iATL INTERNATIONAL ASBESTOS TESTING LABORATORIES

Current Issues in Environmental and Occupational Health & Safety Science for the Industrial Hygiene Community

Next Level

ISSUE 2022 / 05

this issue

Regulator Considerations:

The collection of airborne particles for the determination of asbestos almost universally employs the use of membrane or polycarbonate filter media that capture the suspended particles as a certain volume of air is pulled through the filters. These particles lodged on filter surfaces and, many times, embedded into the filter membrane material, are then prepared by various means for microscopical examination.

The analytical options are numerous and varied - but share many of the same principles. The largest contributor to uncertainty is the volume of air collected and any particle interferences or particle overloading.

Analytical Options:

Building environment air surveys may, by design, or as a consequence of remediation or other disturbance activities, collect large concentrations of particulate while, it is assumed, that clearance activities, and subsequent sample collection, would usually be populated sparsely with particles.

So, what are the options when either typical work area diagnostic samples or clearance samples exceed the method's, or the regulator's, threshold for percent particulate that constitutes the samples being VOID overloaded?

My Air Samples are VOID Overload – Now What?

After countless projects and observations here at iATL from the last 35 years and hundreds of thousands of asbestos air monitoring filters examined, delivering news that samples have to be voided due to particle overloaded is received in multiple ways by engineers, building owners, and the consultants on the 'front lines'.

Surprise or Expected

While some engineering/consulting projects are surprised that some samples fail due to overloading, most tend to, without prompting, confess that the air at that time of collection was questionable due to other activities beyond their control (diesel fumes, metal or other nearby demolition, etc.) that the laboratory can many times support with observable detection of carbon black (diesel soot), iron oxides (rust), or an abundance of calcareous particles (plaster or drywall demo).

The use of cell phone cameras has offered laboratory analysts a quick means of documenting the filters before sample preparation (ex. solid black or red loading) and/or after preparation attempts under the phase contrast or transmission electron microscope. When asked, iATL provides such evidence so that the customer's client (ex. building owner) can see the concentrated collection of particles from the air onto these filters.

Why and What of Filter Loading Criteria?

So many analytical methods encourage a 'more the merrier' approach to targeted analytes. Accordingly, lead (Pb) in air by NIOSH 7082 has no minimum particle loading threshold as the chemical means of preparing and analyzing such samples is little affected by particle populations or interferences. But, the use of microscopy to determine and classify fibers on filters requires some control of uncertainty. Too much overlapping particles and fibers fade into the background. Too many types of fibers overlapping or in close proximity to each other that sometimes PCM counting criteria can be skewed and TEM chemistry (EDS) and diffraction (SAED) data can be near impossible. For AHERA the method lists 25% particulate as a threshold, while NVLAP (regulator and accreditation body) re-set that level at 10% twenty years ago.

Analytical Options

For most activities, especially final clearance projects under AHERA (40CFR763), an overloaded filter result fails the typical set of samples taken inside a containment work area. Many consultants re-clean, encapsulate, and re-collect samples for another attempt at clearance. Yet, patience too is required to be thorough, making sure that no inaccessible areas in the remediation were missed, and that any applied encapsulate has time to dry in a low relative humidity environment. Countless times, re-taking samples in containment where moist (not quite invisible) clouds of encapsulate hover, is a gamble. To make matters worse, often the consultant, before sealing the air monitoring cassette, looks down the cowl at a white filter – a quick check of loading. Yet, white pigments in encapsulate can bely problems as the overloaded filters resist direct sample preparation procedures outlined in AHERA and other relevant methods.

Next Month:

Part II – ISO 13794 to the rescue

Laboratory Holding Times and Sample Treatment Options

REFERENCE: Millette, J .R., Few, P., and Krewer, J. A., **"Asbestos in Water Methods: EPA's 100.1 & 100.2 and AWWA's Standard Method 2570,"** *Advances in Environmental Measurement Methods for Asbestos, ASTM STP 1342,* M. E. Beard and H. L. Rook, Eds., American Society for Testing and Materials, 2000.

USEPA Lead and Copper in Drinking Water Information.

Coming in June 2022 Newsletter:
Recent collaboration study of iATL and New Zealand Asbestos in Water project.

Context:

Many of us don't like surprises. In the early days of asbestos testing (1980's) before many regulatory requirements were promulgated for sample collection, preparation, analysis, and reporting – there was more license to 'let the labs deal with it' by applying basic principles of laboratory science and technology to solve problems.

So it was that in 1987 a few dozen water samples arrived – some in glass jars, others in old 2L soft drink bottles, and still others in small 50mL vials. There were a few research methods from ASTM and USEPA in the earlier 1980's that generally outlined some procedures that included water homogenization, filtration, and TEM analysis. These were not codified until the 1990's.

The surprise for us inorganic lab analysts who studied chemistry, materials science, and geology, was that after a few weeks of these samples sitting in the lab at room temperature, many still untouched, were not fit to be prepared or analyzed – in fact one of the 2L bottles burst while others had visible flocculant (some interesting colors too) and smells.

That didn't stop us though. We dug into the samples but quickly found that calculated sensitivities were abysmal as cloudy water meant smaller aliquots and larger dilutions. Further, even for samples we thought we had neutralized with acid and low pH, many still were difficult and barely any asbestos detected. We were so ignorant of those samples, the issues, and the whole science of sample collection, preservation, and treatment options. "The burned hand teaches best!"

Ask your iATL customer service representative about sample submittals for lead (Pb) or Copper (Cu) or Asbestos in water. Chains of Custody, Sample Logs, Pre-printed labels, and information on holding times and treatment options summarized.

Whys and Wherefores

What is a holding time, and why should we know about it? A "holding time" is the elapsed amount of time from the point of collection to the moment of preparation or analysis. Note that this is not the date/time of receipt at the lab! If samples are analyzed beyond an analytical holding time, the data will be qualified on the analytical report and may not be usable for compliance.

The analytical hold time to a sample is like an expiration date to a carton of milk; past the hold time, analysis technically can still be performed (just as milk may be consumed after it expires), the results, however, in both cases may be *unsavory*. There are very few allowances for missed hold times and in almost every case, resampling is required.

You should get samples to the lab as quickly as possible, as holding times are different for various analytes. For Pb and Cu in drinking water USEPA lists 6 months with turbidity and pH checks and preserving the samples in the lab at pH <2 (nitric acid) for at least 24 hours before any prep/analysis. For asbestos in drinking water, there is a tight 48 hour window with samples cooled to <4°C in specific 1L bottles.

History Lesson

While basic inorganic analytes have reasonable holding times the asbestos drinking water times and consequences of missing published requirements can sound extreme. Asbestos in water testing issues traces its history back to the early days of the Clean Water Act in 1972 and related National Primary Drinking Water Act in 1974. Further studies by USEPA and Phil Cook and Nicholson in 1974 concerning taconite (grunerite cousin) in Lake Superior and the seminal research in 1979 by Chatfield and Dillon on a Canadian Survey of Water Supplies was further supplemented by Millette et al in the 1990's. The latter two became the basis for EPA's Asbestos in Water Methods 100.1 and 100.2 and associated testing for municipal utility authorities (MUAs) requirements in the US. The best summary explanation (15 pages versus over 400 pages) is referenced above.

Asbestos Water Sample Specs

The original sample preservation rules required the addition of a highly hazardous compound to prevent bacterial growth and avert organic/silica interface of colloid-like bio-film on glass bottles. Mercuric Chloride ($HgCl_2$), used to treat syphilis, was added (below image) in small volumes - yet the resulting toxicity outweighed the benefit. This is still listed in 100.2 but not practiced today.

Current Preservation Options

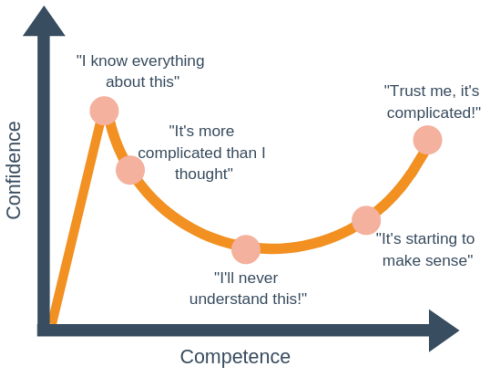
Many samples require some sort of treatment as the 48 hour holding times are frequently missed. If the sample is out of holding time and/or has a turbidity that exceeds 1.0 NTU then the remedy is to treat the sample by percolating ozone (O_3) through the sample for several minutes while a UV lamp is inserted into the water bottle. This is relatively expensive and requires some clean-up, yet the combination of the two sufficiently controls any biological growth.

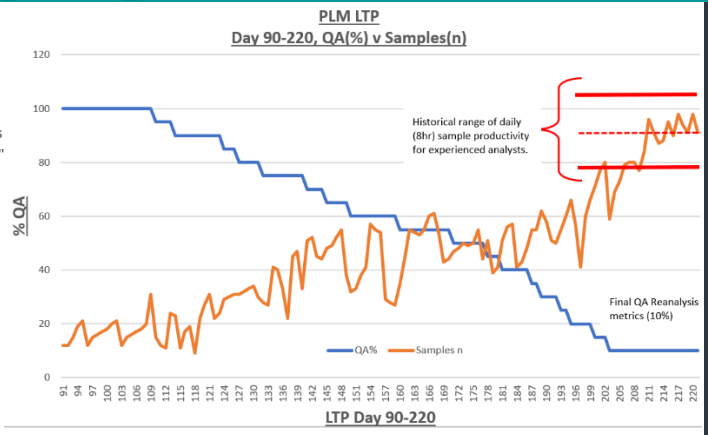
MCL : MFL

While most of the environmental professionals operating in the realms of organic and inorganic water testing are used to seeing maximum contamination levels (MCL) and related threshold values in various SI units (PPM, PPB, mg/kg, ug/L, etc.) there is a bit of a shock when we receive calls from MUAs and other environmental engineering types who think there may be a typo with results reported in MFL.

We already have a template listing USEPA's 7 Million Fiber per Liter (MFL) MCL ready to respond to such inquiries. "Wait, you mean to tell me that this tap water can have 6MFL and it would be acceptable?" Yep. Welcome to our world.

Laboratory Training Programs – Part 3





Recap from Part 1 and 2

The last two issues our Next Level newsletter briefly mentioned why we invest roughly 10% of all lab staff hours in initial and ongoing training modules (regulatory & accreditation requirements), how we train, and what is captured to document the training. It continued with mention of USEPA's specific Laboratory Quality System Requirements (LQSR) and the concept of "4x5" lab performance documentation whose data and narrative could be summarized in Demonstration of Competency (DOC).

Microscopy Training Process

In the 1980's into the 1990's several iATL microscopists travelled to Chicago to the acclaimed McCrone Research Institute and received basic and advanced training in a number of microscopy techniques from the likes of Walter McCrone, Peter Cooke, John Delly, Ian Stewart, etc. One thing that the instructors immediately impressed upon the students – you cannot be a microscopist in one or two weeks. In fact, there are many *microscope users, but much much less microscopists*. As such, at iATL while typical Chemical Department Lab Training Programs (LTP) may take 1-2 months of classroom, hands-on, and operations training – the use of an optical microscope for identifying and classifying suspect minerals in building materials is a considerably longer commitment.

Dunning Kruger Concept

PLM LTP at iATL takes on average 3 months of training in classroom, with mentors, hands-on, and lonely individual iterations of principles and application techniques that are a part of microscopy growth. The principles of the Dunning-Kruger effect are always in play. As such, we want analysts to incrementally understand failure and learn from those valuable missteps towards greater awareness and competency. It is a long road fraught with pitfalls, obstacles, and eventually - reward. After that three-month period a long steady climb towards 'microscopist level' is achieved (5-6 months) and the return on the LTP investment realized only towards 9 months. The graph on the right graphically displays these latter months efforts with QA%, numbers of samples, etc.

LTP Part 4

Annual Data Integrity Program (DIP) training and monitoring provisions will be covered next month.

EYE ON IT

NIOSH 7402

Officials at the Cincinnati offices of OSHA's laboratory institute have approached iATL's long-tenured Laboratory Director, Frank Ehrenfeld, to Review and Edit the long-awaited revision to this important analytical method. Frank was approached in late 2021 by NIOSH officials in his capacity as ASTM International's D2207 Chair on Asbestos and through his involvement for over twenty years with AIHA LAP committees. Sounds like a future update in future Next Level newsletter.

iATL Customer Resources

Because you asked…

Respirable Crystalline Silica (RCS) pump and ancillary sampling equipment rental availability. Contact CustomerService@iatl.com and ask for a project quote.

This Month's Q&A

Q: Why can't the laboratory provide composited analysis of plaster and textured surface layer?

A: Unlike the NESHAP allowances for specific multi-layered wall systems (drywall/joint compound) other multi-layered samples, if those materials are separable (USEPA 600 R93/116 Sec 2.1.5.1) then they must be analyzed and reported separately. NESHAP updates in 1994* and 1995** clarify that…

"Add-on Materials: All materials ``added'' to wallboard or other base materials (e.g., sprayed-on materials, paint, ceiling or wall texture, etc.) must be analyzed separately, if possible. The results of the analysis of those individual layers of ``add-on'' material may not be averaged with the result of the analysis of wallboard for a composite result, but must be analyzed and reported separately. Where a thin coating of one material is applied over another material and the materials cannot be separated without compromising the layers, the analysis may include a small amount of the base layer. If for example, a paint layer containing asbestos is spread over a wallboard layer, and the paint layer cannot be separated from the wallboard, then a small amount of the wallboard layer may be included in the sample of the paint. If any of the ``add-on'' materials meet the definition of regulated asbestos-containing material (as defined in 40 CFR 61.141), and if at least 160 square feet of the material(s) are involved in demolition or renovation (whether planned or unplanned during a calendar year), then the project would be subject to the asbestos NESHAP."

* USEPA, 40 CFR Part 61 [FRL-4821-7]
** USEPA, 40CFR Part 61 [FRL-5399-3]

Professional Development

Is it time to increase your understanding and awareness of some nuanced technical issues? email info@iatl.com.

2022 iATL Online Workshops

iATL Laboratory Director and noted speaker and presenter, Frank Ehrenfeld, will reprise many recent workshop-style presentations for our clients throughout 2022. Expect registration news in coming weeks for March, May, July, September, and November offerings. Topics may include:

- Asbestos and Talc Issues
- Erionite and other EMPs
- Natural Occurrences of Asbestos (NOA) – Evolving International Solutions
- Analytical Methods for Asbestos & International Advances
- WTC 9/11, 20 Years Later Lessons Learned
- Asbestos in Dust - Updates
- Asbestos in Water – What's New
- In situ Asbestos Analyzers
- Asbestos Disease Med Updates
- Vermiculite Method News
- Asbestos Work Practice Studies
- Asbestos in New Building Mat'ls
- Asbestos Vitrification – Updates
- Artificial Intelligence (AI) and Asbestos Analysis Progress
- eLearning through ASTM Int'l
- Combustion By-Product Analysis: Fire, Insurance, and Forensics

Registration for May 19, 2022, Webinar available here.

Register

Current Trends in NOA and Asbestos Soil Issues

Summer School Specials:

No, not summer school as in you failed Phys-Ed and have to go sit in a sweltering gym for the month of July – but Summer, School Specials! Though there continue to be a fraternity house soup of covid variants, beta, omicron, delta, deltacron, etc., the possibility of a more 'normal' summer activities with travel, vacations, and related family events, look promising as vacation and booster rates inch up. This may mean that long-overdue school renovations and asbestos remediation projects will be in your professional summer mix. iATL would like to celebrate those projects with discounts and specials on school air monitoring and clearance sample submittals. The link provides direct connection to our Customer Service representatives who can send you information and rates.

iATL Customer Service Contacts:

Need assistance with questions on upcoming projects, or information on samples in the laboratory? Get answers from staff during normal business hours – or contact us…

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Ask us about iATL's interactive LIMS Database, **iTRACC** Client Portal
- for your devices
- for your convenience

Upcoming Events

- AIHce Annual Conference and Exhibition
  May 23-25, 2022 Nashville TN
- ASTM Intl Johnson/Rook Asbestos Conf.
  July 25-29, 2022 Burlington VT
- Association of Enviro/Eng Geologists
  Sept 13-17, 2022 Las Vegas NV
- ASTM Int'l Symposium: DLs for Air Quality
  Oct 19-21, 2022 New Orleans LA

Next Issue for Next Level

- NZ and iATL Asbestos Water Study
- Lab Training Part 4, Data Integrity
- Overloaded Samples – Part 2

Link to archived Next Level issues

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