atmosphere.
- AMC filter performance (air handlers, fan filter units, tools or displays): upstream and downstream of filter
- Filter cabinets (e.g., Entegris E2000 room circulation system)
- Inert supply gases (CDA, OFA, N₂, O₂, CO₂, 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/interpretation in context
 - Method development
 - Detection limit determination
 - Inter-laboratory comparisons

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

Analytical Services published a commercially available method for measurement of volatile silicon compounds (TMS, HMDSO, D₃), because standard trap technologies do not capture these compounds or do not release them for thermal desorption analysis.²

The laboratory further developed the TruTOC® method for the combined sampling and analysis of volatile and condensable organic AMC (C1 – C26) in one step³ as well as a dry trap method for the sampling of acids and bases that does not require water-filled and artifact-prone impingers or bubblers.⁴

References

All publications can be downloaded at www.entegris.com.

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

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

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

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

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