

Report on the Final Review of Assessment Methods for the Durham York Energy Centre May 2016 Source Test

Project J16058

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Introduction

This project was commissioned by the Region of Durham to provide independent audits of all procedures related to source sampling and assessment of the Durham York Energy Centre (DYEC) during the May 2016 campaign. The source testing was undertaken by Ortech, using source sampling methods described below. Media and materials for the sampling were provided by Maxxam Analytics and samples were processed at Maxxam Analytics' laboratories in Mississauga. Maxxam is a division of Bureau Veritas and has various accreditations, including the Canadian Association for Laboratory Accreditation Inc. (CALA) accreditation in Canada, which references the ISO 17025 operational protocols for the laboratory and the methods of processing. This level of accreditation involves validation of methods, evidence of training and proficiency of analysts and includes producing evidence that procedures are followed as documented at every stage of processing including tracking of samples, tracking of batches of sampling materials, standard reference compounds, surrogate materials and procedures. Levels of documentation include the methods for processing of samples and their validation in the laboratory and the data processing and quality assurance/quality control (QA/QC) procedures used to qualify the data. The compliance modelling was also conducted by Ortech using methods and guidance outlined in Ontario Regulation 419/05 (O. Reg. 419/05), as well as the facility's Environmental Compliance Approval (ECA No. 7306-8FDKNX).

The process and field sampling audits were undertaken by Martin Adomait, P. Eng., and his assistant of Adomait Environmental Solutions Inc. (Adomait). Adomait has 20 years of experience in undertaking source testing and has conducted hundreds of source testing projects in various environments since its founding in 1996. The laboratory audits were undertaken by Airzone One Ltd. (Airzone). Airzone and predecessor companies have specialized in air monitoring and analysis and modeling of atmospheric processes since 1979. Airzone has a CALA-certified laboratory headed by Phil Fellin, M.Sc. (44 years of experience with Ontario Ministry of the Environment and Climate Change (MOECC), Environment Canada, Airzone and predecessor companies). Part of the laboratory audit was undertaken by Dr. Lucas Neil, who has 13 years of experience in air monitoring and analysis of environmental samples and proficiency in the modeling of airborne compounds required for this project. The modeling audit was conducted by Airzone and was headed by Dr. Neil, with assistance from Dr. Franco DiGiovanni (20 years of experience with Environment Canada, Airzone and predecessor companies).

Source Sampling Audit

Adomait Environmental Solutions Inc. (Adomait) observed the sampling of two stack trains at the Durham York Energy Centre, focusing specifically on the sampling of semi-volatile organic compounds (SVOC) that was conducted between May 4th and May 11th. Mr. Derek Ottens of Adomait was responsible for observing the stack samplers throughout the process. Mr. Ottens' observations focused primarily on the stack sampling methods and implementation procedures. The observations are divided into the pre-sampling, sampling, and post-sampling activities. Mr. Martin Adomait observed the instrumentation in the process control room during the sample collection periods.

Process Control Room Operations Review

The purpose of auditing the operations and controls was to understand how the process is controlled and how the parameters of interest are measured to achieve acceptable levels of emissions, most importantly those of dioxins and furans. Also, it was important to observe how production is measured and how a maximum production scenario could be defined. Short-term readings can provide information about equipment limitations and, also show how an operator's troubleshooting experience can beneficially rectify problems.

Dioxin and furan emissions are minimized by their destruction in the incineration chamber when temperatures are maintained at greater than 1000°C for a period of at least one second. Once the gas leaves the combustion zone, the gas stream must be cooled quickly to prevent the reformation of the dioxins and furans. Cooling the gases, however, may lead to the formation of hydrochloric and sulphuric acids. Introduction of lime and carbon are control technologies routinely used to control acid, mercury and dioxin and furan emissions. Lastly, particulate matter, with associated dioxins and furans, are removed with efficient filtration systems.

The control systems are crucial to understanding how the process is operating at any moment. Several key parameters were observed during the audit period. The temperature of the incineration zone is monitored by two thermocouples and an infrared temperature measurement probe. Once the gas leaves the furnace, it loses heat energy to the boiler tubes and the exhaust temperature decreases prior to entry into the quench tower. Once the exhaust gas leaves the quench tower, the temperature typically decreases to a constant level of 143°C to 148°C depending on the boiler. After the introduction of lime/carbon, the temperature falls again before reaching the baghouse. Lime injections vary depending, in part, on the concentrations of hydrogen chloride and sulphur dioxide, but carbon is injected at a constant rate of 5 kg/hour.

Throughout the day, the inlet temperatures of the quench tower increased. Covanta believed this to be partly due to the accumulation of particulate matter on the boiler tubes, which reduces heat transfer. However, the quench tower, through the control system, proportionately increases the water flow to stabilize the quench tower outlet temperature, since this is required to sustain efficient operation of the baghouse. Despite the increase in the inlet temperatures to the quench tower throughout the day, the temperature of the baghouse was maintained to within 1 or 2 degrees of the desired control temperature. This important pattern was observed on several days of auditing. If temperatures of the baghouse are not effectively controlled, the exhaust gas temperature will increase, possibly leading to the release of the semi-volatile dioxins and furans that are retained on the filter bags.

The temperature probes and other analyzers generally displayed consistent stable values of outlet temperatures, CO₂, O₂, HCl, and NO_x. CO₂ and O₂ concentrations were a function of the combustion stoichiometry, whereas HCl was controlled by the lime injection rate used to neutralize the acid. NO_x concentrations were more variable. Control of NO_x was achieved mainly with the non-catalytic reduction system with ammonia injection. In general, all the combustion gases were well controlled and maintained below the emission limits specified for the facility.

Moisture in the stack was measured with a dual set of wet/dry oxygen analyzers. The moisture results varied over a wide range from 0% to 25%. Although some short-term one minute readings were erroneous, the longer-term averages agreed with manually integrated methods, such as the stack test results. While longer-term averages of moisture readings may agree with stack testing results, short-term deviations may have a significant impact on the flow rates. If the moisture in the exhaust flow goes to zero, the dry gas flow will change proportionally, as will the emission rates of all substances. While the impact is short lived, this will affect the one minute readings. Specifically, the short-term averages of the CO levels could be affected, leading to non-compliance with respect to CO emissions. Therefore, accurate moisture readings are critical to maintaining accurate flow rates. The flow rates were generally stable from ~ 81,000 to 88,000 m³/h, but occasional excursions of the rates to levels as high as 130,000 m³/h were observed.

According to the MOECC, stack testing is to be conducted at maximum production rates. Refuse has a variable calorific value and, hence, the number of crane loads represents a poor measure of production. Production is better defined in this facility by the daily weight scale numbers and, potentially, the measured steam flow. Although the scale house weights were not reviewed, the steam flow was observed over the short term. Steam flow ranged between 31,000 kg/hr to 34,000 kg/hr. As long as the burners were operating, the levels were mainly consistent.

Two operational challenges were observed, namely:

- Bridging of the refuse hoppers, and
- Carbon monoxide spiking.

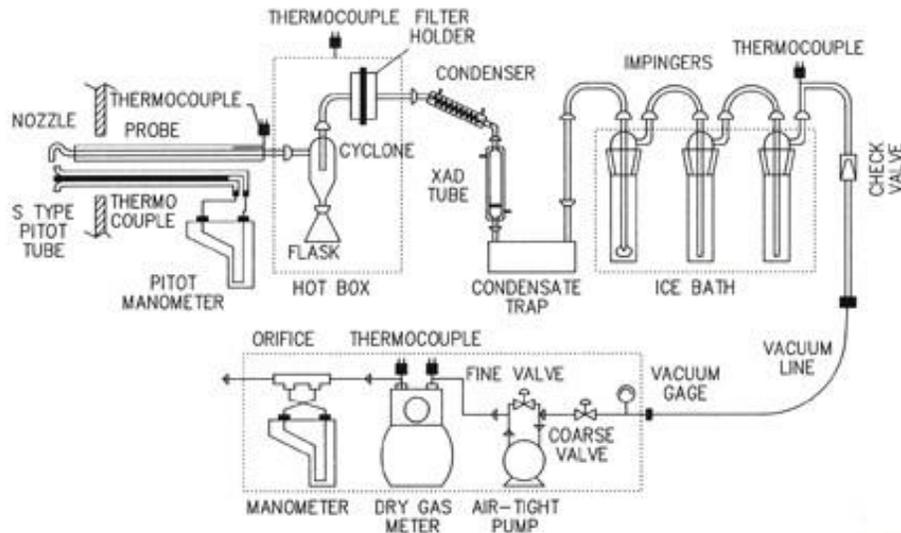
Bridging of the hoppers occurs when large objects, such as mattresses, block the hopper and prevent constant delivery of waste to the incinerator since the hopper may be too small for the type of refuse it is receiving, or operators may overfill the hoppers. Bridging of the hoppers may affect emissions since emissions depend on a steady feed of materials for incineration. Note that during one such incident (mattress blocking the hopper) sampling was suspended and the boiler was shut off, as per the facility's standard practice.

Carbon monoxide spikes are likely a function of variable combustion within the furnace. Currently, excessive CO spiking is controlled through the use of CO burners. However, the operator will only use CO burners when notified by the control system. Since the CO signal is derived from the end of the operation, there may be a significant delay in responding to the alarm. It would be advantageous to locate a CO monitor closer to the furnace, to allow the operator to make operational changes quickly. This would help reduce the elevated CO levels and hence improve compliance with the ECA criteria.

Sampling Methods

SVOC samples were collected following the procedures in EPS 1/RM/3 and US EPA Method 23. Figure 1 shows a diagram of the sampling train that requires sampling the stack gas at isokinetic flows. The gas was drawn through a filter, followed by a condenser and XAD trap, then through a condensate trap, and finally a set of three impingers; the first filled with 100 mL of ethylene glycol, the second empty, and the third with silica gel, in that order.

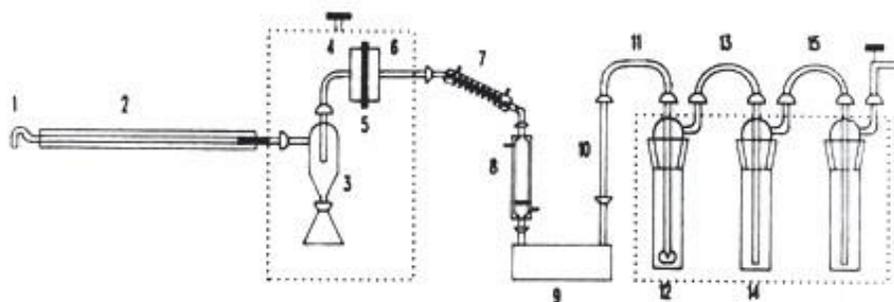
Figure 1: SVOC Sampling Train



Upon completion of each test, the sampling train is recovered as per Environment Canada's protocol, as shown in Figure 2. Pre-cleaned amber jars were used to store the liquid samples and cleaned tinfoil was used to store the filter. Ortech's sampling train differs from that shown in Figure 1 since the condenser and XAD tube are fused into one continuous piece to minimize leaks. Therefore, the condenser could not be soaked for five minutes with acetone and hexane, as recommended in the method. The condenser/XAD trap instead had both ends capped and wrapped in tin foil and the cleaning was conducted by the laboratory. This change does not compromise the performance of the method for collection of SVOCs.

The sampling and recovery procedures followed the protocols specified by the methods to maintain the integrity of the samples. Ortech had adequate staff on site to collect samples and transfer the sampling media to the on-site lab for recovery and clean-up. Communications with the control room were maintained at an excellent level to ensure samples were collected during representative operating conditions.

Figure 2: SVOC Sampling Train Recovery



Container or Sample	Component(s)	Recovery Procedure
1	1, 2, 3, 4	Wash and brush 3 times each with hexane (H) and acetone (A). Rinse 3 times each with H and A.
2	5	Remove carefully from holder. Place on pre-cleaned foil. Fold in half. Place in pre-cleaned glass petri dish.
3	6, 7	Soak 5 minutes each with H and A. Rinse 3 times each with H and A.
4	8	Cap ends and wrap in foil.
5	9, 12	Empty contents into container and rinse each 3 times with HPLC water.
6	6 to 15 except 8	Rinse 3 times each with H and A.

Mark liquid levels on all bottles.
All sample containers are pre-cleaned amber glass bottles with pre-cleaned Teflon lid liners.

Observations During Sample Collection

In general, the procedures detailed in the Environment Canada methods were followed. Since not all procedures are clearly described in the method, some practices may differ slightly. These minor changes do not impact the integrity of the samples. The following are some of the procedures that were observed:

- Sampler Setup:
 - Several clean sets of glassware were prepared beforehand. When system upsets occurred, the extra glassware made it possible to restart sampling without delay.
 - The probe liner was equipped with a molded glass nozzle. This one-piece apparatus is difficult to transport to the laboratory for cleaning, but does have the advantage of making a leak-free joint between the nozzle and liner. According to Ortech, the combined probe and nozzle were cleaned in the field and the rinse collected. The probe rinse was completed before Adomait could observe the process. The rinse used in the probe from Boiler 1 was analyzed and the results showed non-detectable levels of dioxins and furans.
 - All personnel used Tyvek gloves during sample set-up and recoveries.

- All openings were capped prior to sampler relocation, both before and after sample collection.
- Sampling:
 - The sampling team took five-minute readings at twelve different points.
 - The temperature of condenser and impingers (below 70°F) was controlled through use of ice and a water pump.
 - The sampling team performed leak checks upon completion of each traverse and after moving to the next traverse. The method does not require this procedure; however, it is helpful as it identifies problems early.
- Clean Up/Recovery:
 - Capped all open connections on the probe and impingers using Teflon tape.
 - The sampling team used cleaned amber glass jars for recovery of liquids, cleaned tinfoil for filters and followed Method 23 for sample recovery.

All samples were handled appropriately and in accordance with the procedures outlined in the method. Delays in sampling occurred during process upsets; however, the suspension of sampling typically occurs under these circumstances and should not significantly affect the quality of the results.

Changes and Problems During Sampling

Sampling was observed for four days: May 4th, 5th, 6th, and 11th. During this time, there were a few changes to the sampling protocol and a few problems were observed.

- Sampling Protocol Changes:
 - The sampling test length was increased to correspond with the AMESA samplers attached to each stack.
 - Sampling was started prior to placing the probe in the stack. This was to prevent the back flushing of the liquid and tearing of the filter caused by the negative pressure in the stack.
- Problems:
 - May 4th: During the start of the second traverse, the CO concentration in Boiler 1 spiked. This was followed by a spike in CO concentrations in Boiler 2. Ortech was in the midst of finishing the first traverse for both stacks. They paused the sampling and removed the probes from the stack as soon as they were notified about the CO excursions from the control room. The probes were capped. After Covanta discussed the spikes, they decided to eliminate the two samples and resample the boilers the following day. Ortech cleaned up their equipment and recovered the trains.
 - May 5th: The second set of SVOC tests started smoothly. At approximately the midpoint of the test, a message from the control room indicated that the hopper had bridged (i.e., became blocked). This caused the waste stream to stop flowing into the incinerator and the combustion to stop. Ortech removed the probe from the stack and capped it. Covanta discussed the issue and decided to suspend sampling on Boiler 1 since it would take several hours to resume operation of the system. It was also decided to clean out the incinerator and, therefore, Boiler 1 would not be sampled on May 6th.

- May 6th: Sampling was started on Boiler 2. No problems occurred until the final leak check, which failed by a significant margin. It was later discovered that an o-ring had failed inside the filter housing. This sample was subsequently rejected and repeated the following week.

If operations cannot be resumed quickly following a system upset, leading to no measurable impact on the sampling, then the standard operating procedure is to cease sampling and start a new test once the problem is cleared. This is to ensure that testing occurs during representative operating conditions of maximum load rather than during periods with limited waste processing that may lead to erroneous emission levels.

The decision to restart the source test is often left to the discretion of the sampling and management teams and is based on the required sampling length, start-up time for the operational source, available pre-conditioned sampling equipment, and the operating schedule of the facility. Depending on these variables, the choices for restarting the sampling are generally either later the same day or on another day. In the case of the bridged hopper, given the time required to shut down the boiler, remove the bridge and restart the boiler, Ortech had no choice but to conduct the sampling on another day.

Laboratory Processing Audit

Due to the simultaneous processing of samples in different parts of the laboratory, the laboratory audit was divided between Dr. Neil, who undertook observation of the processing of samples related to measurements of particulate matter emissions, specifically the analysis of the condensable fraction of the particulate matter samples, and Mr. Fellin, who observed the processing of samples for organic analysis, specifically the dioxins and furans analysis.

Sample components were separated and labeled by Ortech in the field and hand-delivered to Maxxam Analytics' laboratory with custody forms identifying each sample. Six (6) samples and two (2) field blanks were delivered, constituting samples collected from each of the process stacks at the Durham York Energy Centre (DYEC). Processing of samples for condensables (Maxxam Method SOP-00118/13 (US EPA Method 202)) and the filter-XAD sampling train for determination of semi-volatile organic compounds (SVOCs, Method SOP-00212/6 - generally according to Method 23 for semi-volatile compounds), as per the method flow charts in Appendix 1, was initiated on the afternoon of May 6th and 12th, respectively. All of the samples from the sampling trains were organized on a tray, including samples from the condensable fraction, filter and XAD collection media as received from the field. Samples were labeled as per Ortech labeling and Chain of Custody forms created using the Maxxam LIMS (Laboratory Information Management System). The Maxxam and Ortech labels of samples were audited against the chain of custody forms. No errors were identified.

Next, the process of sample recovery from the train components was initiated. Below is a detailed description of the processing of the condensable and SVOCs components of the sampling train.

Particulate Matter Audit

Container #1 (Impinger Aqueous Sample) and Container #2 (Organic Train Rinse) of each sample was weighed on a calibrated counter-top balance. The sample weight for each container was then transferred to the appropriate sample sheet. After the samples had been processed, the containers were re-weighed to determine the total volume of sample delivered. Daily calibration of the balance was observed and confirmed during the audit.

Sample filters were folded and placed in pre-labeled vials. During this process, the analyst inspected each filter and noted that two filters were ripped and/or torn (samples CHP347 & CHP349). The loss of filter material was very minor and could not be avoided; however, the analyst was careful to transfer as much of the scraps of filter as possible and added them to the vial. Therefore, it was not judged to be of significance to the overall result for these samples. The laboratory technician noted the issue with the samples on the processing form.

The sample filters were subsequently sonicated in reverse osmosis de-ionized water (RODI). The RODI extract was then placed back into Container #1 (Impinger Aqueous Sample) for the specified sample. This process was repeated two more times with RODI, and then three more times with hexane. Each hexane rinse was placed back into Container #2 (Organic Train Rinse) for each sample. The analyst was careful not to pour the broken pieces of the filters into both Container #1 and Container #2 for each of the affected samples. This process is necessary to ensure that any condensable material captured by the filters is extracted and analyzed within the appropriate fraction.

All RODI and hexane used in the analysis came from solvent bottles that are reserved for use only with this method. This minimizes contamination from other samples that may have high levels of organic or inorganic species. It also helps to identify if these solvents are a source of any interferences or contamination introduced during processing of the samples.

The organic fraction (Container #2) is added to a separatory funnel to separate the aqueous portion remaining in Container #2. Any aqueous portion remaining after separation is carefully decanted into Container #1, while the organic fraction is transferred to a labeled beaker. At this stage, a laboratory blank and spiked laboratory blank sample are processed in parallel to the samples to determine blank levels and ensure appropriate sample recoveries, according to method specifications.

The aqueous portion from Container #1 is then added to the same separatory funnel with hexane. Each funnel is shaken to ensure complete mixing and extraction of any organic fractions within the aqueous component. The mixture is allowed to sit to completely separate the aqueous and organic layers. The aqueous layer is then returned to Container #1, while the hexane layer is placed into the labeled beaker for each sample. This process was repeated two more times with hexane layers for each sample combined into the same beaker.

The beakers containing the organic fraction of each sample are placed in a fumehood and allowed to evaporate to no less than 10 mL. The remaining portion is transferred to a pre-weighed vial using disposable pipettes. The organic fractions were then placed under dry nitrogen flow (blow-down) to

evaporate the samples to dryness. Then samples were placed in a desiccator for at least 24 hours to dry the samples. An initial weight of the dried sample was recorded. Then samples are re-placed in the desiccator for 6 hours and re-weighed. If the two weights are within 0.5 mg, the sample is considered to be dry and the sample weight can be determined from the vial's pre-weight. This difference is the weight of the organic fraction of the condensable portion of the particulate matter.

Container #1, containing the aqueous fraction, is placed in an oven and evaporated to no less than 10 mL. This process requires approximately 2 to 3 days and was checked periodically by day and night shift technicians. The remaining portion is transferred to a pre-weighed Teflon dish using disposable pipettes. Then the aqueous fractions were placed in an oven at $\leq 30^{\circ}\text{C}$ to evaporate the samples to dryness. Then samples were placed in a desiccator for at least 24 hours to dry the samples. An initial weight of the dried sample was recorded. Then samples are re-placed into the desiccator for 6 hours and re-weighed. The sample is considered to be dry if the two weights are within 0.5 mg and the sample weight can then be determined from the dish's pre-weight. This difference is the weight of the inorganic fraction of the condensable portion of the particulate matter.

If the difference in weights of the samples from Container #1 at 24 h and 24 h + 6 h are more than 0.5 mg, then the samples are re-placed in the desiccator and re-weighed after another 6 hours. At this time, if the inorganic samples are still not within the required precision, a titration is required in order to chemically determine the mass of inorganic condensable material. This is often required when there is a large portion of inorganic material present in the sample. The inorganic material is highly hygroscopic, making it difficult to dry effectively in a desiccator. Therefore, the use of a chemical analysis removes the need for a dry sample. All the inorganic samples met the method criterion of < 0.5 mg weight difference after the first 6-hour drying period. Consequently, the titration step was not required.

The data, including weights and calculations, are first reviewed by the analyst to ensure accuracy, before it is passed on to, and reviewed by, a second analyst. Finally, the data are passed to the project manager for final review of the analysis report and reporting to the client.

In summary, initial processing of documentation for the samples was appropriate and accurate, initial processing (transfer, extraction and drying) were carried out according to the method. At each step in the extraction, the technician used appropriate solvents and other materials reserved solely for this method of analysis. All glassware and transfer pipettes were segregated to eliminate the possibility of contamination and to ensure the traceability of the entire process. Comprehensive checks were included in the form of field blanks, laboratory blanks and spiked blanks. Additional verification was undertaken at analysis and data processing steps to ensure that QA/QC criteria, in terms of recoveries of spiked blanks at each stage, were appropriate. Moreover, a final 2-analyst review of the data handling and calculations was undertaken to verify that all steps were executed accurately. All of the procedures as outlined in the Maxxam method based on Method 202 were followed.

Semi-Volatile Organic Compound (SVOC) Audit

XAD sorbent from each of the 6 sampling trains, two blank samples from the field and one blank from the original proofed media sent to the field (i.e., a total of 9 samples) were transferred to cleaned,

Soxhlet extraction glassware pre-loaded with drying agent. The Soxhlet extraction vessels were pre-labeled with sample numbers. During the transfer, no problems were encountered except for one train that had a minor crack in the neck of the glassware (sample CIP - 575 -05) resulting in loss of a small amount of XAD. The loss of XAD was very minor and could not be avoided, but was not judged to be of significance to the overall result for this sample. The laboratory technician noted the issue with the sample on the processing form. Filter media from each sample was added to the Soxhlets to allow combined extraction of particle and vapour forms of target compounds. The technician observed that moisture was not an issue and that the colour of the XAD did not indicate any issues.

Next, samples were spiked with surrogate compounds for each class of compound (native and Carbon-13 labeled versions of the target compounds). For each of the surrogate spikes, one technician spiked the sample and another technician recorded each spike, which helps to eliminate the possibility of error. The spiked surrogates were added to track the performance of the extraction process for each of the major compound classes in the SVOCs (i.e., PAH, Dioxins & Furans, CB, CP and PCBs, requiring five different analysis methods). During the transfer steps, all pipettes and glassware were properly segregated to eliminate the possibility of contamination between samples.

Then, Soxhlet extraction apparatus for each of the 9 samples (6 samples, 2 field blanks and one media blank from the original batch sent to the field) was charged with dichloromethane (DCM) solvent and processed for about 80 cycles over 16 to 18 hours. Soxhlets were then charged with toluene and processed again for an additional 80 cycles over 16 to 18 hours. This process required approximately 2 days and was checked periodically by day and night shift technicians. The combined extraction solvent was reduced in volume to approximately 12 mL in preparation for the first clean-up step. The combined extraction solvent was then separated into 2 mL samples for each of the compound classes to be analyzed (5 classes of SVOCs as identified above) and one 2 mL sample as an archive in case any issues were identified during process of any of the target analyses.

On Saturday May 14th, the first clean-up step for the dioxins and furans was initiated. The five fractions for analysis were processed. For this initial clean-up step, mixed-bed columns were prepared and pre-labeled with the sample numbers. For the dioxin and furan processing, the columns were designed to remove moisture, acids and bases, PAH, OCs, PCBs and thio-compounds that may interfere with the instrumental analysis. The samples were added to each column and eluted under gravity feed. The appropriate fraction of the eluent was collected and reduced in volume to 2 mL for each sample. At each step the technician recorded the batch numbers of solvents and other materials used in the elution process for the batch of samples. All glassware and transfer pipettes were segregated to eliminate the possibility of contamination.

On Sunday May 15th, the second clean-up step was initiated. This fractionation step used alumina/carbon columns. The columns were pre-labeled with sample numbers and conditioned with hexane before addition of each sample (2 mL). Then a series of solvents was used to extract Fraction A (eluted with 4% DCM in hexane) to remove PCBs and Fraction B to elute the dioxins & furans. Fraction A was archived and Fraction B was processed further to remove the majority of diphenyl ethers (DPEs) that potentially interfere with the furan analysis. As with the previous clean-up step, the technician

recorded the batch numbers of solvents and other materials used in the elution process for the batch of samples. All glassware and transfer pipettes were segregated to eliminate the possibility of contamination.

For the final clean-up step, a carbon/celite (packing media) column is used to remove DPEs that may interfere with the determination of some of the chlorinated dibenzofurans. Individual columns were packed and pre-labeled with packing media, conditioned sequentially with toluene, DCM/cyclohexane and hexane. The sample was added and then eluted sequentially with DCM/hexane, toluene/ethyl acetate and then the final 15 mL toluene rinse was collected in the original vials. Note that while this step removes a large fraction of the DPEs, some small amounts may remain in the analysis sample and are captured during data processing, as described later in this report. The vials were brought to dryness and transferred to the analysis laboratory. As with the previous clean up step, the technician recorded the batch numbers of solvents and other materials used in the elution process for the batch of samples. All glassware and transfer pipettes were segregated to eliminate the possibility of contamination.

In the analysis laboratory, samples were reconstituted with 20 microlitres (μL) of isooctane and injected with additional surrogate standards to verify instrument performance with each sample. The reconstituted samples were analyzed with GC/HRMS (gas chromatograph/high resolution mass spectrometer) instrument. Chromatography is a well-developed analytical technique used to resolve complex mixtures of compounds. Combined with mass spectrometry, which can identify the characteristic mass fragments of individual compounds, this technique provides a powerful analysis system for unambiguous identification and quantification of many organic compounds at trace levels. The instrument used for analysis was programmed with the method for determination of dioxins and furans and tested with standards to determine if performance was within acceptance criteria and then final calibration and control standards were run. Samples were introduced and the analysis was bracketed with standards to ensure stability of calibration during analysis of the 9 samples. After initial data acquisition, the analyst reviewed the data to ensure that acquisition parameters were acceptable within the calibration range and determined that some of the samples required dilution since they were outside the calibration range. Once diluted, samples were processed within the acceptable calibration range and acquisition parameters, and then the results for samples were sent for manual review.

Manual review requires that each chromatogram and channel (channel refers to masses corresponding to different congeners and isomers of target dioxins and furans) is reviewed to determine the acceptability of baseline selection by the automatic processing software. Adjustments to the data are made at this point to rectify any instrumental overestimate or underestimate of baseline determination and thus recalculate the concentrations. Typically, the adjustments are minor, but can be important. Moreover, additional QA/QC criteria are applied to the data including the following:

- Peaks must be within a 2-second window of the target dioxins and furans.
- Peaks must have appropriate mass ratios ($\pm 15\%$ of theoretical).

These criteria are stringent and are used to identify and quantify (according to the instrument calibration for the specific batch of analyses) the target dioxin and furan congeners and isomers. Peaks within the channel not meeting the criteria are flagged but not removed from the data report. We

reviewed and observed the processing of several samples in which DPEs were found in the furan channels during analysis. These were especially evident for one of the samples that required dilution. The DPEs were clearly outside the target retention time windows of the furan congeners and the data processing technician was easily able to identify and flag the peaks corresponding to DPEs. The DPEs' total contribution was relatively modest at less than 15% of the furan amounts. Thus initially, if flagged, the peak is identified as an interfering compound and not included in the total dioxin/furan mass quantified. However, the peaks are included, when converted to toxic equivalency (TEQ) for the POI (Point of Impingement) calculations and thus yield a more conservative value of the TEQ for determination of acceptability of the results. Finally, the data, baseline determinations, and calculations are reviewed by a second analyst, and passed to the project manager for final review of the analysis report and reporting to the client (Ortech in this case).

In summary, the initial processing of sample documentation was appropriate and accurate, initial processing (transfer, extraction and clean-up steps) were carried out according to the method. At each step in the extraction and clean-up step, the technician recorded the batch numbers of solvents and other materials used in the elution process for the batch of samples. All glassware and transfer pipettes were segregated to eliminate the possibility of contamination. This ensures the traceability of the entire process. Comprehensive checks were included in the form of labeled surrogate compounds at each step. Additional verification was undertaken at analysis and data processing steps to ensure that QA/QC criteria, in terms of recoveries of surrogates at each stage, were appropriate. Moreover, a final 2-analyst review of the data handling and calculations was undertaken to verify that all steps were executed accurately. All of the procedures as outlined in the Maxxam method based on Method 23 were followed.

Laboratory Results

Airzone has reviewed the laboratory results provided by Ortech in Report No. 21656. The only comment pertains to the particulate matter data where questions have been raised regarding the apparent discrepancy between the reported concentrations for total filterable particulate matter and $PM_{10}/PM_{2.5}$. From the results reported, it would appear that concentrations for total filterable particulate are less than those for PM_{10} and $PM_{2.5}$, which are sub-fractions of total filterable particulate. However, it is important to keep in mind that all the results for filterable PM, PM_{10} and $PM_{2.5}$ are reported below their corresponding detection limits. At these levels, the imprecision of an analytical method increases dramatically. Consequently, it would not be unexpected to find this apparent discrepancy in the concentration of associated contaminants. Therefore, at this time, there is no concern regarding the reported numbers for total filterable particulate matter, PM_{10} and $PM_{2.5}$.

Modelling Results

The peer review included an assessment of the dispersion modelling conducted by Ortech as outlined in Ortech Report No. 21656. Airzone's review was based on the understanding that, as part of the source testing program, a modelling assessment is required as outlined in Schedule "E" of the DYEC's ECA (ECA

No. 7306-8FDKNX). As indicated in Schedule “E”, the dispersion modelling must be in accordance with Ontario Regulation 419/05 (O. Reg. 419/05). Furthermore, the facility’s approved Emission Summary and Dispersion Modelling (ESDM) report, dated March 2011, was used as guidance regarding all modelling options that were approved by the MOECC during the review process of the facility’s ECA.

Airzone conducted an initial review of the modelling data provided by Ortech and provided comments to the Region of Durham in a memo dated June 24th, 2016 (see Appendix 2). These comments were supplied to Ortech, who provided a response to the inquiries via email, through the Region of Durham, dated June 27th, 2016 (see Appendix 3). Based on these responses from Ortech, Airzone provided a second round of comments to the Region of Durham in a memo dated July 5th, 2016 (see Appendix 4).

Based on the final comments provided by Airzone (dated July 5th, 2016), there still remain a number of outstanding concerns regarding the completeness and accuracy of the modelling, including corresponding results, reported by Ortech. Due to these concerns, Airzone cannot, at this time, conclude that the modelling is compliant with all regulatory requirements, as per the facility’s ECA.

Recommendations

At this time, there are no recommendations in regards to the source testing, laboratory testing or results. However, due to the outstanding issues regarding the modelling, the following recommendations are made:

- 1) Model Versions:
 - a. Ortech should consult with the MOECC to ensure that the appropriate regulatory version of the CALPUFF dispersion model, as chosen for this facility, is used in all modelling.
- 2) CALPUFF Options and Flags:
 - a. Ortech should consult with the MOECC to ensure that the appropriate regulatory options and flags are used within the CALPUFF dispersion model, including, but not limited to, the puff splitting and secondary chemistry options outlined in the Airzone memos.
- 3) Modelling Results List:
 - a. Ortech should consult with the MOECC to confirm the test contaminant list required for the dispersion modelling. Specific attention should be made to the Test Contaminants outlined in Schedule “D” of the facility’s ECA.
 - b. Ortech should ensure that all test contaminants are compared against all relevant standards and guidelines. If need be, Ortech should consult with the MOECC to ensure that appropriate standards and guidelines are chosen.
 - c. Emissions of SO₂ should be assessed in future modelling using non-zero numbers, even if those numbers are below the instrument detection limit, as the use of detection limits will provide a conservative estimate of the facility’s off-site impacts.
 - d. Modelling of condensable particulate matter should be included since condensable material will contribute to the facility’s overall loading of the local air shed in relation to

particulate matter. Specifically, Airzone recommends that Ortech include results for filterable particulates, condensable particulates and total particulates (filterable + condensable).

- e. Modelling of sub-fractions of particulate matter, especially PM_{2.5}, should be included. If need be, Ortech should consult with the MOECC to ensure that appropriate standards and guidelines for PM_{2.5} are chosen.

Many of the remaining outstanding issues can be addressed via consultation with the MOECC, which should have been considered a basic requirement of this work, to ensure that the modelling meets all regulatory requirements required by the facility's ECA.

We further recommend that the modelling for the May source testing campaign be re-visited based on consultation with the MOECC regarding the topics outlined above, and in more detail in the Airzone memo dated July 5th (see Appendix 4). Until this is completed, Airzone cannot comment on the compliance status of the dispersion modelling.

Conclusions

Based on the observations made, both during field sampling and laboratory analysis, Adomait and Airzone are satisfied that both Ortech and Maxxam collected and analyzed all samples according to standard operating procedures and approved methods. Therefore, at this time, there are no concerns about the validity of the data reported by Ortech and Maxxam.

With regards to the dispersion modelling, a number of concerns have been found; in particular, deficiencies have been found pertaining to the CALPUFF Model Version and CALPUFF Options and Switches used. These deficiencies need to be addressed before the modelling can be deemed to have been conducted in accordance with all regulatory requirements (i.e. the facility's ECA). At this time, Airzone cannot conclude that the modelling meets all of the regulatory requirements.

Prepared by:



Lucas Neil, Ph.D.
Air Quality Scientist
Airzone One Ltd.

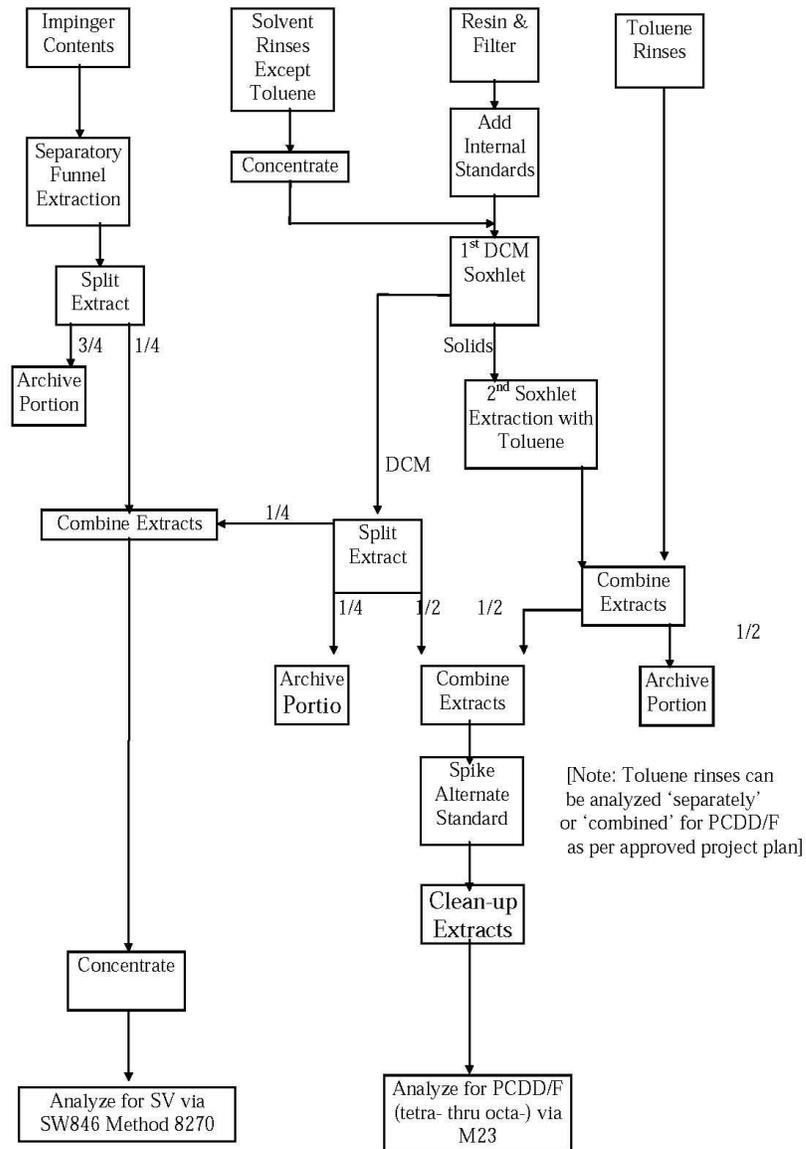
Reviewed by:



Phil Fellin, M.Sc.
Manager, Air Monitoring & Analysis
Airzone One Ltd.

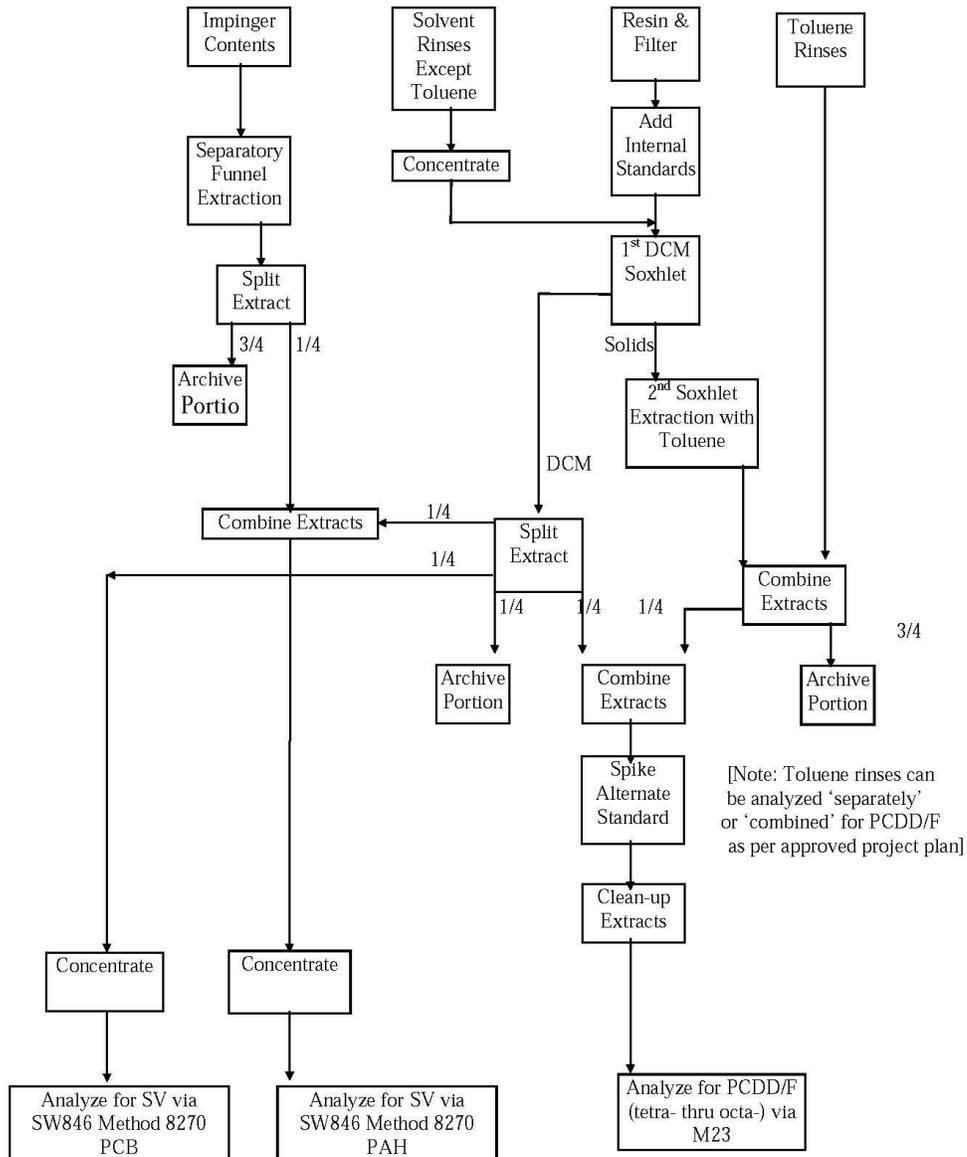
Appendix 1: Maxxam Analytics Flowcharts

Typical Combined M23/0010SV Train (3-Way Split)



Note that SVOC effective final volume (total) is 2.0 ml, the same as for a dedicated 0010 train.

Typical Combined M23/0010SV Train (4-Way Split)



Appendix 2: Airzone Modelling Memo (June 24th, 2016)



Gioseph Anello, MEng PEng PMP
Manager of Waste Planning & Technical Services
Region of Durham, Works Department
605 Rossland Road East, Box 623
Whitby, Ontario, L1N 6A3
Tel: (905) 668-4113 ext.3445
Email: Gioseph.Anello@Durham.ca

June 24th, 2016

RE: Initial Review of Modelling Conducted by Ortech as outlined in Ortech Report No. 21656

To Mr. Anello,

We have conducted an initial review of the dispersion modelling provided by Ortech in connection to the emission testing program at the Durham York Energy Centre (DYEC) located in Courtice, Ontario between May 2 and May 11, 2016. Our review was based on the understanding that, as part of the source testing program, a modelling assessment is required as outlined in Schedule "E" of the DYEC's ECA (ECA No. 7306-8FDKNX). As indicated in Schedule "E", the dispersion modelling must be in accordance with O. Reg. 419/05. Furthermore, the facility's approved Emission Summary and Dispersion Modelling (ESDM) report, dated March 2011, was used as guidance regarding all modelling options that were approved by the Ministry of the Environment and Climate Change (MOECC) during the review process of the facility's ECA.

Based on an initial review of all modelling files provided by Ortech we have identified the following questions. As requested, we are providing these questions and comments to you so that Ortech (aka "the consultant") can review these questions.

1) Model Versions

- a. The consultant has utilized CALPUFF version 5.8.4; however, the version used with the ECA application, as listed in the ESDM report, is version 6.263. Please provide an explanation for the deviation from the previously used version.

2) CALPUFF Options and Flags

- a. Puff Splitting
 - i. The ESDM report, submitted with the ECA application, provides a table of selected CALPUFF options and flags (Exhibit 9 of ESDM report).
 - ii. The consultant has deviated from this list with the MSPLIT flag. The previously used value is 1 (indicating puff splitting is allowed); however, in the source testing modelling the flag value selected was 0 (indicating puff splitting is not allowed).
 - iii. Please provide an explanation for the deviation from the previously used option.

- b. Secondary Chemistry
 - i. The ESDM indicates in Section 6.8 that chemical transformations were used in the ECA application to assess the contributions of secondary particulate matter to total suspended particulate matter.
 - ii. Secondary particulate matter chemistry was not modelled as part of the consultant's report.
 - iii. Did the consultant confirm with MOECC if chemical transformations were approved as part of the ECA application and required for any update modelling?
- 3) Modelling Results List
- a. A number of contaminants appear to be missing from the modelling results. For example, many chlorobenzenes and chlorophenols are missing. Please provide an explanation as to why they were excluded from the modelling assessment.
 - b. The emission rate of the dioxins & furans used to estimate POI values was calculated using concentrations estimated at half the detection limit. Please provide rationale for using half the detection limit as the basis for the emission estimates, as opposed to the more conservative estimate of the detection limit value.
 - c. A number of contaminants have not been assessed against all standards or guidelines provided for those contaminants (e.g. naphthalene, lead, acetaldehyde, ethyl benzene, and xylenes). Please provide rationale for not including these assessments.
 - d. Emissions of sulphur dioxide are listed as 0 g/s, resulting in a POI value of 0 ug/m³. Please provide an explanation as to why sulphur dioxide emissions are listed at zero.
 - e. Particulate Matter
 - i. Condensable Fraction
 - 1. Please provide rationale as to why the condensable fraction of particulate matter was not included in the modelling assessment.
 - ii. PM_{2.5}
 - 1. Review of the modelling report shows that the consultant did not assess PM_{2.5} or PM₁₀.
 - 2. It should be noted that PM_{2.5} and PM₁₀ were assessed as part of the ECA application.
 - 3. Did the consultant have discussions with the MOECC on the necessity of this assessment for the stack testing report and the corresponding criteria?
- 4) Odour modelling
- a. No results were provided for odour modelling.
 - b. Was odour modelling required to be conducted as part this source test plan?

With regards to standards used for modelling, many of the contaminants being assessed here have new standards that come into effect July 1, 2016. We would recommend that comparisons to these new standards be included in the source testing report, to ensure that the facility is compliant with these new standards ahead of their phase-in date.

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At this time we are unable to complete our review of the modelling exercise as a result of outstanding questions regarding model versions. Therefore, we cannot comment on the completeness or correctness of the modelling results.

Sincerely,



Lucas Neil, Ph.D.
Air Quality Scientist
lneil@airzoneone.com
(905) 890-6957 ext. 111

**Appendix 3: Ortech Response to Airzone Modelling Memo
(June 24th, 2016)**

Lucas Neil

From: Gioseph Anello <Gioseph.Anello@Durham.ca>
Sent: June 28, 2016 9:55 AM
To: Lucas Neil
Subject: FW: Source Test Modeling
Attachments: CALPUFF_View_Release_Notes_V.6.pdf; cpuff_Sc1.inp

Please see below

From: Tina Sanderson [mailto:TSanderson@ortech.ca]
Sent: June-27-16 3:06 PM
To: Gioseph Anello
Cc: Hank Van Bakel; Brasowski, Leon (LBrasowski@covanta.com); Chris Belore
Subject: RE: Source Test Modeling

Hi Gioseph,

We reviewed the comments from AirZone. Please find our responses below:

- 1) CALPUFF version 6.263 is no longer supported through the Lakes interface. Available model versions are the EPA Regulatory Version (this was used by ORTECH for the Fall 2015 compliance testing program and the Spring 2016 voluntary testing program), Version 6 (which is currently running v. 6.42) and Version 7 (which is currently running v. 7.1.2). I talked to the support services at Lakes and they said if there are differences in input file format between v6.263 and v6.4, it may cause a run failure on the part of the CALPUFF model. If you would like ORTECH to re-run the model using Version 6 or Version 7 please let us know. We expect the impact to the dispersion results to be minimal. I have also attached the CALPUFF release notes from lakes which details the differences between the two models.
- 2) ORTECH setup the modelling run using the input file provided by Golder Associates. When setting up the initial model for the Fall 2015 compliance testing program it was noted that there were discrepancies between the input file provided and the description in the ESDM report. In discussion with Covanta it was decided that ORTECH should use the model input file provided by Golder to setup the runs as that was what was submitted to the MOECC. I have attached the input file provided by Golder (cpuff_Sc1.inp). In the input file Puff Splitting (MSPLIT= 0) and Chemical Transformations (MCHEM=0) were off.
- 3A) For compliance testing reports it is typical to provide dispersion modelling results only for those compounds that have standards or guidelines listed in "MOECC Summary of Standards and Guidelines to Support Ontario Regulation 419/05 – Air Pollution – Local Air Quality". We do not include AAQC, JSL or other limits. The MOECC has never requested that compounds with other limits be assessed as part of a compliance testing program.
- 3B) Note 8 (page 26) of "MOECC Summary of Standards and Guidelines to Support Ontario Regulation 419/05 – Air Pollution – Local Air Quality" states that "for the purposes of calculating the total TEQ concentration for a mixture of dioxin-like compounds, a value of half the minimum detection limit (MDL) should be substituted for concentrations less than the MDL." MOECC SDB has requested this calculation methodology for all dispersion modelling completed as part of compliance testing programs. This is consistent with the methodology used in the Fall 2015 compliance test

program. Note the concentration used to assess against the in-stack limit uses the full MDL for those compounds less than the MDL and excludes the 12 dioxin-like PCBs.

3C) Naphthalene, ethyl benzene and xylenes have other time period 10-minute standards. Lead has an other time period 30-day standard. Acetaldehyde has an other time period ½-hr standard. If you would like we can revise the report to include these, or include them moving forward (future reporting).

3D) Emissions for SO₂ were zero because the average emissions measured by the facility's CEMS was 0.0 ppm during the test program. Note that values less than 5 ppm are generally considered to be within the noise level of the instrument. It is typical to report CO, NO_x and SO₂ values to 1 decimal place only as the instruments are generally not that sensitive.

3E) For compliance testing reports it is typical to model filterable particulate only, this is consistent with the Fall 2015 compliance testing program and other compliance programs completed by ORTECH. If you would like we can add a separate line in the dispersion modelling tables that combines filterable and condensable particulate matter. PM_{2.5} and PM₁₀ do not have POI standard or guidelines listed in "MOECC Summary of Standards and Guidelines to Support Ontario Regulation 419/05 – Air Pollution – Local Air Quality" therefore as per 3A) they were not assessed.

4) Odour sampling was not part of the testing program. It is ORTECH's understanding that this was only required as part of the initial compliance program.

Including the July 1, 2016 standards was discussed during a conference call with Covanta and the Region and it was decided not to include them in the voluntary testing report as the testing was conducted and the report completed before July 1st.

Please let us know if you would like clarification on any of the above or would like the report revised to reflect any of the changes mentioned. To discuss this further please contact either Chris (x324) or myself (x522).

Regards,

Tina
(905) 822-4120

From: Gioseph Anello [<mailto:Gioseph.Anello@Durham.ca>]
Sent: June-27-16 8:51 AM
To: Chris Belore
Cc: Tina Sanderson; Hank Van Bakel; Brasowski, Leon (L.Brasowski@covanta.com)
Subject: Source Test Modeling

Good Day

Please see attached a few questions from AirZone our third party reviewer.

I am available to discuss

Gioseph Anello, MEng, PEng, PMP
Manager of Waste Planning & Technical Services
Phone: (905) 668-4113 ext. 3445

Cell: (905) 447-8231

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Appendix 4: Airzone Modelling Memo (July 5th, 2016)



Gioseph Anello, MEng PEng PMP
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Tel: (905) 668-4113 ext.3445
Email: Gioseph.Anello@Durham.ca

July 5th, 2016

RE: Response to Ortech's Comments Concerning our Initial Review of Modelling Conducted by Ortech as outlined in Ortech Report No. 21656

To Mr. Anello,

We are providing this reply to Ortech's response to our initial review comments on the modelling provided by Ortech (aka "the Consultant") in connection to the emission testing program at the Durham York Energy Centre (DYEC) located in Courtice, Ontario between May 2 and May 11, 2016. Based on our review of the Consultant's response to our initial review, there are still deficiencies.

The deficiencies are identified based on our understanding that the Consultant was to conduct modelling according to the ECA requirements, as outlined in our previous memo. From the deficiencies identified below, the ECA requirements have not been met.

1) Model Versions

- a. The Consultant has utilized CALPUFF version 5.8.4; however, the version used with the ECA application, as listed in the ESDM report, is version 6.263. Please provide an explanation for the deviation from the previously used version.

Ortech's Response: "CALPUFF version 6.263 is no longer supported through the Lakes interface. Available model versions are the EPA Regulatory Version (this was used by ORTECH for the Fall 2015 compliance testing program and the Spring 2016 voluntary testing program), Version 6 (which is currently running v. 6.42) and Version 7 (which is currently running v. 7.1.2). I talked to the support services at Lakes and they said if there are differences in input file format between v6.263 and v6.4, it may cause a run failure on the part of the CALPUFF model. If you would like ORTECH to re-run the model using Version 6 or Version 7 please let us know. We expect the impact to the dispersion results to be minimal. I have also attached the CALPUFF release notes from lakes which details the differences between the two models."

Airzone Response: Since Lakes Environmental is not the regulatory body governing compliance modelling within Ontario, their support of different versions of dispersion models is immaterial. The

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MOECC approved version of CALPUFF for this facility is version 6.263. Therefore, this version should have been used for all compliance modelling for this facility, unless otherwise stated by the MOECC.

2) CALPUFF Options and Flags

a. Puff Splitting

- i. The ESDM report, submitted with the ECA application, provides a table of selected CALPUFF options and flags (Exhibit 9 of ESDM report).
- ii. The Consultant has deviated from this list with the MSPLIT flag. The previously used value is 1 (indicating puff splitting is allowed); however, in the source testing modelling the flag value selected was 0 (indicating puff splitting is not allowed).
- iii. Please provide an explanation for the deviation from the previously used option.

b. Secondary Chemistry

- i. The ESDM indicates in Section 6.8 that chemical transformations were used in the ECA application to assess the contributions of secondary particulate matter to total suspended particulate matter.
- ii. Secondary particulate matter chemistry was not modelled as part of the Consultant's report.
- iii. Did the Consultant confirm with MOECC if chemical transformations were approved as part of the ECA application and required for any update modelling?

Ortech's Response: "ORTECH setup the modelling run using the input file provided by Golder Associates. When setting up the initial model for the Fall 2015 compliance testing program it was noted that there were discrepancies between the input file provided and the description in the ESDM report. In discussion with Covanta it was decided that ORTECH should use the model input file provided by Golder to setup the runs as that was what was submitted to the MOECC. I have attached the input file provided by Golder (cpuff_Sc1.inp). In the input file Puff Splitting (MSPLIT= 0) and Chemical Transformations (MCHEM=0) were off."

Airzone Response: Did Covanta confirm with MOECC that these model switches were the approved model switches? Again, the MOECC is the regulatory body, not Covanta; therefore, all questions concerning model variables and inputs should have been confirmed with the MOECC to decide which options to employ.

3) Modelling Results List

- a. A number of contaminants appear to be missing from the modelling results. For example, many chlorobenzenes and chlorophenols are missing. Please provide an explanation as to why they were excluded from the modelling assessment.

Ortech's Response: "For compliance testing reports it is typical to provide dispersion modelling results only for those compounds that have standards or guidelines listed in "MOECC Summary of Standards and Guidelines to Support Ontario Regulation 419/05 – Air Pollution – Local Air Quality". We do not include AAQC, JSL or other limits. The MOECC has never requested that compounds with other limits be assessed as part of a compliance testing program."

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Airzone Response: While this may be typical for compliance testing, that is irrelevant in this case since the facility's ECA specifically outlines Test Contaminants in Schedule "D", while Schedule "E" of the ECA indicates that the report on the Source Testing program should include "the results of dispersion calculations in accordance with the *O. Reg. 419/05*, indicating the maximum concentration of the Test Contaminants, at the Point of Impingement." Therefore, the POI value of all Test Contaminants should be included in the report regardless of whether or not they have standards or guidelines, as required per Schedule "E" of the ECA. We recommend that the Consultant update the modelling results to include all Test Contaminants.

- b. The emission rate of the dioxins & furans used to estimate POI values was calculated using concentrations estimated at half the detection limit. Please provide rationale for using half the detection limit as the basis for the emission estimates, as opposed to the more conservative estimate of the detection limit value.

Ortech's Response: "Note 8 (page 26) of "MOECC Summary of Standards and Guidelines to Support Ontario Regulation 419/05 – Air Pollution – Local Air Quality" states that "for the purposes of calculating the total TEQ concentration for a mixture of dioxin-like compounds, a value of half the minimum detection limit (MDL) should be substituted for concentrations less than the MDL." MOECC SDB has requested this calculation methodology for all dispersion modelling completed as part of compliance testing programs. This is consistent with the methodology used in the Fall 2015 compliance test program. Note the concentration used to assess against the in-stack limit uses the full MDL for those compounds less than the MDL and excludes the 12 dioxin-like PCBs."

Airzone Response: Rationale accepted.

- c. A number of contaminants have not been assessed against all standards or guidelines provided for those contaminants (e.g. naphthalene, lead, acetaldehyde, ethyl benzene, and xylenes). Please provide rationale for not including these assessments.

Ortech's Response: "Naphthalene, ethyl benzene and xylenes have other time period 10-minute standards. Lead has an other time period 30-day standard. Acetaldehyde has an other time period ¼-hr standard. If you would like we can revise the report to include these, or include them moving forward (future reporting)."

Airzone Response: Again, naphthalene, ethyl benzene and xylenes are all Test Contaminants as defined by Schedule "D" of the facility's ECA. Therefore, the comparison of these contaminants to all relevant standards should have been included in the report, as required per Schedule "E" of the ECA. The Consultant should update the modelling results to include all relevant standards for all Test Contaminants and address these omissions.

- d. Emissions of sulphur dioxide are listed as 0 g/s, resulting in a POI value of 0 ug/m³. Please provide an explanation as to why sulphur dioxide emissions are listed at zero.

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Ortech's Response: Emissions for SO₂ were zero because the average emissions measured by the facility's CEMS was 0.0 ppm during the test program. Note that values less than 5 ppm are generally considered to be within the noise level of the instrument. It is typical to report CO, NO_x and SO₂ values to 1 decimal place only as the instruments are generally not that sensitive.

Airzone Response: The average of the emissions was actually listed as 0.1 mg/Rm³ (0.04 ppm), as listed in the table of the Executive Summary of the Consultant's report. While it's understood that the sensitivity of the instrument may be quite low at this level, it would be conservative to model emissions of 0.04 ppm rather than 0.0 ppm. Please update the dispersion modelling tables to reflect the measured values of SO₂.

e. Particulate Matter

i. Condensable Fraction

1. Please provide rationale as to why the condensable fraction of particulate matter was not included in the modelling assessment.

ii. PM_{2.5}

1. Review of the modelling report shows that the Consultant did not assess PM_{2.5} or PM₁₀.
2. It should be noted that PM_{2.5} and PM₁₀ were assessed as part of the ECA application.
3. Did the Consultant have discussions with the MOECC on the necessity of this assessment for the stack testing report and the corresponding criteria?

Ortech's Response: "For compliance testing reports it is typical to model filterable particulate only, this is consistent with the Fall 2015 compliance testing program and other compliance programs completed by ORTECH. If you would like we can add a separate line in the dispersion modelling tables that combines filterable and condensable particulate matter. PM_{2.5} and PM₁₀ do not have POI standard or guidelines listed in "MOECC Summary of Standards and Guidelines to Support Ontario Regulation 419/05 – Air Pollution – Local Air Quality" therefore as per 3A) they were not assessed."

Airzone Response: (i) With regards to TSP, we recommend that the Consultant provide a separate line in the dispersion modelling tables that combines filterable and condensable particulate matter, or, provide alternative decision after consultation with the MOECC. (ii) With regards to PM₁₀ and PM_{2.5}, and yet again as per Schedule "D" of the ECA, PM₁₀ and PM_{2.5} are considered Test Contaminants and should therefore have been included in the Source Test report. The Consultant should correct the dispersion modelling tables to include PM₁₀ and PM_{2.5}. (iii) The Consultant was non-responsive to our question e. ii. 3. Asking such questions of the MOECC would be considered a basic requirement of this work.

4) Odour modelling

- a. No results were provided for odour modelling.
- b. Was odour modelling required to be conducted as part this source test plan?

Ortech's Response: "Odour sampling was not part of the testing program. It is ORTECH's understanding that this was only required as part of the initial compliance program."

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Airzone Response: Rationale accepted.

At this time we are unable to complete our review of the modelling exercise as a result of outstanding deficiencies. Therefore, we cannot comment on the completeness or correctness of the modelling results.

Sincerely,



Lucas Neil, Ph.D.
Air Quality Scientist
lneil@airzoneone.com
(905) 890-6957 ext. 111