CASAC AAMM Subcommittee Review of
Ambient Air Lead Monitoring Method - Consultation

Comments by AAMM Subcommittee Member Yousheng Zeng

General Comments

I have some general comments that affect my responses to this set of charge questions. I am presenting these general comments first.

The main reason for Pb-TSP (as opposed to Pb-PM_{10}) is to capture and include the portion of Pb that is associated with ultra-coarse particles (d>10 μ) in ambient air. Sources for the ultra-coarse particles include stationary industrial sources and resuspended particles that have settled on the ground in the past. Industrial sources emit both Pb-PM_{10} (mainly associated with combustion or high temperature processes) and Pb-TSP (mainly associated with mechanical processes such as material handling), but their emissions of Pb associated with ultra-coarse particles are becoming less and less. With promulgation and implementation of MACT standards for Primary Lead Smelter (40 CFR 63 Subpart TTT), Secondary Lead Smelter (40 CFR 63 Subpart X), and Lead Acid Battery Manufacturer, as an Area Sources, (40 CFR 63 Subpart PPPPPP) from late 1990s to 2007 (in addition to NSPS standards promulgated earlier for the same source categories), Pb-TSP emissions points at these industrial facilities are controlled by fabric filters or scrubbers. Process areas that were used to be fugitive emission sources (such as material transfer, charging/discharging, etc.) are now required to be enclosed and controlled. Exhaust streams controlled by fabric filters and scrubbers have very little ultra-coarse particles. In addition, outdoor material piles and in-plant roads are subject to work practice standards (e.g., water spray) to minimize wind induced emissions, which without these work practice standards would contain more ultra-coarse particles. Stationary sources in other source categories that involve handling of Pb containing materials (e.g., copper smelter) are also subject to similar MACT regulations. With all of these controls, the ultra-coarse particles from stationary sources are (or will be) very minimal. The primary sources of the ultra-coarse Pb-bearing particles are becoming resuspended dust in regions that have high Pb level due to past activities. Ultra-coarse particles become resuspended in ambient air due to mechanical disturbance (e.g., vehicle traffic and wind) and they are not just from inside of industrial facilities. A large portion of ultra-coarse particles are (or will be, upon full implementation and enforcement of the abovementioned MACT standards) from dust outside of stationary sources.

As required by the Clean Air Act, EPA is conducting residual risk assessment for these Pb stationary sources after the applicable MACT standards are implemented. According to the information posted on the EPA Air Toxics Website, the information on residual risk for Primary and Secondary Lead Smelters will be available this summer. These residual risk assessments should offer some insight on air quality impacts of these stationary Pb sources.

With this backdrop, I wonder why EPA would want to direct its resources to develop a better method for monitoring Pb-TSP. It probably will not significantly improve agency's ability to further control ultra-coarse Pb-bearing particles from stationary sources. For the contribution from resuspended dust, it is

more effective to manage it through programs outside of air programs, such as remediation, land-based stabilization, changes in land use and landscaping, etc.

Pb-TSP is a more relevant parameter to the Pb ingestion pathway than the inhalation pathway. The main technical issue surrounding the Pb-TSP samplers is the inlet designs that primarily affect collection of ultra-coarse particles. However, the ultra-coarse particles do not affect the inhalation pathway. They affect particles' deposition flux and eventually link to ingestion pathway. It would be more direct and effective to monitor Pb deposition rate rather than coming up with an arbitrary sampler to capture some portion of ultra-coarse particles. Even monitoring Pb deposition rate does not seem necessary if the main source is resuspended dust. With stationary sources becoming less and less significant active origins in the chain that lead to Pb ingestion, the Pb environmental issue not associated with inhalation pathway should be managed through other environmental programs. Only the inhalation pathway should be the focus of the air programs.

Unlike Pb-PM_{10} which can be directly linked to an environmental regulatory endpoint, Pb-TSP is related to, but is not directly linked to an environmental endpoint (ingestion risk). Monitoring Pb-TSP may be useful in terms of assessing how much Pb is still supplied by controllable stationary sources. The Pb-TSP data can feed to the other media or pathways that lead to an environmental endpoint, which should be managed through other media program. When active stationary sources are no longer injecting significant Pb-TSP into an airshed, the importance of monitoring Pb-TSP diminishes. It will be more effective to start from the next point in the chain, which should be the Pb content in the dust that can be cause ingestion exposure.

Charge Question 1: Would a low-volume Pb-TSP sampler be an improvement over the existing high-volume Pb-TSP sampler? What advantages and disadvantages do you see associated with a low-volume Pb-TSP sampler?

EPA has presented some advantages and disadvantages of a low-volume Pb-TSP sampler and I agree with EPA's assessment on these advantages and disadvantages. However, based on my general comments above, I would not recommend EPA to develop a low-volume Pb-TSP FRM sampler.

Charge Question 2: What inlet designs would be best suited for a low volume sampler? What designs are not appropriate for a low-volume Pb-TSP sampler?

There is really no good solution to this because the purpose of the Pb-TSP sampler is not clearly linked to an environmental regulatory endpoint. If EPA really wants to do this, the inlet should be designed to capture as much PM as the sampler can to represent the PM that can settle and become a source for ingestion pathway.

Charge Question 3: What is your preferred approach for the development of a low-volume Pb-TSP sampler, and why?

For reasons described in the General Comments section above, my preferred approach is for EPA to evaluate/confirm the contributions from resuspended ultra-coarse particles vs. active stationary sources using the data that represent the conditions after MACT standards are fully implemented and enforced. If active stationary sources are no longer a significant contributor, it will be unnecessary for EPA to develop

a low-volume Pb-TSP sampler. If EPA or state agencies would like to monitor Pb-TSP as a sunset parameter, the existing Pb-TSP FRM can satisfy that need. It does not make a lot of sense to me to pursue a better monitoring method while we don't know how to use the monitoring results to assess environmental impact. The Pb risk associated with ingestion pathway can be assessed through proper exposure assessment supported with Pb concentration data from each media.

If EPA cannot confirm diminishing contributions to Pb-TSP by active stationary sources due to time constraint, it should be fine to continue to use the existing Pb-TSP until next review cycle.

Charge Question 4: If the EPA were to develop a low-volume Pb-TSP FRM, how important is it that the sampling capture efficiency be characterized for varying particle sizes?

It would be important to understand the sampler capture efficiency with respect to particle sizes. In this case, all particle sizes should be captured for the purpose of assessing ingestion. Again, for reasons stated above, I don't see the importance of developing this FRM. If ingestion risk is a concern, it better to monitor deposition flux.

Charge Question 5: If the EPA were to develop a low-volume Pb-TSP FRM, should the new FRM replace the existing high-volume Pb-TSP FRM, or should the EPA maintain the existing FRM?

Again, I don't recommend this path. If EPA insists, EPA should develop a sampler that can provide consistent, reproducible results (even the capture curve is somewhat arbitrary). The newly developed low-volume Pb-TSP FRM is at least expected to minimize the variation of monitoring results with changing wind directions, be better characterized for its particle capture efficiency curve with respect to particle sizes, and have some operational advantages than the bulky high-volume sampler. Therefore, it should replace the existing high-volume sampler. There may be an issue with data comparability with historical data. However, if we gave too much consideration to historical data, we would never correct deficiency and move forward. Plus, this issue of data comparability with historical data should be manageable and not disruptive.

Charge Question 6: Is it appropriate to accept alternative sampler and inlet designs as FEM?

Yes, as long as the procedures in 40 CFR 53 for equivalency are followed. I assume this question is about establishing FEM using the newly developed low-volume Pb-TSP FRM as the reference. Please note that I don't support this idea (see above responses).

If the question is about establishing a low-volume FEM to match the existing hi-volume FRM, I would not recommend it because the reference method is not well characterized. It will be like shooting a moving target. It would be better to just continue to use the high-volume FRM.

Charge Question 7: Are the proposed FEM testing criteria for Pb methods adequate to ensure equivalence of alternative sampler and inlet designs? If not, what additional testing requirements should be considered?

See my response to Question 6.