

***World Leader in Sample Preparation, Segmented Flow
and Discrete Analyzer Technology***





Increasing Efficiency in BOD Analysis with Automated Sample Preparation and Measurement

Topics for Discussion

- Method Protocol
 - SM 5210B
- Sample Pretreatment
- BOD Analysis
- Automation!



Method Protocol

- Samples
 - pH
 - Residual Chlorine
- BOD Analysis
 - Dilution Water
 - Sample Addition
 - Seed and Nitrification Inhibitor
 - Initial Read and Cap
 - Incubate
 - Final Read



Sample Pretreatment



Sample Pretreatment

- Residual Chlorine Check
 - Sodium Sulfite
- Sample Temperature
 - $20 \pm 3^{\circ}\text{C}$
- Sample pH
 - Check pH 6 - 8
 - Adjust the Sample pH
 - 1 N H_2SO_4 or 1 N NaOH



Sample Pretreatment



BOD Analysis



BOD Analysis

- Dilution Water
 - Distilled or Deionized Water
 - Copper Interference
 - Chlorine Interference
 - DI Water System Maintenance
 - Blank Checks
 - < 0.2 mg/L BOD
 - Replace Source Water
 - Remake Dilution Water



BOD Analysis

- Dilution Water
 - Source Water Storage
 - Plastic or Glass Carboy
 - Contamination Free
 - Passing Blank Checks
 - < 0.2 mg/L BOD
 - Prepared Dilution Water
 - Addition of Nutrients
 - Stable 24 Hours



BOD Analysis

- Sample Dilutions
 - Minimum 3 Dilutions
- 1.0 mg/L Residual DO and DO Uptake 2.0 mg/L
 - After 5 Day Incubation Period
- BOD Bottle - 67% Sample
 - Limited Nutrients
 - Add Nutrients
 - 1 mL/L or 0.3 mL/300 mL BOD Bottle



BOD Analysis

- Seed
 - Ensures Sufficient Microbial Population
- Seed Sources
 - Wastewater Influent
 - Wastewater Effluent
 - Commercial Seed
- Constant Stirring
- No Filtration



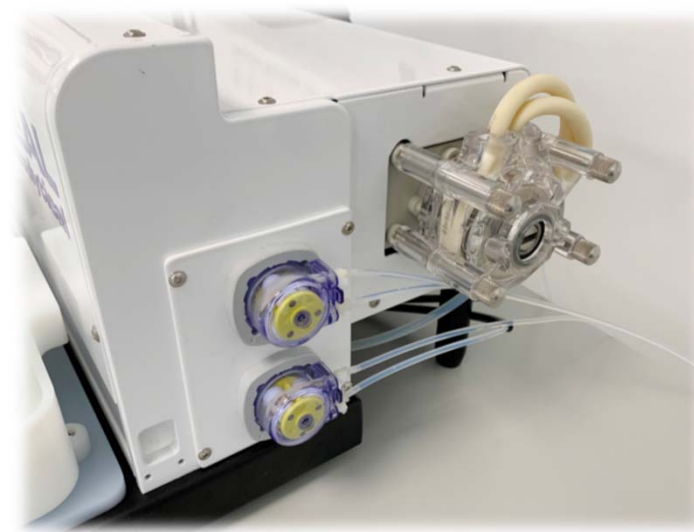
BOD Analysis

- Seed
 - Seed Control
 - DO Uptake 0.6 – 1 mg/L
 - Seed Quality
 - Seed Concentration
 - Seed Individual BOD Bottle
 - BOD Added to Dilution Water
 - Inconsistent Results
 - Seed Concentration Based on Dilution
 - Calculation Errors



BOD Analysis

- Nitrification Inhibitor
 - Carbonaceous BOD or cBOD
 - Addition of Nitrification Inhibitor
 - TCMP and ATU
 - 2/3 BOD Bottle Filled



BOD Analysis

- Initial Read
 - Calibrate Probe
 - Allow Probe to Stabilize
 - Rinse Between Each Read



BOD Analysis

- Capping BOD Bottles
 - Create Water Seal
 - Vapor Barrier
 - Cap or Foil
 - Reduce Risk of Evaporation
- Final DO Read
 - Calibrate Probe
 - Calculations!



$$\text{BOD}_5, \text{ mg/L} = \frac{(D_1 - D_2) - (S)V_S}{P}$$

Automation



Automation

- Automating BOD Analysis
 - Add Dilution Water
 - Add ATU
 - Add Seed
 - De-capping/Capping
 - Reading DO
 - 1 – 6 Probes



Automation

- Automating BOD Analysis



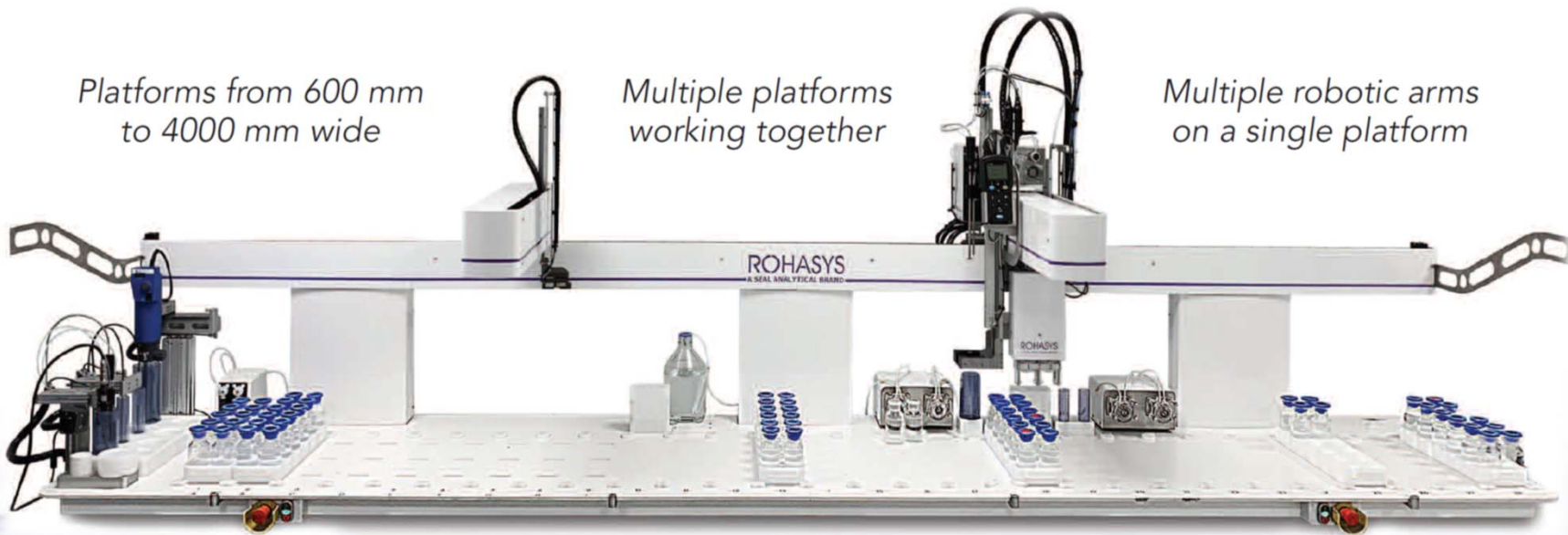
Automation

- Automating BOD Analysis

*Platforms from 600 mm
to 4000 mm wide*

*Multiple platforms
working together*

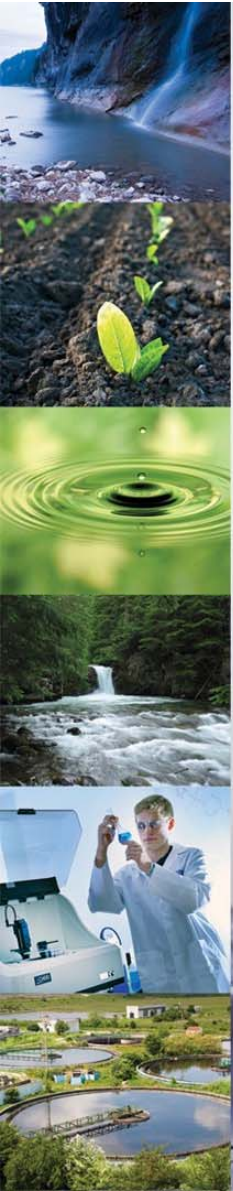
*Multiple robotic arms
on a single platform*



Automation

- Reading Barcode
- Reading Conductivity
- Reading pH & Adjusting pH
- Homogenize Sample
- Air Purging
- Sample Dilutions
- Dosing Sample
- Make Dilutions
- Add Dilution Water
- Add ATU
- Add Seed
- De-capping/Capping
- Reading DO





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