Surveillance

Covanta Municipal Waste Combustor PFAS Emissions Characterization Study

PFAS Per and Polyfluoroalkyl Substances

Audited Organizations:
Jacobs Technology, Inc.
ORD-CEMM-AMCD
RTP, NC
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Audited By:

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I. INTRODUCTION

This project involves multiple organizations and parties. Overall, this project is to support ORD research objectives and is technically directed by the ORD PI Erin Shields. The project team includes Covanta Energy, LLC ("Covanta") who is collaborating through a Cooperative Research and Development Agreement (CRADA) and is supported by their emissions testing contractor TESTAR, Jacobs Technology Incorporated (JTI), and JTI's subcontractors TRC Environmental Corporation (TRC) and Eurofins-Test America (TA). Overall project coordination is an ORD responsibility. ORD will coordinate with Covanta through the CRADA (Erin Shields CRADA PI).

Extractive sampling methods for this effort include:
1) OTM-45 for quantitative measurement of targeted polar compounds and collection of semivolatile polar compounds for qualitative analysis of nontargeted PFAS,
2) OTM-50 for the collection of volatile nonpolar compounds for targeted analysis and characterization of unknowns.
3) SW-846 Methods 0010 and 8270 for collection and quantitative measurement of targeted semivolatile nonpolar compounds and characterization of unknowns.
4) ASTM D6348-12 - Standard Test Method for Determination of Gaseous Compounds by Extractive Direct Interface Fourier Transform Infrared (FTIR) Spectroscopy

II. PERSONNEL INTERVIEWED and AUDIT OPERATION

The following project personnel were the primary personnel associated with this project on-site during testing.

Principal Investigator:	Erin Shields (ORD)
Emissions Sampling:	Herb Dixon (Testar, Jacobs Contractor)
FTIR Measurements:	Jim Barufaldi (TRC, Jacobs Contractor)

The audit checklist was the primary basis for observing measurement activities and conducting interviews of relevant project personnel. The audit checklist (Attachment 1) was based on information in the following documents:

- ORD QAPP: J-AMCD-0034378-QP-1-0 - *Joint ORD/Covanta Municipal Waste Combustor PFAS Emissions Characterization Study*
- Jacobs QAPP: J-AMCD-0000000-QP-1-0 - *Covanta Municipal Waste Combustor PFAS Emissions Characterization Study*
- TRC SOP: *Standard Test Method for Determination of Gaseous Compounds by Extractive Direct Interface Fourier Transform Infrared (FTIR) Spectroscopy (ASTM D6348-12)*
- OTM-45: *Measurement of Selected Per- and Polyfluorinated Alkyl Substances from Stationary Sources (Version 3, 9/27/2023)*
- OTM-50: *Sampling and Analysis of Volatile Fluorinated Compounds from Stationary Sources Using Passivated Stainless-Steel Canisters*
- Method 0010: *MODIFIED METHOD 5 SAMPLING TRAIN*

III. DEFINITIONS

Deficiency: *An identified deviation from the requirements of the audit standard.*
Finding: *A deficiency to implement a requirement specified in the audit standard that may or will have a significant adverse effect on quality.*
Observation: *A deficiency that may impact operational efficiency but will not have a significant adverse effect on quality.*
Noteworthy Best Practice: *A best practice that benefits the system by increasing the efficiency and/or credibility of system operations. The exemplary nature of a noteworthy best practice makes it a model for other systems.*

IV. AUDIT RESULTS

Deficiencies:
None

Findings:
None

Observations:
Observation-01: In general, project documentation was primarily collected electronically rather than with the use of laboratory notebooks. Laboratory notebooks were not prominent, but were indeed present and utilized by those that had them. More commonly, comprehensive documentation was accomplished electronically, through the use of personal computers, electronic data sheets and data logging. This is becoming standard practice and maybe this observation is more of a Noteworthy Best Practice rather than an observation.

Observation-02: The FTIR measurements required some deviations (which were well documented) as a result of the intended FTIR spectrometer not being provided for use. Rather, two different FTIR spectrometers, each configured differently, were used. One FTIR, a refurbished IMACC, was configured for "hot wet" operation which means that all system components are heated, including the sample cell. This was the original intended configuration. Unfortunately, this FTIR was provided configured with the wrong spectral resolution. As a result, the available reference spectra could not be used for the 1st two days of testing. The correct spectra were provided so that this instrument could be used for the last day of testing. The second FTIR was a MKS 2030 that was configured for "dry" operation. In this configuration, moisture was removed by a chilled condenser prior to reaching the sample cell. As a result, some compounds present such as HCl would also be removed in this configuration. That is not a concern for the C2F6 and CF4 target analytes. Extensive and comprehensive dynamic spiking was performed for C2F6 and CF4 at a variety of levels that were integral to empirically assessing measurement detection levels. Having both FTIR configurations was fortuitous as it provided data under two distinctly different measurement

conditions. This change did not significantly impact data availability or quality. In fact, the "dry" configuration resulted in better than anticipated measurement sensitivity for C2F6 and CF4 relative to the "hot wet" configuration. This is because with the moisture removed, there was less spectral interference from water. The only negative consequence was that only one day of data of known and acceptable quality were generated using the "hot wet" configuration.

Observation-03: During the collection of OTM-50 nitrogen blanks, it was observed that minor leaks were encountered during sampling. An issue that was ultimately resolved as a result. The impact of these leaks on data quality is unknown but should be considered when validating these data. If the data are used, they should be flagged appropriately.

Observation-04: Laminar flow element-based Mass Flow Controllers (MFCs) were used to control C2F6 and CF4 injections. The QAPP indicates that following use, the MFCs will be submitted to the Metrology Laboratory for validation against a Roots Meter with air as the volumetric gas. An additional validation should be considered where the volumetric flow is evaluated using C2F6 and/or CF4. This is due to the fact that the LFE MFCs are based on gas viscosity and the correction factors used for C2F6 and CF4 are calculated and not empirical.

Noteworthy Best Practices:
Best Practice-01: Separate mobile laboratory trailers were used for recovering inlet and outlet samples. This measure presumably decreased the possibility for cross-contamination and also allowed for each trailer to have the space for separate work areas for OTM-45 and M0010 trains. Separate work areas similarly decreased the possibility for cross-contamination as well as the likelihood for using the wrong solvent wash bottle.

Best Practice-02: Enough glassware was provided so that no glassware was reused. This deemed the collection of field blanks unnecessary and removed the associated analytical costs as well as time required for collection in the field.