RJ Lee Monthly Report Summary for March 2017

In support of the ongoing Chemical Vapor Initiative undertaken by the U.S. Department of Energy (DOE) contractor, Washington River Protection Solutions, LLC (WRPS), RJ Lee Group's Mobile Organic Monitoring Laboratory (hereafter referred to as the Mobile Laboratory or ML) conducted systems testing over several weeks at Columbia Basin Analytical Laboratory (CBAL). The testing was performed over the four-week period between February 17, 2017, and March 14, 2017. The Mobile Laboratory tested the Liquid Calibration Unit (LCU), flow controller (FC), and began bench scale testing of the Picarro Cavity Ring-Down spectrometer, which will be used to directly measure ammonia concentrations. Additionally, primary experimentation began on the use of the Gas Chromatography Proton Transfer Reaction Mass Spectrometer (GC/PTR-MS) as an alternative PTR-MS verification method.

The ML sample collection lines are designed to sample air from either of two locations:

- A sample collection line located above the wind shear zone of the van for on-the-road, real-time collection and analysis of emission excursion, and
- A sampling interface located on the side of the van used for stationary measurements only, where air samples are pulled into the sampling system by an oil-free diaphragm pump.

No field measurements were collected at Hanford by the Mobile Lab during this time period.

The PTR-MS TOF-4000 is used to quantify chemicals of potential concern (COPCs) from the sampled air. The sampled air enters the PTR drift tube. In the drift tube, volatile organic compounds (VOCs) with proton affinities greater than water undergo chemical ionization via a fast proton transfer reaction using the reagent ion, hydronium. The hydronium is produced from water vapor through a series of reactions in the hollow cathode PTR ion source. This is a soft ionization method and VOC fragmentation is minimized. These ionized compounds and hydronium then travel through the drift tube to the transfer lens system, subsequently entering the time-of-flight mass spectrometer (TOF-MS) where they are separated by mass and monitored. The signal from the TOF-MS is used to identify the VOCs based on their mass, as well as to calculate individual compound concentration based on the ratio of compound signal to hydronium signal.

The activities that were performed during this period include:

- Conducted testing of the LCU and inlet flow controllers to ensure that flow rates were operating as expected and were optimized for data collection. (Week 3.1)
- Continued conducting testing of the LCU and inlet flow controllers, began readiness testing the GC-MS for PTR-MS verification samples, conducted bench-scale testing of the Picarro cavity ring-down spectrometer, and began PTR-MS resolution experiments to examine peak separations between interfering compounds, specifically those with masses of 69 and 75. (Week 3.2)
- Continued experimentation started in week 3.2 and began testing alternate reagent ion experiments to continue attempts at reducing PTR-MS interferences (Week 3.3)
- Installed and tested the Picarro spectrometer in preparation for remote field operation and to verify correlation with the PTR-MS. Additionally, testing was done with semi-volatile compounds to determine if the PTR-MS could detect COPCs of this class. The PTR-MS was also compared to IH sampling pumps to ensure that the elapsed time on the pump readout correlates with elapsed local time. (Week 3.4)

At the completion of this report, WRPS' Data Quality Objective (DQO) Group and a Fugitive Emissions/Source Apportionment Sub-team had not yet developed a process for the Mobile Laboratory to sample and monitor certain sources for analysis or vapor composition. Because of this, vapor source identification and quantitative analysis of vapor composition could not be completed for this report. Source identification processes are under development by WRPS' DQO Team and the Fugitive Emissions/Source Apportionment Sub-team with input from RJ Lee Group and will be documented in the FY2017 Test Plan.

To view the full report, follow this link.