

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 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



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DFS DualData XL: Staggered Injection

- Both GCs are running simultanously.
- The injection on GC 2 is performed during the aquisition 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 through put with mixed chemistries



Requirements

- DFS with dual 1310 GCs
- Older DFS can be converted, but cannot use Trace GCs.
- Will add a 4-way valve to control gases





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- Will add a 4-way valve to control gases
- A gas module is installed next to your injector.
- New software





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	DDXL_GC1_DF_5W_FC43_GC2.mid Edit	
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	Additional Action	
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	Activate Report Reference	
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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!



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Resolution - TCDF





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





DDXL_BDE_GC2_DF	F_GC1_BDE_ONLY.meth -	
<u>F</u> ile DualData <u>H</u> elp	p	
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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







DDXL_OC[_GC2_DF_GC1meth -	x
<u>F</u> ile DualData <u>H</u> elp	
DualData AS 1 GC 1 AS 2 GC 2	
Run Parameter	
Method Type dual (alternating) V Start Device 2	
Valves Mode with Valves	
Event Settings	
GC 1 C:\Xcalibur\data\PacificRim_Dec_10\DF_Thermo_22_GC1.raw No. Event Time	
DualData -5 0 5 10 1 Start DFS 10 100	
2 Stop DFS 42	
PrepRun AS	
-5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95	
>> ✓ Display GC2 foremost AcquisitionTime MID1 32.00 min Runtime GC1 57.06 min	
GC 2 C:\Xcalibur\data\PacificRim_Dec_10\DF_Thermo_22_GC1.raw No. Event Time	
-5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 1 Start DFS 10	
2 Stop DFS 42	
40	
20	
-5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95	
>> AcquisitionTime MID2 32.00 min Runtime GC2 39.75 min	
PrepRunTime AS 0.00 min InterimTime DFS 0.00 min Advanced	
Get Times from MID and GC Send EventList to GC Undo	
	1919191

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



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



PCDD/F & dIPCB

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!!



	DF_GC1meth -
<u>F</u> ile DualData <u>H</u> e	elp
	DualData AS 1 GC 1 AS 2 GC 2
DFS	Method Type dual (alternating) Start Device 2 Valves Mode with Valves history by Adventised by Adv
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DualData	GC 1 C:\Xcalibur\data\PacificRim_Dec_10\DF_Thermo_13_GC 1.raw No. Event Time 4.5 4.5 13.5 22.5 31.5 40.5 49.5 58.5 67.5 1 Start DFS 20 100
	80 Inject
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	>> ▼ Display GC2 foremost AcquisitionTime MID1 34.00 min Runtime GC1 57.06 min
	GC 2 C:\Xcalibur\data\PacificRim Dec 10\DF Thermo 22 GC1.raw
	4.5 4.5 13.5 22.5 31.5 40.5 49.5 58.5 67.5 1 Start DFS 10
	100 - Start DF\$ - Stop DF\$
	0 9 18 27 36 45 54 63 72 81 90
	AcquisitionTime MID2 32.00 min Runtime GC2 39.75 min
	PrepRunTime AS 0.00 min InterimTime DFS 0.00 min
	Get Times from MID and GC Undo

PCDD/F & OCP

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



DDXL_BDE_GC2_D	DF_GC1_BDE_ONLY.meth -
<u>F</u> ile DualData <u>H</u> el	lp
	DualData AS1 GC1 AS2 GC2
	Run Parameter
DFS	Valves Mode with Valvee
	Injection by Autosampler
ि ज	Event Settings
	GC 1 C:\Xcalibur\data\PacificRim_Dec_10\DF_Thermo_13_GC1.raw No. Event Time Time
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	80 Inject 2 Stop DFS 54
	60 PrepRun AS
	-4 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80
	>> ✓ Display GC2 foremost AcquisitionTime MID1 34.00 min Runtime GC1 57.06 min
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	100
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	Acquisition Time MID2 30.00 min Runtime GC2 33.85 min
	Get Times from MID and GC Send Event list to GC Lindo

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





Thank you from Pacific Rim Labs.



