Maxxam Analytics

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Driven by Service and Science

Holiday 2009

Atlantic

ceo's note

Season's Greetings!

By now you may already know our big news. In mid-October, we acquired Burnaby, B.C.-based CANTEST Ltd., including its laboratory locations in Victoria and Winnipeg. Cantest is British Columbia's largest independent analytical laboratory business, specializing in environmental, food and pharmaceutical laboratory services—it's a wonderful addition to the Maxxam family.

The acquisition represents an obvious and exciting opportunity to strengthen Maxxam's presence in Western Canada and more specifically in the British Columbia marketplace, where we now have over 350 employees. But this is not just about Western Canada. For our customers throughout Canada, we look forward to introducing and extending some of Cantest's specialized services such as ecotoxicology and bioanalytical services.

The acquisition continues Cantest's growth trajectory, while carrying on the work and legacy of one of its founders, Dr. Donald B. Rix, a leader in the British Columbia biotechnology and business communities. Like Maxxam, Cantest has a solid commitment to science, innovation, quality and exceptional customer service. We're pleased to add Cantest's extensive experience and knowledge to our team.

It may be a gross understatement to observe that 2009 has been a challenging year for our industry. For our part we have felt the impact in reduced volumes and inconsistent, often unpredictable demand. Through it all we have worked hard to ensure that we remain responsive and that we have not cut corners that could impact our ability to deliver on the promise of on time, accurate, defensible data. Ultimately you are the judge of our performance and we always welcome feedback on how to improve our service.

> *Like Maxxam, CANTEST has a solid commitment to science, innovation, quality and exceptional customer service. We're pleased to add their extensive experience and knowledge to our team.*

As we turn the page to 2010, I wish everyone all the very best for the holiday season. We are grateful for your support over the past year and we look forward to working with you in the New Year.

Jon Hantho

President & Chief Executive Officer
Maxxam Analytics International Corporation

Polychlorinated Biphenyls

Total Aroclors or congeners

Polychlorinated biphenyls (PCBs) are biphenyl molecules with varying degrees of chlorine substitution on the ring structure. The amount of chlorine substitution and the location of the chlorine(s) on the biphenyl ring dictate the chemical and physical properties of the material, and are used to describe the individual molecules. Each possible configuration is referred to as a congener, with 209 possible congeners.

PCB homologues refer to groupings of PCBs having the same molecular weight, i.e., the same number of chlorine atoms on the biphenyl molecule. Hence, homologue groups are described as monochlorobiphenyls (one chlorine – 3 congeners), dichlorobiphenyls (two chlorines – 12 congeners), trichlorobiphenyls (three chlorines – 24 congeners), etc.

Mixtures of PCB congeners having specific chemical and physical characteristics depending on the proportion of each congener in the mix were manufactured and sold in North America by Monsanto Co. under the trade name *Aroclor*. Aroclor mixtures are designated by a four digit code, with the first two numbers representing the type of compound (12 = biphenyl) and the last two digits representing the percent chlorine by weight. Hence, Aroclor 1248 is a chlorinated biphenyl mixture containing 48 per cent chlorine by weight.

Although PCBs are recalcitrant and persistent, they have been shown to degrade under normal environmental conditions, primarily by two main mechanisms: biodegradation and weathering. Therefore the PCB congener patterns in older Aroclor mixtures can be altered. This is important because PCB patterns observed in ambient environmental samples may not match the composition of the original source Aroclor mixture(s).

Industry standards for the determination of PCBs in environmental matrices range from simple low cost, high volume analyses for Aroclor mixtures using gas chromatography coupled with electron capture detection (GC/ECD) to the higher cost, specialized analysis using gas chromatography combined with high resolution mass spectrometry (GC/HRMS). Each approach offers its own unique advantages and disadvantages depending upon the needs of the project. Table 1 (below) summarizes the more common analytical methods.

Table 1: Comparison of Analytical Methods for PCBs

Method	Reference	Relative Cost	Reporting Limits		Application
			Soil (µg/g)	Water (µg/L)	
GC/ ECD	EPA Method 8082	Low	0.01	0.05	Aroclors
GC/ LRMS	EPA Method 8270	Medium	0.01	0.02	Homologues
HRGC/ HRMS	EPA Method 1668	High	0.000003 - 0.000007	0.00005 - 0.0002	Congeners

The analytical approaches presented in Table 1 do not represent an exhaustive list of options. As an example, GC/ECD methods can be used to analyze for PCB congeners, but with some important caveats. Depending on the sample matrix (and potential interferences), these may include lack of specificity for individual compounds (relative to HRGC/HRMS analysis), co-elution of congeners, and elevated reporting limits, although reporting limits can be lowered somewhat by increasing the level of cleanup and concentration of the extract. This comes with an increase in cost and an increased risk of concentrating interfering compounds present in the sample.

So, when planning a sampling and analysis plan, should the focus be on individual PCB congeners or Aroclor mixtures? To properly address this question, a number of factors need to be considered, including site history; data quality objectives (DQOs) for the project; risk assessment and management; cost of analysis (budget); and turnaround time. Table 2 offers some of the pros and cons associated with each of the above-noted analytical approaches.

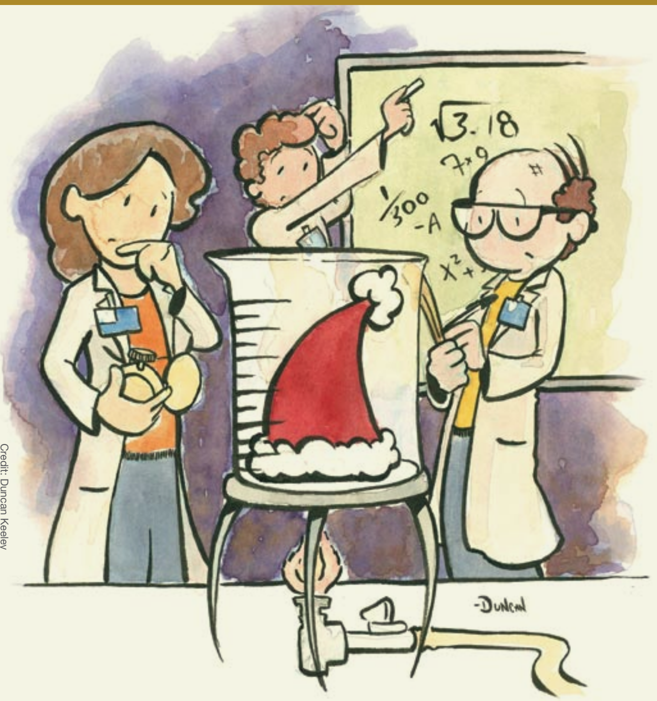
Table 2: Pros and Cons of PCB Analytical Methods

Method	Pros	Cons
GC/ ECD	• Low cost • Faster Turnaround time	• Interferences may bias results high • Quantitation is based on pattern recognition rather than individual compounds which may over- or under estimate the true concentration
GC/ LRMS	• Summation of homologue groups provides a better representation of "total" PCB concentration	• Interferences may bias data
HRGC/ HRMS	• Congener specific analysis provides a "truer" representation of the total PCB concentration in a sample • Low risk of interferences biasing results • Low limits of detection	Labour/Capital intense analysis leading to: • High cost • Longer turnaround times

A primary advantage to analyzing for PCB congeners over Aroclors is in the area of risk assessment and establishing toxic effect. The World Health Organization has designated a series of twelve individual chlorinated biphenyl congeners as being "dioxin-like" in their potential health effects. These dioxin-like PCB congeners have been shown to exert a number of toxic responses similar to those of 2,3,7,8-tetrachlorodibenzo(p)dioxin (TCDD)—the most toxic dioxin. It is important, for the purpose of establishing risk, to be able to identify and quantify the dioxin-like PCBs at ultra-trace levels.

Terry Obal
Ph.D, C.Chem
Manager, Scientific Services

lab lines



Credit: Duncan Keeley

The real name for "science" is magic.

Harlan Ellison,
science fiction author

atlantic canada

PCE Analysis at Maxxam

Tetrachloroethylene is also known industrially as perchloroethylene (PCE) or perc and is used commercially to degrease metals, dry clean garments and manufacture specialty goods. It is a stable, colourless liquid with an ether-like odour. PCE has a boiling point of 121°C and is insoluble in water, but soluble in alcohol, ether and oils.

Health Canada guidelines[1] state that the maximum acceptable concentration for PCE in drinking water is 0.03 milligrams per litre (mg/L). CCME guidelines[2] recommend 0.2 milligrams per kilogram (mg/kg) as the acceptable limit for PCE contamination in residential soil samples. Lower limits are in effect for agricultural locations. Halifax Regional Municipality Bylaw[3] W101 lists a maximum of 1 mg/L for wastewater discharge to sewers.

Analysis

Maxxam uses purge and trap extraction, followed by gas chromatographic separation and mass spectral detection, to determine PCE in both soil and water samples. PCE analyses can be obtained by requesting either the Purgeable Halocarbons or the more extensive EPA 624 Volatile Organics[4] (VOC) scan. PCE and its primary breakdown product, trichloroethene, are suspected carcinogens[5]. These chemicals can change through a process of reductive dechlorination, into other compounds of possible concern detected as part of the VOC scan (e.g. dichloroethene, vinyl chloride, dichloroethane, chloroethane).

Principle of Analysis

An aliquot of a water sample is purged with helium and the volatile components are retained on a trap. The trap is then thermally desorbed onto a capillary column where individual components are chromatographically separated. Detection is achieved via mass spectrometer. Characterization and quantitation of the sample components are obtained by comparing mass spectral data and instrumental response with prepared standards.

Sampling

Water samples for determination of PCE should be collected in three clean 40-millilitre (mL) vials, leaving no headspace (air bubble) and sealing with Teflon-lined caps. Vials are available from sample reception staff, either pre-charged with sodium bisulfate or sodium thiosulfate for water from chlorinated supplies.

Soil samples are collected in 60 mL jars fitted with Teflon liners. Jars should be filled completely leaving minimal headspace.

Samples should be protected from light, kept cold (4°C) and delivered as soon as possible to the laboratory. Clean sample containers are supplied upon request.

Detection Limits

Detection limits are evaluated using U.S. EPA protocols. The reporting limit for halocarbons in water is 0.001 mg/L and 0.025 mg/Kg in soil samples.

1 Guidelines for Canadian Drinking Water Quality - Summary Table, Health Canada, May 2008.

2 Canadian Soil Quality Guidelines, Summary Table, Update 6.0.2, November 2006.

3 Halifax Regional Municipality By-Law W-101 Respecting Discharge Into Public Sewers, June 2001.

4 Agency for Toxic Substances and Disease Registry, ToxFAQs, September 1997.

5 Environmental Protection Agency SW846-8260B, Rev.2, 1996.

BenchTalk is produced for Maxxam Analytics International Corporation by IM Group Inc. www.imgroup.ca

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Holiday Hours

	Bedford/Sydney/St. John's		Dartmouth Depot
	Office Hours	Sample Reception Hours	Office Hours/Sample Reception
Dec. 23	8:30am-5pm	8am-5pm	8am-5:30pm
Dec. 24	8:30am-3pm	8am-1pm*	8am-1pm*
Dec. 25	CLOSED	CLOSED	CLOSED
Dec. 26	CLOSED	CLOSED	CLOSED
Dec. 27	CLOSED	CLOSED	CLOSED
Dec. 28	CLOSED	CLOSED	CLOSED
Dec. 29	8:30am-5pm	8am-5pm	8am-5:30pm
Dec. 30	8:30am-5pm	8am-5pm	8am-5:30pm
Dec. 31	8:30am-3pm	8am-1pm*	8am-1pm*
Jan. 1	CLOSED	CLOSED	CLOSED
Jan. 2	CLOSED	CLOSED	CLOSED

Important Notice: During the holiday season, Maxxam will have reduced staffing levels. If you are submitting samples during this time, please speak to your Project Manager to ensure hold and turnaround times can be met.

Special Notes: *No sample receipt available after 12pm in Regional Offices due to hold times.