Reduce analytical cycle time by 1 minute and increase revenue by $100,000 or more? Yes!

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Customer Success Manager – Contract Testing Labs

Chromatography and Mass Spectrometry

August 2022

The world leader in serving science

Seems obvious – run quicker – what's the big deal?

CTL (contract testing labs) processes that distract from workflow focus

Sample pre-analysis

- Sample receiving, handling, storage, sample preparation, digestion & dilution, extraction

Sample analysis

- Instrumental analysis, chromatography data system, mass spectrometry, bench chemistry

Sample post analysis

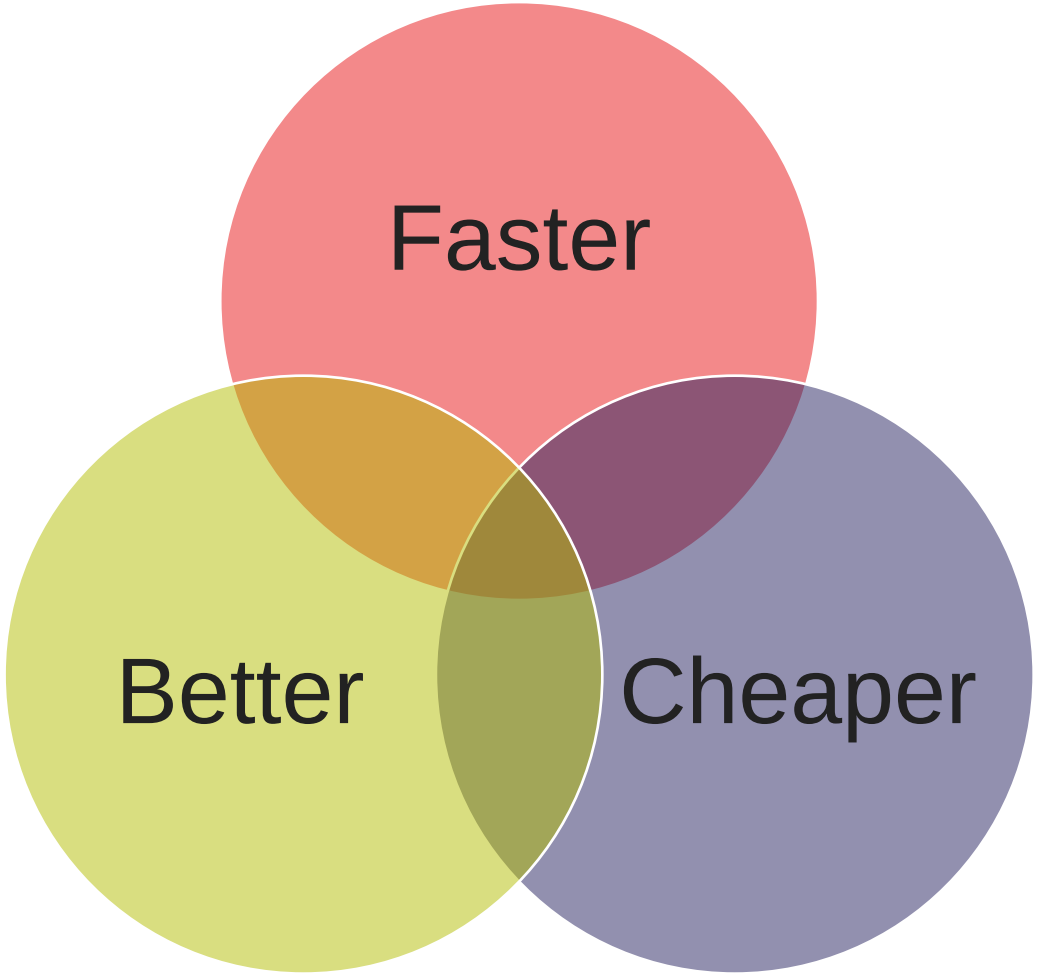
- Instrument data integration and transfer, LIMS, data review & reporting, sample disposal

Business development & managed growth

- Gap evaluation, review workflows, market demand, equipment / instrumentation financing

Triple constraint theory

Time. Cost. Quality.



Typically, pick any two (2)

- Faster + Better = $ Expensive
- Faster + Cheaper = Poor Quality
- Better + Cheaper = Slower

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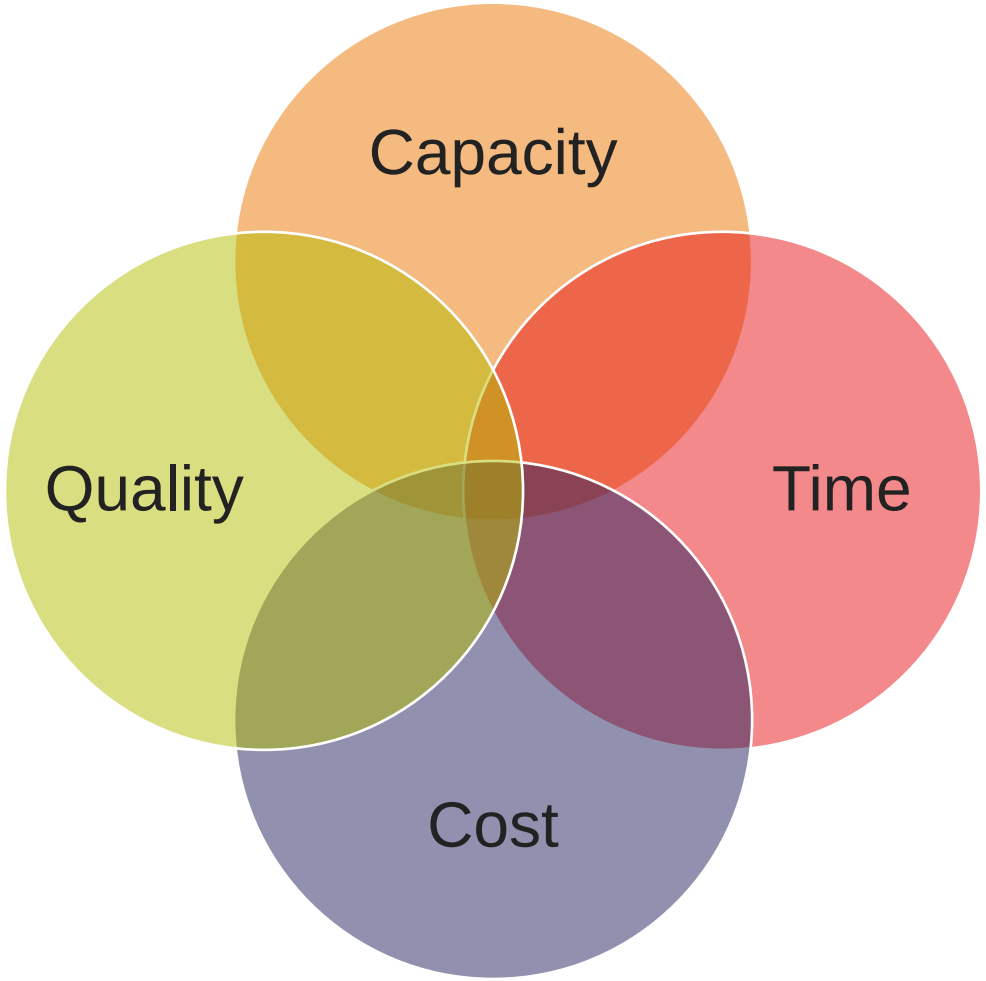
CTL (contract testing labs) quadruple constraint theory

Capacity. Time. Cost. Quality.

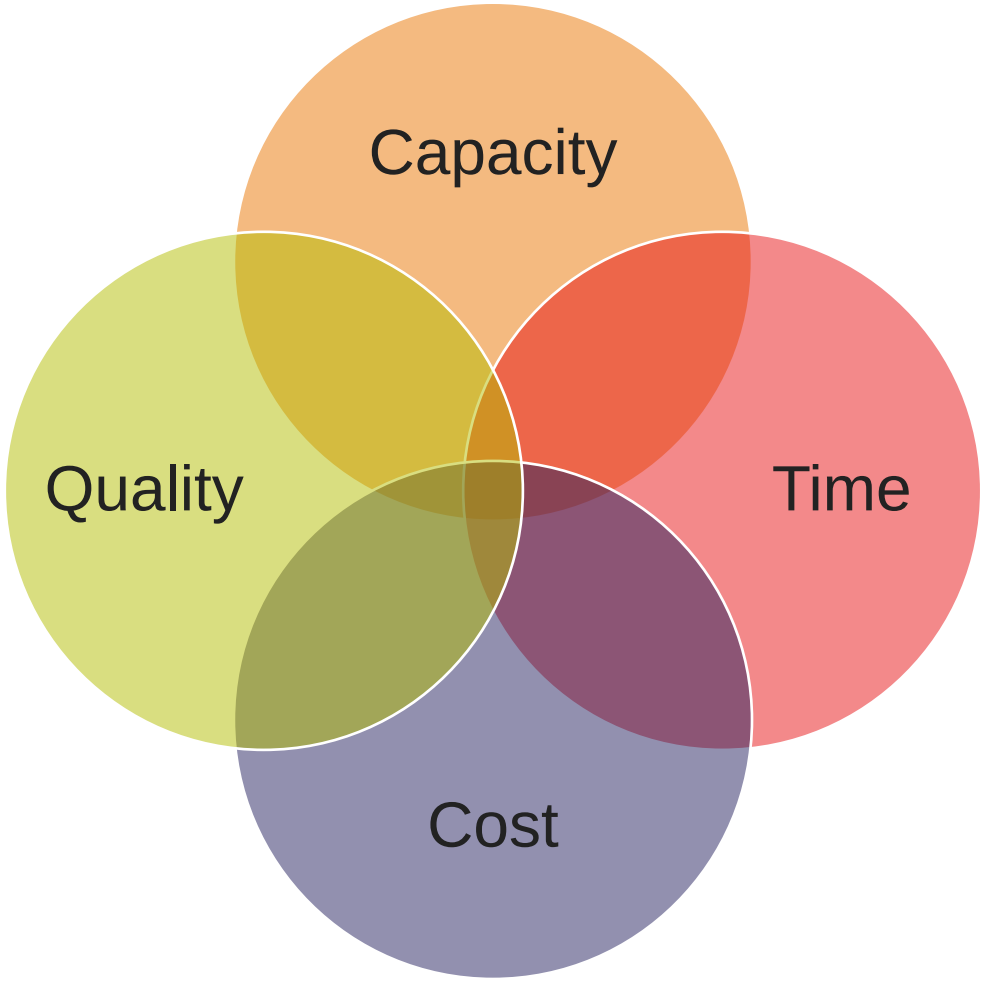


Must have all four

- Capacity: Run more samples
- Time: Must be quicker
- Cost: No overtime
- Quality: Right the first time

CTL quadruple constraint theory

How can CTL's satisfy each of the constraints?



- Capacity: Add instruments, reduce cycle time
- Time: Optimize workflows, automation
- Cost: Enact LEAN, cross-train, "one-off's"
- Quality: Improve first-time quality, CAPA

Capacity

How much is available?

24 hours / day
X 60 minutes / hour
= 1440 minutes / day

365 days / year
– 52 days (Sundays)
= 313 days / year

313 days
X 1440 minutes / day
= 450,720 minutes / year
(100% maximum capacity)

Instrument utilization

Impossible to achieve 100%

- Maintenance – routine, preventative
- Lean staffing – unexpected absence, instrument sits
- Instrument mechanical failure

Max. min./yr. X 70% usage (realistic utilization) = 315,504 min./yr.

80% usage (optimized utilization) = 360,576 min./yr.

90% usage (maximized utilization) = 405,648 min./yr.

Converting available minutes to billables

70% usage (realistic utilization) = 315,504 min.

- 10 minutes, injection-to-injection
  - 31,550 total possible injections / year
- Not every injection is billable – QC samples (CCV, CCB, etc.)
  - 20 sample sequence, 32 injections – 12 QC
- 31,550 X 70% (assuming QC samples @ 30%)
  - 22,085 potential billables

1. CCV
2. CCB
3. BLK
4. LCS
5. Parent
6. DUP
7. SPK
8. Sample 2
9. Sample 3
10. Sample 4
11. CCV
12. CCV
13. Sample 5
14. Sample 6
15. Sample 7
16. Sample 8
17. Sample 9
18. Sample 10
19. Sample 11
20. Sample 12
21. Sample 13
22. Sample 14
23. CCV
24. CCB
25. Sample 15
26. Sample 16
27. Sample 17
28. Sample 18
29. Sample 19
30. Sample 20
31. CCV
32. CCB

Revenue gain from instrument utilization

Instrument usage, maximum available minutes for 10min. cycle, number of injections

- 70% = 315,504 min. / 31,550 inj.
- 80% = 360,576 min. / 36,057 inj.
- 90% = 405,648 min. / 40,564 inj.

Factor 30% QC (non-billable) @ $20 / sample

- 70% = 22,085 billables = $441,700
- 80% = + 3,154 billables = **+$63K/Yr.**
- 90% = + 6,309 billables = **+$126K/Yr.**

Improving current instrument usage significantly improves revenue potential.

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Capacity and revenue gain from reducing cycle time

Just looking for one minute and not the knockout blow

70% instrument usage, 30% QC

10-minute cycle time

- 315,504 min./yr. = 31,550 injections
- 22,085 billables/yr.

9-minute cycle time

- 35,056 injections
- 24,539 billables
  - + 2,454 billables/yr. @ $20/sample = **$49,080/yr.**

Cycle-time reduction

Why the effort to reduce cycle time if it is <10 min.?

Is there benefit from reducing a relatively short cycle time for a $20 analysis?

- 9 ➡ 8 min. = +3,067 billables = **$61,340**
- 8 ➡ 7 min. = +3,944 billables = **$78,880**
- 7 ➡ 6 min. = +5,258 billables = **$105,160**
- 6 ➡ 5 min. = +7,362 billables = **$147,240**

Longer cycle times @ 70% utilization / 70% QC

Reducing GC, GCMS and LC/LCMS cycle times will also yield revenue benefits

35 ➡ 34 min.	**30 ➡ 29 min.**	**25 ➡ 24 min.**
+186 billables, $9,300-$18,600/yr. / instrument	+254 billables, $12,700-$25,400/yr. / instrument	+386 billables, $19,300-$38,600/yr. / instrument
$37,200 - $74,000/yr.	**$50,800 - $101,600/yr.**	**$77,200 - $154,400/yr.**

Where are the minutes “hiding”?

Ion chromatography and flow injection analyses

Poorly developed method

- Method runs after the last peak is resolved (IC & FIA)
- Eluent concentration not optimized - slow elution
- Flow rate not optimized - overall run slower

Not using columns designed to speed-up analysis

- FAST column technology for IC available for years

Autosampler old or functionality not optimized

- What is the autosampler doing during sample analysis?

Where are the minutes “hiding”?

ICP and ICP-MS

Poorly developed method

- Rinse times unnecessarily long
- Scanning individual masses too long, too many scans

Autosampler old or functionality not optimized

- Sits between samples versus rinsing
- Not using FAST valve or FAST autosampler

How do we find the “minutes”?

Observation and data review

Review data

- Look at chromatograms for extended method length
- Look at temperature profile – ramping, cooling
- Look at mass scanning for scans and time of scans

Observation

- Watch a few samples run – what’s happening?
  - Is the autosampler “sitting” between or rinsing?
    - Is the next sample loaded before previous finishes?
- Use instrument utilization reports
    - Quantify data uploaded into LIMS

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Why do these conditions exist in our lab?

It’s much more common than you think

It’s the way we’ve always done it”

- The worst reason in the history of reasons
  - However, one of the most common responses
- SOP’s must be changed to reflect new approach

Lack/loss of institutional knowledge/experience

- Experience has left your lab and the industry in general
- Teaching staff how to “run” samples and not sample analysis
  - Keep feeding the autosampler

Examples of the power of integrated partnerships

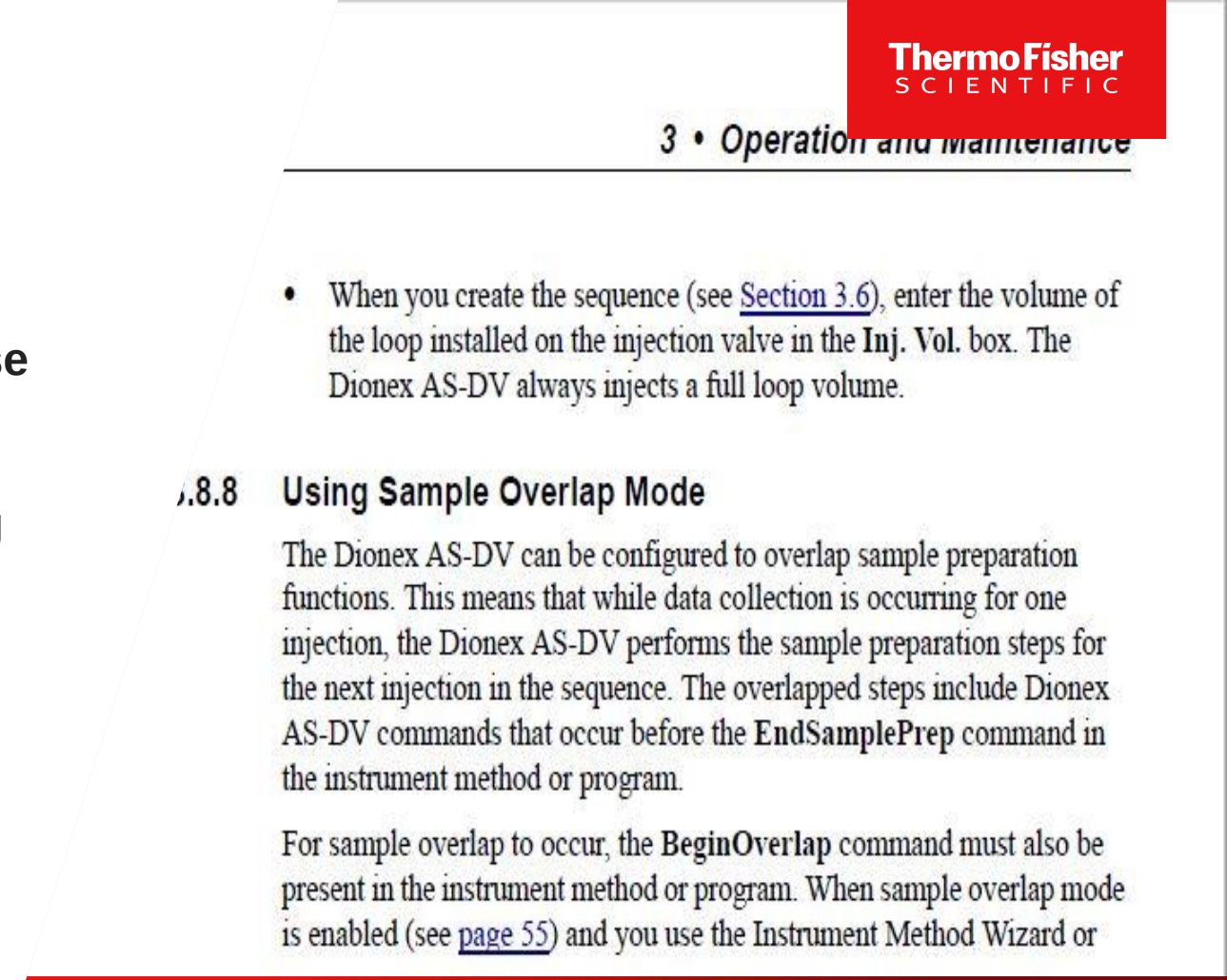
Collaboration and support

Product knowledge and support

Improving customer product knowledge

Using the FAST columns for anion analysis can be enhanced by autosampler settings to further decrease cycle time

- The autosampler was an AS-DV model not employing Sample Overlap Mode
- Using the Sample Overlap Mode for the autosampler allows the next sample to be loaded during analysis
- The feature is in the autosampler owner manual and details how to set-up the overlap mode
- Cycle time was reduced from 8 minutes to 6.5 min
- Added 6,371 billables/yr. @ $20 = **$127,420/yr.**



3 • Operation and Maintenance

- When you create the sequence (see Section 3.6), enter the volume of the loop installed on the injection valve in the **Inj. Vol.** box. The Dionex AS-DV always injects a full loop volume.

.8.8 Using Sample Overlap Mode

The Dionex AS-DV can be configured to overlap sample preparation functions. This means that while data collection is occurring for one injection, the Dionex AS-DV performs the sample preparation steps for the next injection in the sequence. The overlapped steps include Dionex AS-DV commands that occur before the **EndSamplePrep** command in the instrument method or program.

For sample overlap to occur, the **BeginOverlap** command must also be present in the instrument method or program. When sample overlap mode is enabled (see page 55) and you use the Instrument Method Wizard or

Cycle-time reduction

Increased revenue

Added billables

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Customer collaboration

Engagement with customer for solution

A long anion run time of 21 minutes attributed to changes in lab procedures and loss of experienced staff

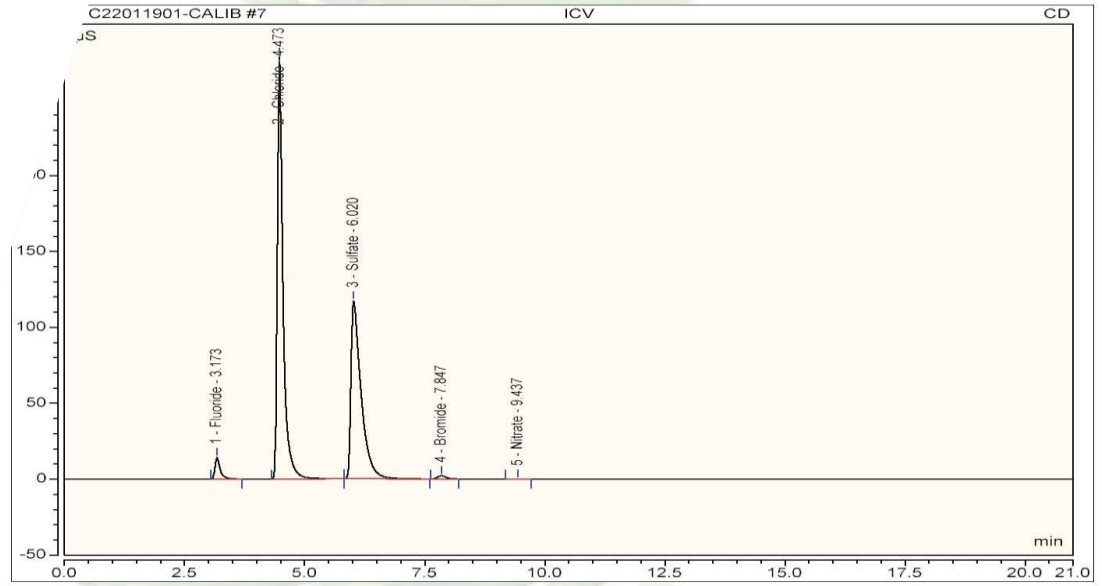
- Observation of data indicated that the IC method was running 10 minutes after the last peak eluted
- The lab had previously included orthophosphate as a reportable analyte but were no longer reporting
- After the change was made, the analytical method was not modified, and the primary analyst resigned
- Reducing the run time to 11 minutes resulted in 9,561 more billable samples/yr. (@ $20 = **$191,220 annually**) per instrument – (2) instruments = **$382,440/yr.**

try
CALIB

Peak Integration Report

	ICV	*Inj. Vol.:*	5000.00
	Unknown	*Dilution Factor:*	1.0000
I:	Anions_012919	*Operator:*	Chemistry
	20-Jan-2022 / 04:47	*Run Time:*	21.00

Time min	Peak Name	Peak Type	Area µS*min	Height µS	Amount
3.17	Fluoride	BMB	1.808	14.249	3.1051
4.47	Chloride	BMb	38.292	277.892	101.1483
6.02	Sulfate	bMB	28.653	117.329	104.3933
7.85	Bromide	BMB	0.431	2.200	2.8830
9.44	Nitrate	BMB	0.006	0.029	0.2407
	TOTAL:		69.19	411.70	211.77



Run-time reduction

Increased revenue

Added billables

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Demonstration of capability

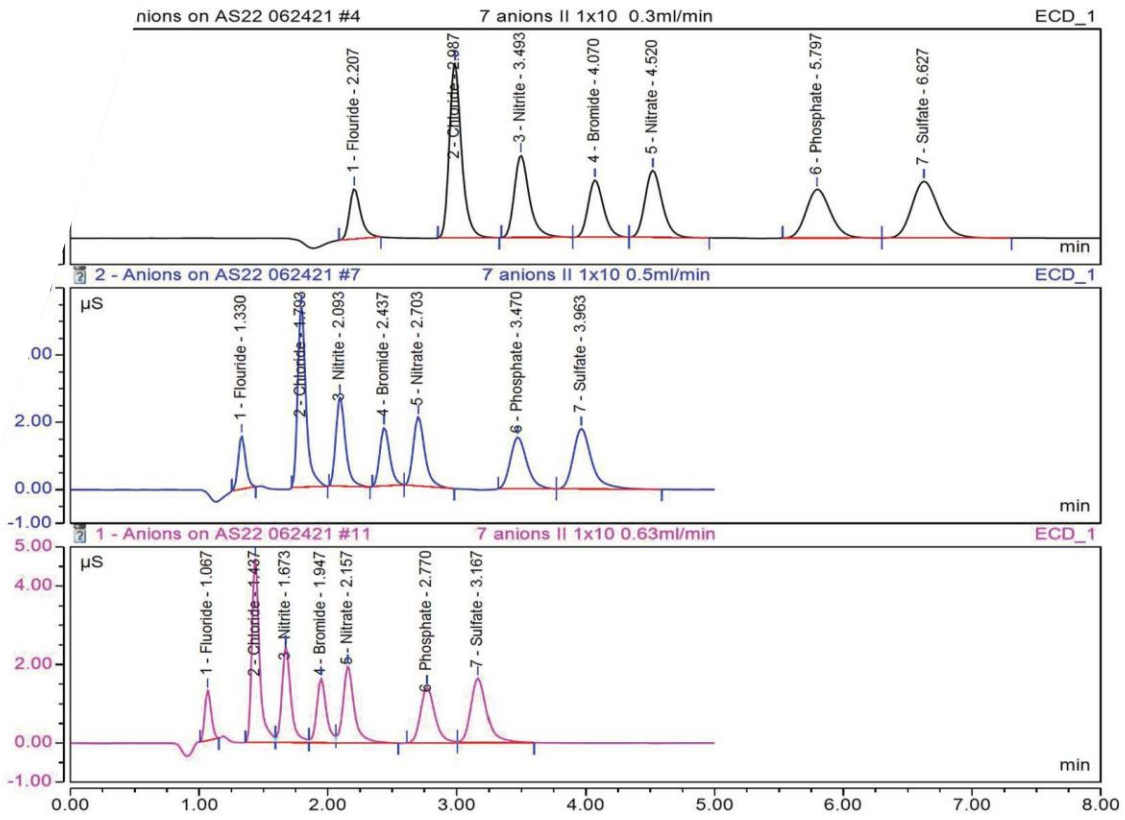
Proof of concept for customer

Customer indicated a competitor IC could run anions in 5 minutes (using TFS's columns) and wanted to know if Thermo Fisher Scientific instruments could replicate

- Client indicated they wanted to optimize anions
- Our COE (Center of Excellence) staff performed a proof of concept 7 anion analysis in < 4min.
- Client purchased recommended consumables
- Cycle time was reduced from 11 min. to 6 min.
- Gain of 16,731 billables/yr.
- $20/sample = $334,620/system
- Example of partnering with customer to assist in improving process and workflow

Results and Chromatogra

tograms of anion standard in DI water



Cycle-time reduction

Increased revenue

Added billables

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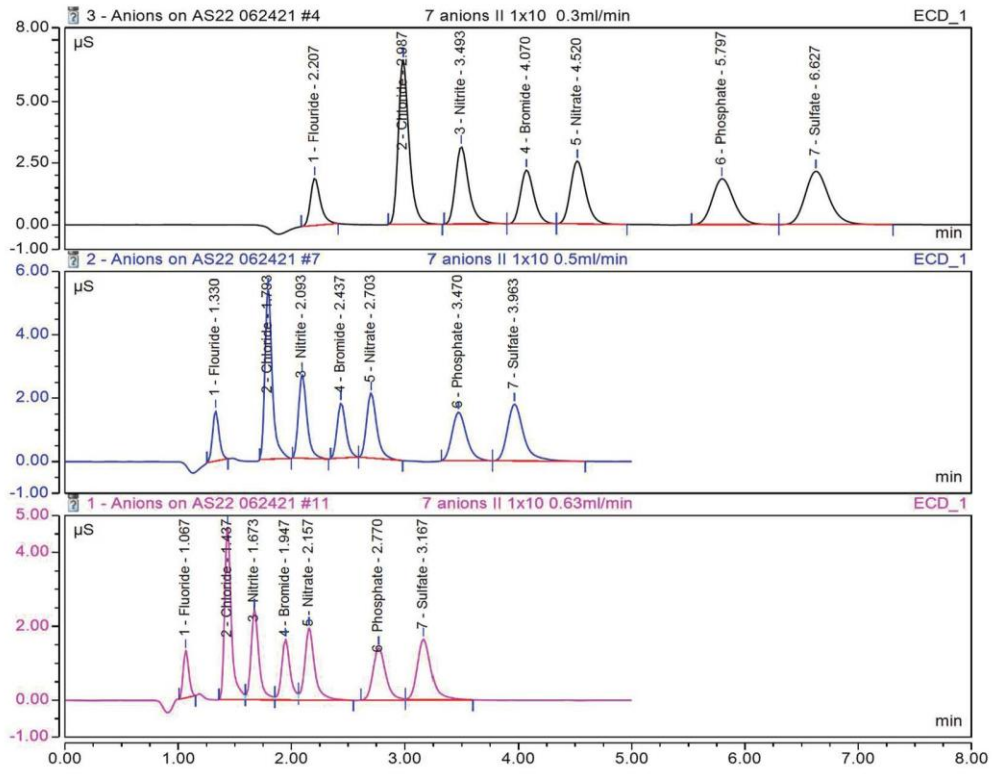
Proof of concept for 7 anions in < 5 minutes

Results and Chromatograms

Figure1. Chromatograms of anion standard in DI water with different flow rates



1) Fluoride-2.0 ppm *2) Chloride- 10 ppm* *3) Nitrite-10 ppm*
4) Bromide-10 ppm *5) Nitrate-10 ppm* *6) Phosphate -20 ppm* *7) Sulfate-10 ppm*

Can I get some help to diagnose? Yes !!

Thermo Fisher Scientific partnering with contract labs

- Initiative began in 2020 to provide CTL's with an engaged and active partnership for their success

- The objectives are to transform the customer relationship
  - Transform the traditional transactional mode to more of a white glove, concierge experience
  - We can make Thermofisher Scientific "smaller" to our customers
  - Align our resources with the needs and requirements of our customers

- These CTL Partnering Teams are established in USA and Europe
  - In the USA, teams are in the Midwest and on the West, East and Texas Gulf coasts
  - In Europe, teams are in France, Germany, Spain and the United Kingdom

For further information, please contact:

- **Richard.Clinkscales@thermofisher.com** (Texas Gulf Coast)

Thank you