DWTU Task Group on Lead Standard

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1. Originally, the JC created this TG on Higher Lead Influent to investigate how to account for situations encountered in Flint, MI, when spikes of greater than 1000 ppb lead were encountered and to satisfy the demands of Academic and Regulatory community, if the treatment devices, certified for pH 8.5 lead removal under current NSF Standard 53 at 150 ppb lead influent, are still able to meet the standard requirements.

2. Current NSF 53 Standard for lead removal stipulates that the influent challenge should be a combination of soluble and particulate lead and that the particulate lead must consist of a) Total Particulate lead between 0.1 and 1.2 micron between 30 to 40% and b) the Finer Particulate lead between 0.1 to 1.2 micron be greater than 20% of the Total Particulate. The Total and Fine particulate lead is determined by filtering the influent solution through a 0.1 micron and 0.45 micron, 1.2 micron and 5 micron PVDF absolute syringe filters and measuring the filtrate for lead concentration as well as Original unfiltered lead solution after acidifying the samples to pH <than 2.

3. Following equations the yield the speciation as follows:
   a) Total Particulate Pbtp=((Pbt-Pb0.1µ)/Pbt)x100
   b) Fine Particulate Pb=((Pb1.2µ-Pb0.1µ)/Pbtp)x100. To determine the fine Particulate Lead further:
   c) Particulate%(Pb0.45µ-0.1µ)=((Pb0.45µ-Pb0.1µ)/Pbt)x100
   d) Particulate%(Pb1.2µ-0.45µ)=((Pb1.2µ-Pb0.45µ)/Pbt)x100. Please note that c+d=b
   e) Particulate% (Pb>5 µ)=(Pbt-Pb5µ)/Pbt)x100
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3. This TG found out that once the concentration of lead exceeded the 150 ppb, under the high TDS (>100ppm) and pH 8.5 test waters, the size of the lead particles tends to be much higher than 1.2 micron and as high as 5 micron and above at 1000 ppb lead concentration, violating the Particle Size Distribution requirements of NSF 53 standard.

4. Despite this, in order to satisfy the demands of Academic and Regulatory community to show that devices are still effective, the TG was proposing to subject the devices to two spikes at 50% and either 120% or 200% of the capacity, depending on the presence or absence of Performance Indicator Device (PID).
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5. Around November of 2019, another situation arose in Newark, NJ, where treatment devices, certified for NSF Standard 53 for lead removal, failed to perform. The JC at that time, urgently expanded the scope of this TG to investigate this situation and recommend the overall solution to the Lead Standard.

6. Under this expanded scope, the TG found out that waters around Newark and in fact throughout Northeast, were low in TDS (<100 ppm), had pH between 6.5 to 7.5 and were treated with Orthophosphate at between 3 to 6 ppm as PO₄ for corrosion inhibition. The speciation of the actual lead particles in these waters was drastically different from that formed in the Standard 53.
7. Presence of Orthophosphate at 3 ppm as PO4, increases the Total lead particulate above 0.1 micron to 40 to 70% and above; and Fine Particulate between 0.1 to 1.2 microns to 70 to 100%. Out of the Fine particulate, a large portion, 50 to 60% was between 0.1 to 0.45 micron. It is this portion that is hard to remove that caused the Newark problem.

8. During the last Conference Call in April, the TG was presented with a DRAFT Proposal for a new Lead Standard that included:

1) Current high TDS (>100 ppm), pH 8.5 protocol at 150 ppb lead influent with optional 2 spikes of 1000 ppb lead at 50% or either at 120% or 200% of the capacity, depending on the presence or absence of PID;

2) Current low TDS (<100 ppm), pH 6.5 protocol with 150 ppb soluble lead influent; and a

3) New protocol with low TDS (<100 ppm), using pH between 7 to 7.5 with 3 ppm Orthophosphate as PO4
8. During the last Conference Call in April. The TG decided that, since the Protocol #3 above with low TDS and Orthophosphates, was the most difficult and urgent one, the TG should table the Protocol #1 on Spiking and concentrate on the development of low TDS Orthophosphate protocol, starting with a Round Robin Test with various laboratories to validate the reproducibility, consistency and stability of lead particle size distribution between the various laboratories.

9. Pursuant to that, an invitation has been sent to various interested parties to participate in the Round Robin Test, requesting the response by May 8.