

ACCOUNTING FOR CASSETTE WALL DEPOSITS GRAVIMETRICALLY

Background

Aerosol sampling methods typically employed in North America, specify the use of 37mm closed-face sampling cassettes. Both OSHA and NIOSH consider that all particles entering the opening of closed-face sampling cassettes should be included as part of the sample whether they deposit on the filter media or on the inside surfaces of the sampler used.

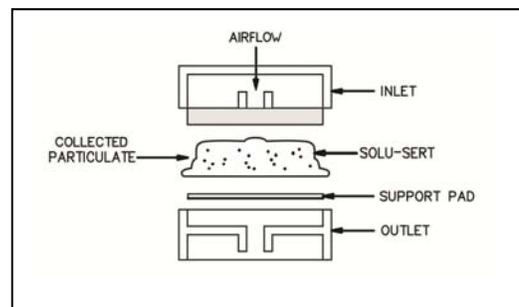
A detailed discussion of this phenomenon can be found in NIOSH Manual of Analytical Methods (MNAM) 'Sampler Wall Losses' Chapter 0 [1]. OSHA has also addressed this issue, in its gravimetric method PV2121 [2].

Why should I account for cassette wall deposits

To obtain the highest accuracy of occupational exposures, one must include all aerosol particles entering the sampler. Therefore following the collection of samples, steps must be taken during the sample preparation procedures, to account for material adhering to the internal surfaces of air sampling cassettes. Various researchers, starting as early as 1989, have shown that particles deposited on the interior surfaces of air sampling cassettes, often constitutes a significant portion of the aerosol that enters the cassette [3][4][5][6] and in some cases exceeds that that is collected on the filter [7]. Due to high variance of this wall deposit phenomenon, a standard correction factor cannot be developed. Even the act of transport can cause particles to alter their location from the filter to the walls.

The Zefon Gravi-Sert™ Solution

The Zefon Gravi-Sert™ filter capsule is a self-contained filter "cassette capsule" that captures all particles collected by a filter cassette. It consists of a PVC filter membrane sealed to a Polyvinyl chloride (PVC) shell to create the capsule. This capsule is weighed in the laboratory, then inserted into a Zefon 2-Piece filter cassette with a support pad as a



complete unit. After sampling the entire capsule is removed, and weighed again in the laboratory.

Benefits

- Recommended by NIOSH as a viable method of accounting for cassette wall deposits.
- Provides a more accurate representation of worker exposure.

FAQ

Q1. Why should I be concerned about cassette wall deposits?

A1. Studies have shown that a significant portion of the sample collection may be adhering to the walls of a cassette. By not including the deposits on the cassette walls in your sample results, your sample results are being under reported. In a typical 37mm 2-Piece cassette, up to 32% of the sample may be adhering to the wall. In a 37mm 3-Piece cassette this number increases to up to 55%. References to numerous studies supporting this are included at the end of this document.

Q2. Is inclusion of cassette wall deposits a recommendation, or an enforceable requirement?

A2. As of August 2013, this varies by agency, however it is projected that in due time all agencies will make it mandatory as standards get updated. NIOSH has begun by publically making this a recommendation, and has indicated they are starting the process of revising the methods affected by this recommendation. Standards agencies ASTM and ISO are also in the process of adding this requirement to their standards.

Q4. Which NIOSH methods can be used with Solu-Sert?

A4. Solu-Sert™ is suitable for collecting the following contaminants:

Contaminant	NIOSH Method
Carbon Black	5000
Dust – Total	0500
Dust - Repirable	0600

Q5. Who is “Air Sampling Devices, LLC”?

A5 The Gravi-Sert was designed by the founder of Air Sampling Devices, LLC, Eli Smyrloglou. Zefon has since purchased the Gravi-Sert product line from Air Sampling Devices LLC and taken over manufacturing of the product. This is enabling Mr. Smyrloglou to continue his mission of developing specialty air sampling devices. Mr Smyrloglou is an expert in membrane filtration and many other aspects of industrial hygiene sampling. He is still involved with the Gravi-Sert product and is a technical consultant to Zefon.

Prior to founding Air Sampling Devices, Eli Smyrloglou founded Omega Specialty Instruments in 1982 and served the industrial hygiene community in various capacities for 21 years.

References

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[2] OSHA method PV2121. Sampling and Analytical Methods Sandy, UT OSHA 2003
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[3] Demange, M., J.C. Gendre, B. Herve-Bazin, B. Carton and A. Peltier: Aerosol evaluation difficulties due to particle deposition on filter holder inner walls. Ann. Occup. Hyg. 34: 399-403 (1990)

[4] Demange, M., P. Gorner, .M.Elcabache and R. Wrobel: Field comparison of 37mm CFC and IOM samplers. Appl. Occup. Environ. Hyg. 17:200-208 (2002)

[5] Dobson, L.,L. Reichmann and D. Popp: Evaluation of quartz residue on cassette interiors of AIHA proficiency samples. J. ASTM Int .2(4); DOI; 10.1520/JAI12229(2005)

[6] Puskar, M.A., J.M. Harkins, J.D. Moomey and L.H. Hecker: Internal wall losses of pharmaceutical dusts during closed face 37mm polystyrene cassette sampling, Am. Ind. Hyg. Assoc. J. 52: 280-286 (1991)

[7] Harper, M., and K. Ashley: Guidelines for Aerosol Sampling Presentation.

https://bhsc.llnl.gov/documents/04_13_BHSC_Meeting/NIOSH_Guidelines_for_Aerosol_Sampling_MartinHarper.pdf