

New Instruments Aid Trace Organics Analyses

By Mike Doubrava, Environmental Laboratory Trace Organics Unit

The Trace Organics unit at the King County Environmental Lab has purchased and installed three new Gas Chromatography (GC) systems with “fast analysis” capabilities. The new GCs replaced three systems that were more than 10 years old.

The new GC systems are more cost-effective and efficient for pesticides, PCBs, and fuels analyses. One major advancement is the new GC oven design which allows faster temperature increases. The newer ovens can ramp up at 50 degrees centigrade per minute compared to only 25 degrees centigrade per minute on the older systems.

The benefit of faster ramp up rates will drop analysis times by about 50 percent, which enables Trace Organics scientists to keep up with a heavier workload.

Along with the oven redesign, the new GCs have the capability of back flushing the column after sample injection. Over repeated injections of samples with higher organic matrix, the front of the column can become coated which diminishes the separation and sensitivity aspects of the column.

Normally, several hours of column maintenance would be performed. The ability to back flush or “clean” the front of the column after sample injections reduces maintenance downtime and prolongs the life of the column.

The new GCs will also use hydrogen as a column carrier gas. With this in place, analysts should see better compound separation, resolution and sensitivity. This should also provide opportunities to make assessments at lower detection limits and compound identification.

Using hydrogen, along with column back flushing, will help keep the columns cleaner, resulting in a reduction of maintenance and chromatography troubleshooting.

For projects where fuels analyses are requested “fast” GC will aid in petroleum

identification for samples contaminated with complex mixtures. The increased column separation of compounds should make it possible to further identify or confirm the presence of fuel constituents; for example, diesel further separated from lube or motor oil.

A project where the “fast” technology should pay immediate dividends is the King County Roads’ Street Waste Alternative Program (SWAP). Samples from SWAP piles generated from collected vector wastes and street sweepings are analyzed over a period of time for petroleum products in order to identify decreases in concentrations of the diesel and lube oil(s).

Once the new temperature programs are developed and tested for projects where pesticides and/or PCBs analyses are requested, the “fast” GC method should be more efficient in separating compounds from each other and/or from interferences. This would increase confidence in identification, quantitation and confirmation of analytes present or not in samples.

One program where this is helpful is in sediment remediation. The Duwamish/Diagonal sediment samples can be challenging to analyze for pesticides due to higher concentrations of PCBs.

The “fast” GC should aid with resolving the pesticide peaks from the PCB peaks in the chromatogram. Once the peaks are resolved, the analyst will have more information to determine the absence or presence of pesticide analytes in the sample.



For compounds analyzed by “fast” GC, the sensitivity of detection should increase due to a combination of back flushing and hydrogen as a carrier gas. Projects requiring National Pollution Discharge Elimination permits, such as treatment plants and stormwater systems often request “best possible” detection limits for analyses.


Once method development is completed and tested, the new GCs should

be able to analyze lower concentration calibration standards. This would result in lower instrument detection of analytes, which could redefine “best possible” treatment.

The Lab will continue to enhance its technologies to provide more cost-effective and efficient services for customers and clients.

If you would like further information related to these services feel free to contact Mike Doubrava at 206-684-2355 or by e-mail michael.doubrava@kingcounty.gov.

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