Using Magnetic Sector DFS with DualData XL in a Commercial Dioxin Lab

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Overview

• History
• DualData – What is it?
• DualData XL – Why?
• DualData XL – Practical Applications
• Conclusions
Who Am I?

• Analytical Chemist
  • P.Chem. – ACPBC
  • Past-President, Canadian Council of Independent Laboratories
  • Owner, Lab Director, Quality Assurance Officer, Pacific Rim Laboratories

• I am not
  • Toxicologist
  • Consultant
My Business Partner and co-founder

- Patrick Pond
- Chief Technical Officer
- GC and HRMS instrument specialist
VG70 arrives!
Beginnings

Dioxin 2005 - Toronto

Thermo Fisher Scientific POPs Symposium– Venice 2007
More business means more instruments

First DFS (2007) – 1450 samples per year; 2250 tests – staff of 7
Second DFS (2010) – 2530 samples per year; 3500 tests – staff of 9
TSQ8000Evo (2014) – 3500 samples per year; 4450 tests – staff of 11
Third DFS (2015) – 4600 samples per year; 6750 tests – staff of 15
DualDataXL installed on DFS – projecting 6500 samples
Pacific Rim Laboratories Inc.
Scientific Research and Experimental Development

• We thrive on innovation
  • PBDE method in 2005
  • 209 congener PCBs in 2005
  • Sub-ppb PAH analysis food in 2006
  • Published 2009 congener PCB by SGE HT8 column (2009)
  • Cape Tech column clean-up (2012)
  • OCPs by HRMS (2012)
  • Improved clean-up methods for dioxins/PCB (2014)
  • Rocket evaporator (2015)
  • Single run PAH and alkylated PAH on TSQ8000Evo (2015)
What is Dual Data?  PCDD/F analysis
EPA 1613b – TCDD must elute >25 minutes
Both GCs are running simultaneously.
The injection on GC 2 is performed during the acquisition of GC 1 and vice versa.
Why DualData XL?

- Cheaper than buying new instrument
- No additional floor space required
- No additional electrical considerations
- Autosampler ready to inject as soon as we get ready signal
- Can double our throughput with mixed chemistries
Requirements

• DFS with dual 1310 GCs
• Older DFS can be converted, but cannot use Trace GCs.
• Will add a 6-way valve to control gases
• A gas module is installed next to your injector.
• New software
Dual PCDD/F
Runtime DFS – 62 minutes or 23 inj/day
Runtime DualData XL – 67 minutes to complete cycle for both GCs
42 injections in 24 h!

82% more samples!
Column Resolution - TCDD
HxCDF resolution
TCDD - CS-Lo  0.1 pg injected
TCDD – CS-LoLo! 20 fg injected
Dual PCB

Runtime DFS – 68 minutes (21 inj/day)
Runtime DualData XL – for dioxin-like PCBs 74 minutes to complete cycle for both GCs

38 inj/day
82% more analyses

Runtime DualData XL – for 209 congener PCBs 94 minutes to complete cycle for both GCs

30 inj/day
43% more analyses
HxCB @ 0.1/0.5 pg injected
Dual BDE

Runtime DFS – 41 minutes (35 inj/day)

Runtime DualData XL – 60 minutes to complete cycle for both GCs

47 inj/day

34% more runs!
TeBDE @ 0.5 pg injected
DecaDBE

CS-1
2.5 pg
Dual OCP

Runtime DFS – 51 minutes (28 inj/day)

Runtime DualData XL – 64 minutes to complete cycle for both GCs

44 inj/day

57% more analyses
Our workload is not just dioxins

- PCDD/F 21%
- PCB 23%
- PAH* 35%
- OCP 6%
- TBT* 7%
- PBDE 2%
- Other* 6%
  - *mix of HRMS and MS/MS
PCDD/F & dI PCB

PCDD/F Runtime DFS – 62 minutes
PCB Runtime DFS – 48 minutes
Runtime DualData XL – 57 minutes to complete cycle for both GCs

Therefore, you can run dioxins and PCBs together in less time than it takes to run one dioxin sample!!!
PCDD/F and 209 congener PCB

PCDD/F Runtime DFS – 62 minutes
PCB Runtime DFS – 69 minutes
(EPA1668C: PCB209 cannot elute before 55 minutes)
Runtime DualData XL – 77 minutes to complete cycle for both GCs
PCDD/F & TBT

PCDD/F Runtime DFS – 62 minutes
TBT Runtime DFS – 30 minutes
Runtime DualData XL – 56 minutes*

* This takes less time than running dioxins by themselves!!
PCDD/F & OCP

PCDD/F Runtime DFS – 62 minutes
OCP Runtime DFS – 51 minutes
Runtime DualData XL – 66 minutes
PCDD/F and PBDE

PCDD/F Runtime DFS – 62 minutes
PBDE Runtime DFS – 41 minutes
Runtime DualData XL – 64 minutes

Note – you must run PBDE at 10,000 resolution

In our lab we use different tuning compound for PBDE v dioxin, so would never run together. This is just an example of what could be done.
Conclusions

1. DualData XL saves time, even when running in single GC mode
2. Not limited to running the same column/program in each GC
3. Source changes less frequent as “burn off” being vented to air
4. Wafers are a consumable, but are cleanable too!
5. Source does not need to be vented when changing columns
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Thank you from Pacific Rim Labs.