



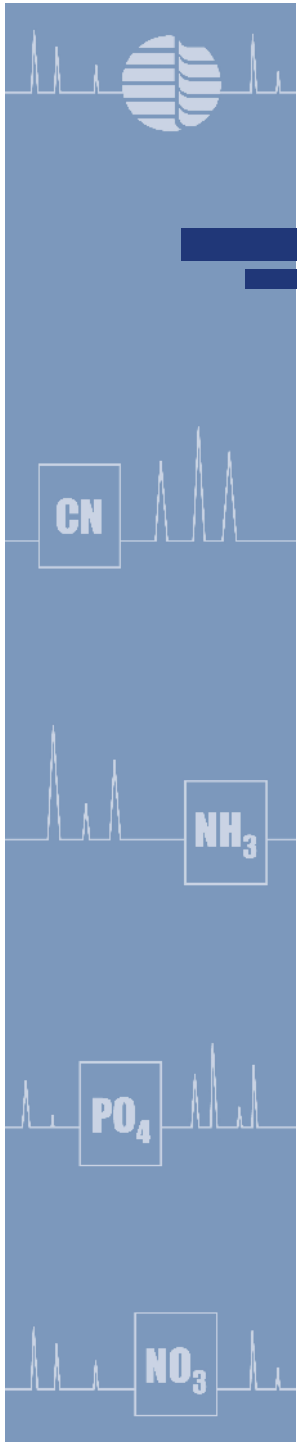
# The DA3500

**A Selective Multi-chemistry Batch Analyzer**

# Laboratories do testing by batch.

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- **Preparation batch**
- **Analytical batch**





# Many environmental tests require a preliminary sample preparation.

- **Digestion**
  - TKN
  - Total Phosphorus
- **Distillation**
  - Ammonia
  - Cyanide
  - Phenols
  - Fluoride



# Tests with preliminary processes have their own batch QC

- **Method Blanks**
- **Control Samples**
- **Fortified Matrices**
- **Duplicates**
- **Digested/Distilled Calibrants**



# Some environmental tests do not require preliminary processing.

- Nitrate + Nitrite
- Nitrite
- Chloride
- Sulfate
- Phosphate



# Even with no preliminary process, all tests still require batch QC

- **Blank**
- **Control Samples**
- **Fortified Matrices**
- **Duplicates**



# All laboratories do Chemical Analysis by Batch

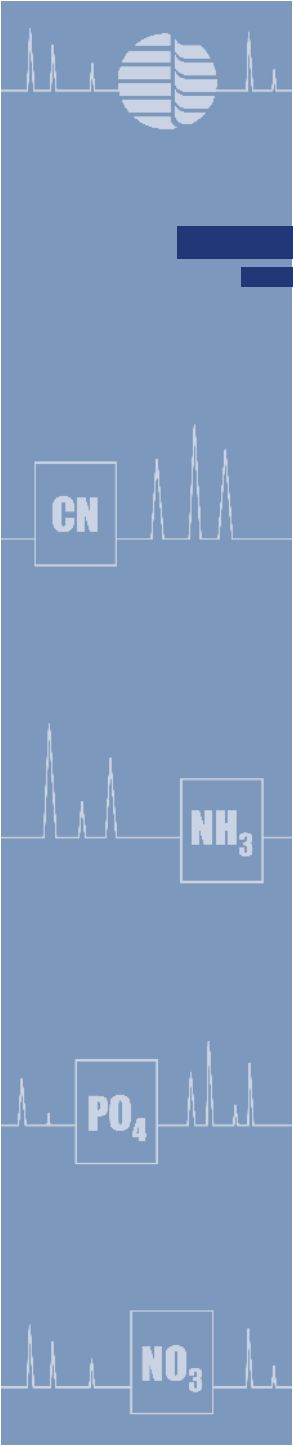
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- A batch consists of either 10 or 20 samples
  - Quality Control samples are added
  - A batch of 20 = 27 runs



# Sample are batched for Quality Control purposes

- **Up to 7 QC samples per batch**
  - Calibration Blank
  - Continuing Calibration Verification
  - Laboratory Control Sample
  - Laboratory Control Sample Duplicate
  - Matrix Spike
  - Matrix Spike Duplicate
  - Continuing Calibration Verification



# Data is accepted or rejected based on batch QC results

- All accreditation programs require batch QC
  - ISO 17025
  - NELAC
  - AOAC
  - FDA



# Laboratories “store” samples and then do analyses by test.

- **Sample are grouped by test or instrument.**
- **On the day test is scheduled**
  - analyst gathers the stored samples
  - attempts to analyze all samples in one run

CN

NH<sub>3</sub>

PO<sub>4</sub>

NO<sub>3</sub>



# Samples are grouped for wet chemistry to wait for analysis

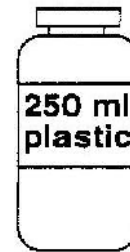
- They are grouped by
  - preservative
  - instrument for analysis
  - holding time



# Sample Storage and Analysis by Test – CFA or IC



Unpreserved  
NO<sub>2</sub>, PO<sub>4</sub>, Cl,  
SO<sub>4</sub>, CrVI



NaOH  
preserved  
CN



H<sub>2</sub>SO<sub>4</sub>  
preserved  
Total P, TKN,  
NO<sub>3</sub>/NO<sub>2</sub>-N,  
NH<sub>3</sub>-N



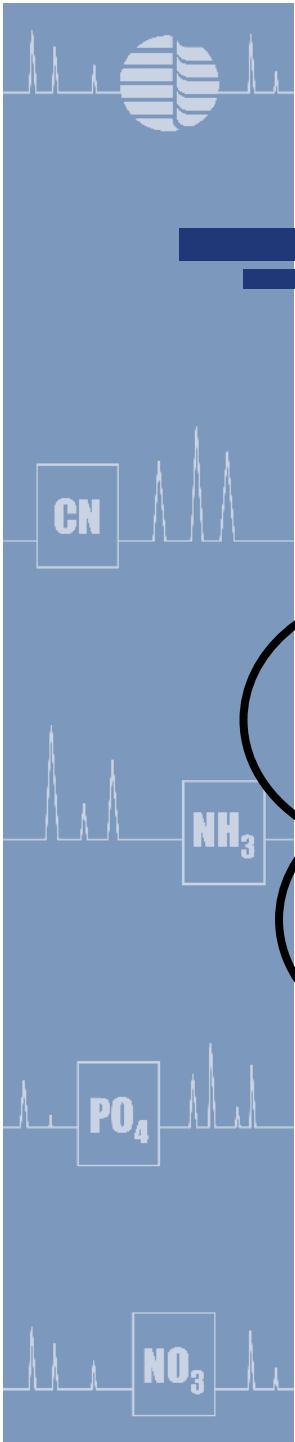
H<sub>2</sub>SO<sub>4</sub>  
preserved  
Phenolics

CN

NH<sub>3</sub>

PO<sub>4</sub>

NO<sub>3</sub>



**The CFA or IC way:**

**“I’m in a hurry, where is it”?**

# An example of how samples are grouped at an environmental lab

- **Anions**
  - Cl & SO<sub>4</sub>: grouped for IC analysis or wet chemical determination.
- **Simple Nutrients**
  - Nitrate & Ammonia: stored to be run on a CFA analyzer
- **Short Hold**
  - NO<sub>2</sub> & PO<sub>4</sub>: analyzed upon receipt by a manual colorimetric method.



# For IC and CFA, large runs are most profitable

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- **Small CFA or IC runs and “rush” samples waste time and money**



# Samples with short holding times are almost always run as a “rush”

- **Only analyzed for short hold parameter**
  - **Stress to analyst**
  - **Forces other runs to be delayed**
  - **High incidence of error**



# Remember, all laboratories do chemical analysis by batch

- A batch consists of either 10 or 20 samples
- Batches with the DA3500:
  - Up to **8** separate tests per sample when batched by 10
  - Up to **5** separate tests per sample when batched by 20



# The DA3500 is designed to achieve maximum throughput batch analysis

- **140 heated reaction cuvettes.**
  - **Samples are mixed, reacted, and results read from the cuvette.**
  - **No flow-cell or cuvette washing**

# The DA3500 runs up to 8 tests per sample plus QC in a batch of 10

<b>Tests per sample</b>	<b>4</b>	<b>8</b>
<b>Sample locations used</b>	<b>33</b>	<b>17</b>
<b>Cuvettes used</b>	<b>132</b>	<b>136</b>
<b># of Batches</b>	<b>2</b>	<b>1</b>

# The DA3500 runs up to 5 tests per sample plus QC in a batch of 20

<b>Tests per sample</b>	<b>5</b>
<b>Sample locations used</b>	<b>27</b>
<b>Cuvettes used</b>	<b>135</b>
<b># of Batches</b>	<b>1</b>



# The DA3500 analyzes multiple tests concurrently, not sequentially

- **Selective – only tests requested**
- **Random Access – vials can be placed in any order**
- **Concurrently – multiple tests are incubating all at the same time.**

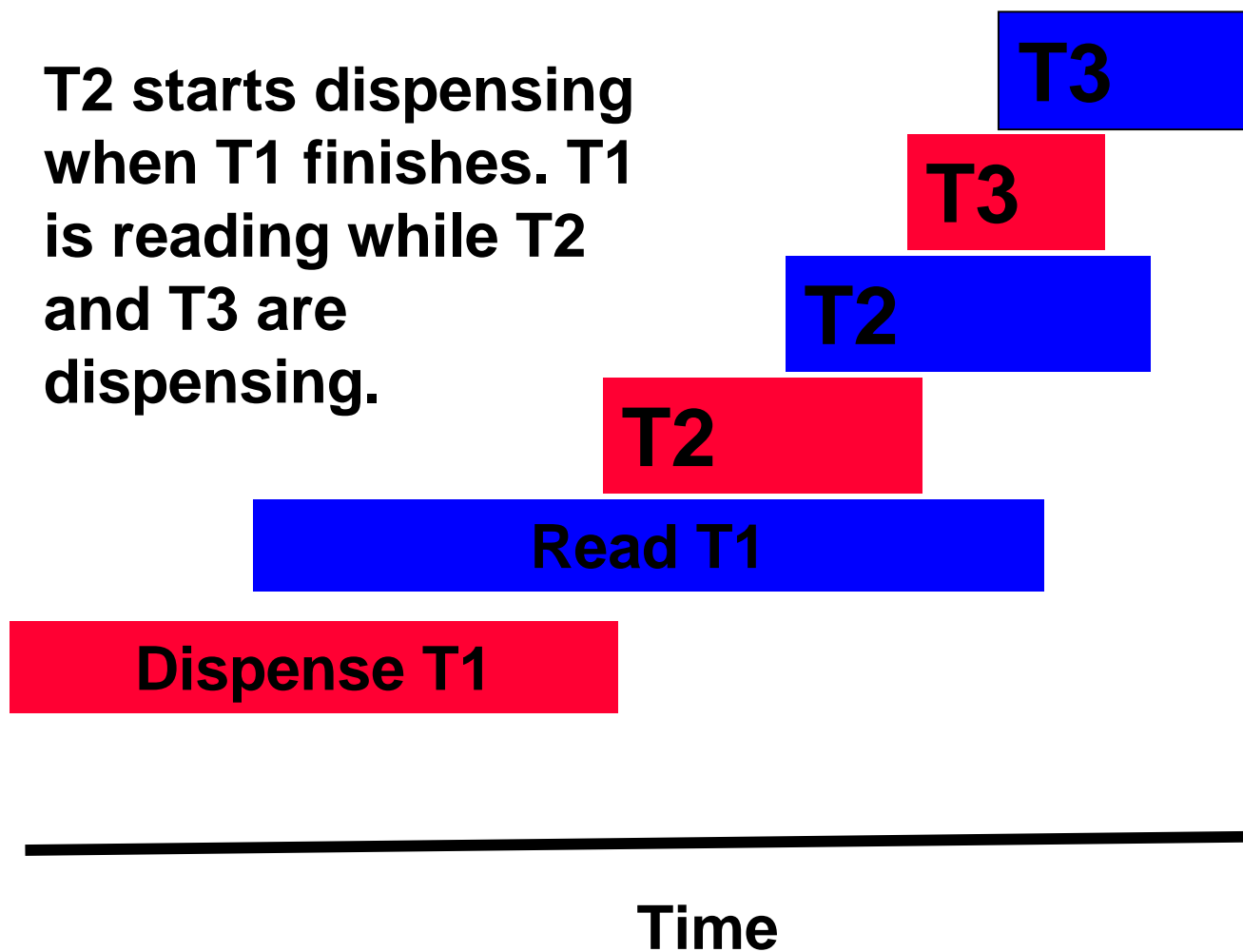


# Concurrent processing improves throughput.

- **Tests dispensed sequentially**
  - Longest incubation first.
- **The next tests continue to be dispensed while previous tests incubate.**

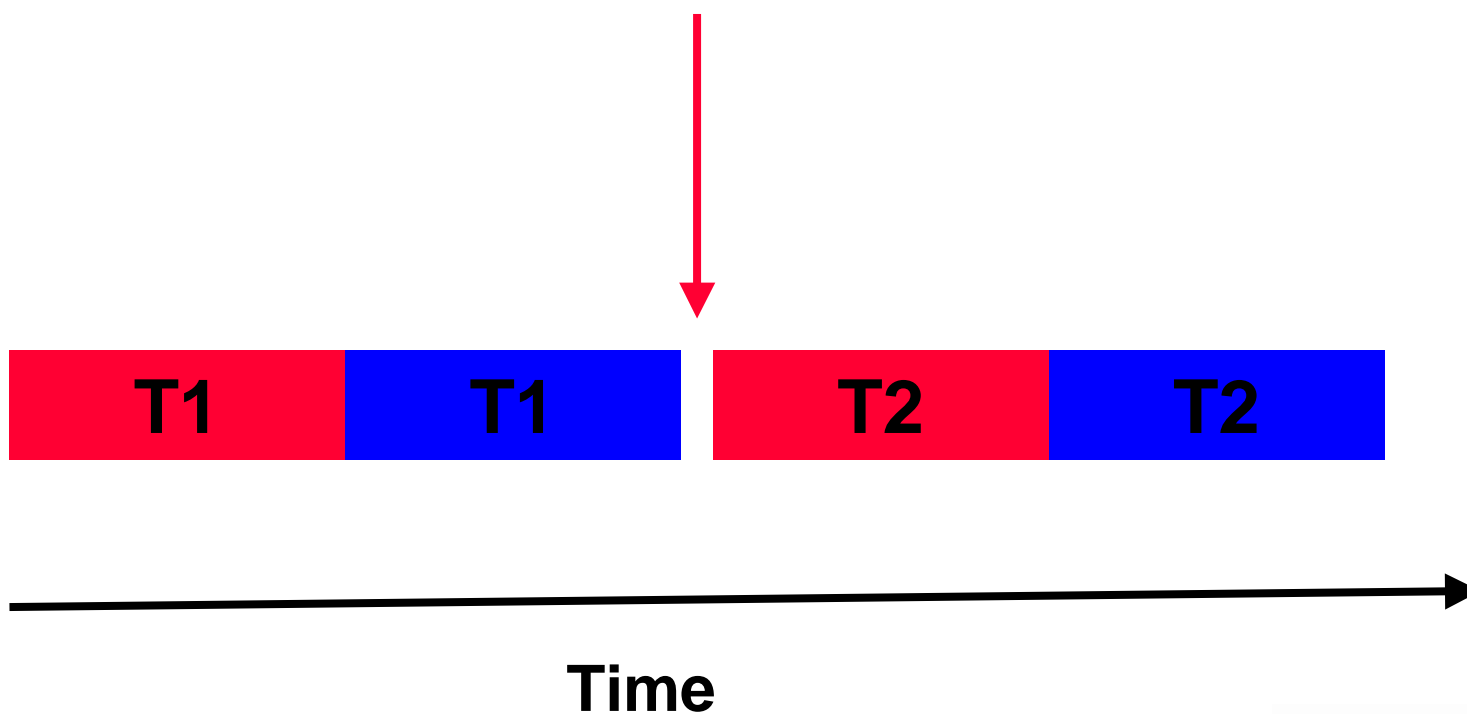
# Concurrent means multiple tests all running at the time.

T2 starts dispensing when T1 finishes. T1 is reading while T2 and T3 are dispensing.



# Sequential Analysis is slower than concurrent.

T2 waits till T1 is completely finished  
rinsing between tests





# Sequential Analyzers operate similar to continuous flow analyzers.

- **Sequential**
  - Single channel CFA
  - One method at a time
- **Throughput a function of reagents**
  - More reagents – less throughput
- **Temptation to continuous feed**

# Continuous feed ignores QC batch

- **“Need to get this one sample done now!”**
  - **Artifact of CFA mindset**
  - **CFA has long startup and shut down**
  - **Tendency to store samples then “Run them all”**



# Individual disposable cuvettes allow concurrent analysis.

**Concurrent means multiple tests at the same time.**

**You don't need continuous feed.**



# Continuous feed assumes the test added is the one running.

- **Cannot just “tack on” a different test.**
- **Reagents must be in place**
- **Method must be calibrated**



# Continuous feed assumes no sample processing.

- **Preliminary digestions or distillations cannot be “added on”**
  - Must be processed first
  - Must have their own QC batch



# The DA3500 is done before the sequential analyzer is finished.

- **Continue your QC by batch**
  - Let samples running finish
  - Meanwhile set-up “rush” tray
  - Include all QC
  - Run when the other is done.
- **Running another schedule saves time and follows QC protocol.**



# The DA3500 can analyze multiple tests at the same time

- **Run them All, as soon as received!**
  - **Anions (Cl & SO<sub>4</sub>)**
  - **Simple nutrients (NO<sub>3</sub> & NH<sub>3</sub>)**
  - **Short holds (NO<sub>2</sub> & PO<sub>4</sub>).**

CN

NH<sub>3</sub>

PO<sub>4</sub>

NO<sub>3</sub>



**With the DA3500 samples are run when received.**

- **Advantage to the lab:**
  - **Faster turn around times**
  - **Use pre-stored, pre-calibrated methods**
  - **Results do not vary by operator**
  - **Increases laboratory profitability**

CN

NH<sub>3</sub>

PO<sub>4</sub>

NO<sub>3</sub>



# Results for all tests can be obtained within 48 hours

- Previously only nitrite and phosphate results were obtained as “rush samples “ this fast.



# The DA3500 is a multi-chemistry batch analyzer

- Designed for the QC batch
- Rapid concurrent processing
- No “continuous feed” ensures compliant data
- If you got the speed, you don’t need continuous feed.



# Multiple tests when received from one cup improves throughput

- **Three batches of 20 samples per day with 5 tests per sample = 300 tests per day**
  - 1500 tests per week
  - 6000 tests per month
- **300 tests per day @ \$10 / test = \$3000 per day**

# Analyze samples directly from the shipping vial and reduce costs



**NO<sub>2</sub>, PO<sub>4</sub>, CrVI, SO<sub>4</sub>, CL, etc.**

**Analyzed in all samples (where requested) almost immediately upon receipt**

**NO<sub>3</sub>/NO<sub>2</sub> and NH<sub>3</sub>-N\***

**Can be analyzed at same time as above or immediately after**

**\* Assuming no distillation required.**

# No more losing samples, or wondering when they'll be run



**TKN, Total P**

Analyzed as soon as digested



**CN**

Analyzed as soon as distilled.

**These can be loaded on same tray with the same schedule.**



**Phenolics**

Analyzed as soon as distilled.



# The DA3500 saves you money and gets results out fast.

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- Log them in
- Bring them to the Discrete Analyzer
- Load the Sample Tray
- Start Run
- Print Results
- Send to LIMS
- **Done!**



# The DA3500 saves you time.

- Your time is valuable
- Don't waste it looking for samples
- Don't waste it deciding what to run today
- Run all samples when received

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