MEMORANDUM

24 March 2017

TO: Leon Brasowski, Covanta

cc: Gioseph Anello, Durham

SUBJECT: AMESA Comparison Testing

Since our teleconference earlier this week I have been doing some investigation and thinking about how to approach the testing.

We all know that the results of the stack testing show that the levels in the stack are well below the limits set out in the ECA for the facility. The stack testing values obtained by ORTECH in the Fall 2016 testing are so low that the uncertainty in the value is high – I would suggest that it would be above the ±50 pg TEQ/Rm^3 uncertainty that has been documented for concentrations at the Canadian LOQ of 32 pg TEQ/Rm^3. With that level of uncertainty, the AMESA cartridge results from the Fall 2016 testing agree with the stack results.

That simple comparison ignores the problem that the comparison between M23 results and the AMESA cartridge is a bit of an "apples and oranges" one – the M23 sample includes all the materials caught in the sampling train; the AMESA cartridge analysis approach ignores the material trapped in the probe and nozzle of the system. Including the probe catch with the AMESA cartridge, the AMESA results are at least an order of magnitude higher than the M23 test results – 5 – 59 times higher depending upon the sample.

It is recognized in the European standard – CEN/TS 1948-5 – *Stationary source emissions – Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs – Part 5: Long-term sampling of PCDDs/PCDFs and PCBs* – that the lower the stack concentration the greater the expected departure from agreement between reference method and long term sampler results. The standard states ±35% at 100 pg and ±100% at 20 pg levels and applies this for comparisons to the standard reference method. The comparison uses samples taken at a fixed point as close to the long term sampling nozzle as possible without interfering with its function. The sampling and comparison strategy is described below:

7.1 i) 4) Long-term sampling and standard reference sampling according to EN 1948-1:2006, 7.2, a) and 7.2, b) shall be performed in parallel during a specified time period (at least 40 h). The long-term sampling as well as the standard reference sampling is performed for 6 h to 8 h. The sampling unit including the filter of the standard reference methods are exchanged, whereas the sampling unit including the filter of the long-term method are kept for the specified time period. This results in one sample for the long-term method and a mean value of multiple, at least five samples for the standard reference methods.

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This implies that at a minimum five 8-hour M23 runs would be required. In the ideal world, the sampling train could be withdrawn from the stack at the end of the 8-hour period and a new clean train introduced within 15 minutes so sampling could continue. This would negate the need to do anything with the AMESA system during the switch over, although the TS does state that:

7.1 i) 5) During interruption of the sampling, the sampling probe of the long-term sampling system shall be secured against any contamination. This should be done in the same way as during regular interruptions in the sampling process, e.g. by thermal desorption and reverse flow purging or by closing the nozzle, if appropriate after having removed the probe.

The samples could be recovered from the completed train and it could be cleaned and reassembled for the next run. Done during a period when other sampling was going on at the site, sufficient sampling staff would be present to available to do the sample recovery and cleanup; however, the ideal round-the-clock operation would require operators to be spelled off on a regular basis.

Turning the AMESA pump off for the "15 minute" changeover period would likely not have a major impact even though particles are "falling" in the stack at the sampling location and could enter the nozzle. Alternatively, this problem could be minimized if the probe were purged by reversing the flow with compressed air through the probe liner and nozzle – the appropriate connecting piece is available for at least one of the units. I would be concerned with following the purge procedure if the downtime were to be extended to a considerably longer time – say 16 hours. However, extending the testing to 8 hours per day would also extend the duration of the sampling period to a full week adding to the labour costs.

At the end of the AMESA sampling period, the cartridge would be recovered and the probe and nozzle would be cleaned.

The straight 6 – 8 hour comparison of M23 and AMESA results mirrors the RATA approach in the Performance Standards issued by the US EPA but these call for a minimum of 9 tests to be compared. If we were to run 10 tests with the AMESA and M23 – say 5 on each stack and combine the results – assuming the AMESA performs the same way in each unit we are talking 2 test teams for 5 days. Moreover, since there are 2 AMESA samples and 1 M23 sample for the laboratory from each test and thus there would be 30 samples to be analysed.

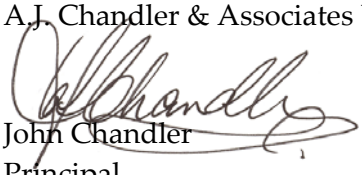
From a cost point of view, sampling in shifts over a two-day period with a team to recover the samples from the train and clean it for the next run, might be the preferred approach. Both AMESA units could be tested in this way in a week without requiring excessive equipment because they could be done back to back. Moreover, there would be 5 or 6 M23 samples to be analysed and only 2 AMESA samples, from each unit, this would half the analytical budget.

One thing I think would be worthwhile is to separate the M23 analyses into front half and back half (before and after the filter) with the filter being included with the cartridge. This is similar to the AMESA glass wool plug filter being analysed with the cartridge. This would add to the analytical cost, but might provide a better understanding of what might be in the AMESA probe albeit we are dealing with heated versus cooled probes.

I thought I would get these thoughts out quickly so the approach could be considered by Leon in consultation with ORTECH.

Comments on the Fall AMESA data will be forwarded next week.

A.J. Chandler & Associates Ltd.



John Chandler
Principal