Future of Automated Discrete Analysis for Malt Evaluation

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ASBC
THE SCIENCE OF BEER

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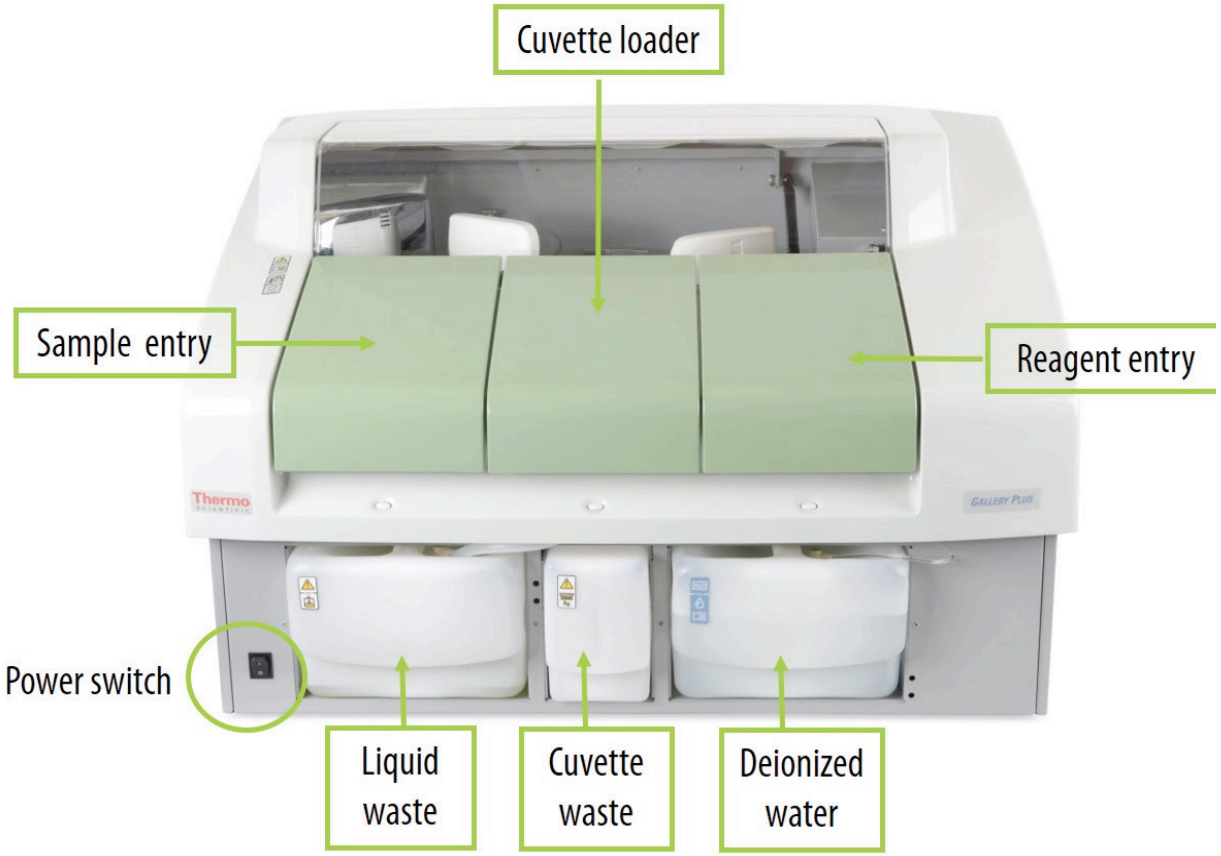
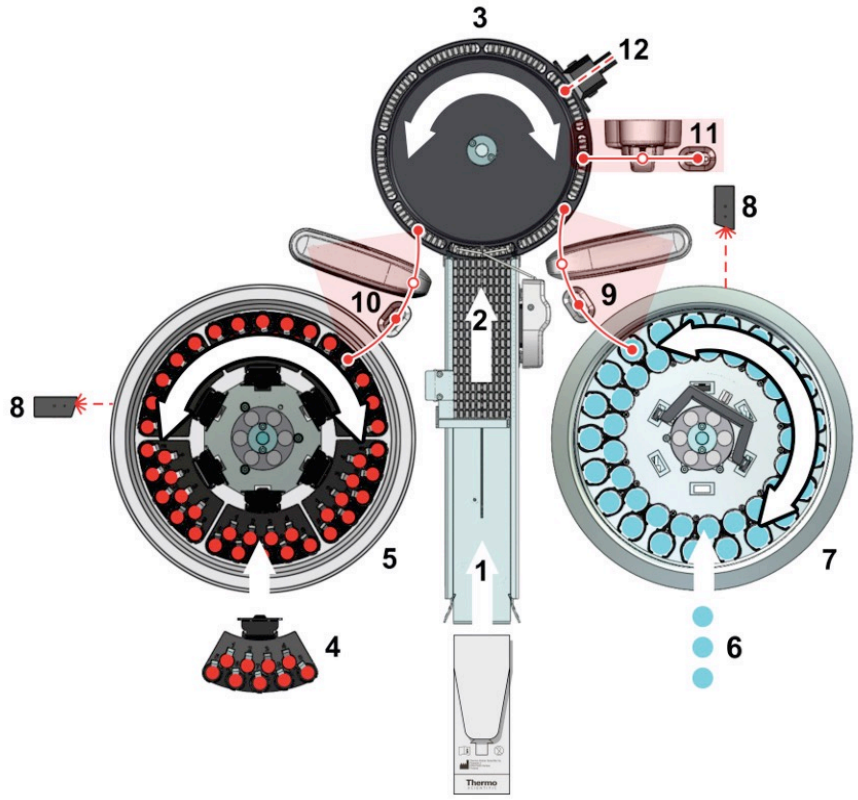
Discrete Analyzer: Gallery

Simply described – an automated spectrophotometer





1. Cuvette entry point
2. Cuvette loader
3. Incubator
4. Sample racks
5. Sample disk
6. Reagents
7. Reagent disk
8. Barcode reader
9. Reagent dispenser
10. Sample dispenser
11. Mixer
12. Photometer unit

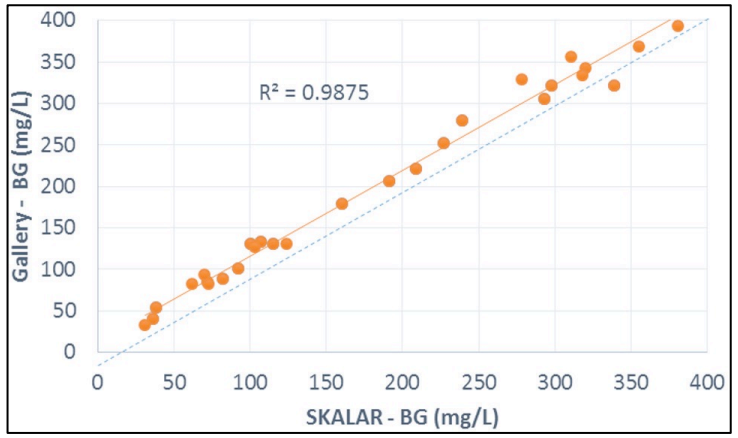
General Comparison – Discrete analysis vs. Segmented Flow

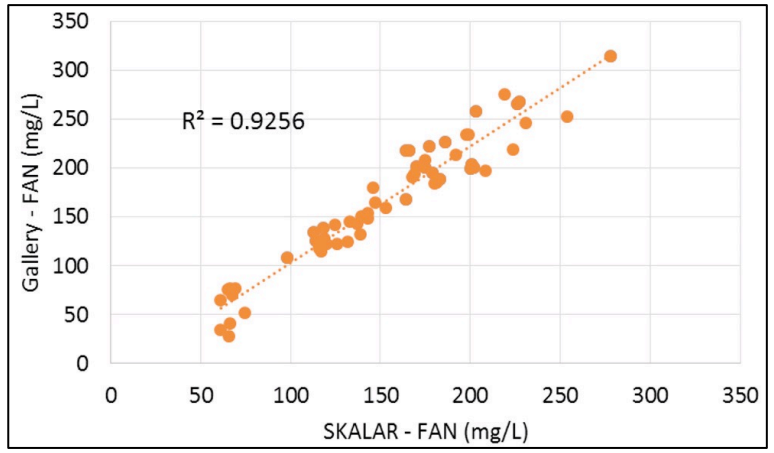
	Automated Discrete Analysis	Segmented Flow Analysis
Cost of entry	low	High
Flexibility of system	high	Low
Hands on maintenance	lower	higher
Reagent volumes	small	large
Sample volumes	small	Large
Annual contract	Available, ~$5600/year	Available, but maybe less necessary ~$600/year maintenance

- Current ASBC Methods –

Discrete analysis has high correlation with segmented flow analyzers

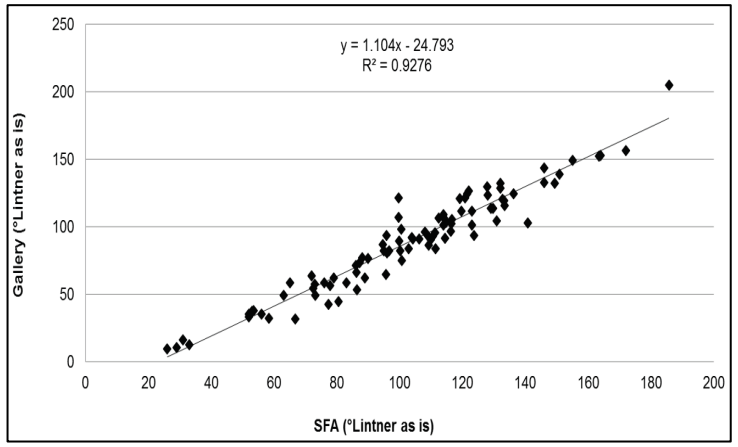
B-Glucan
R = 0.99

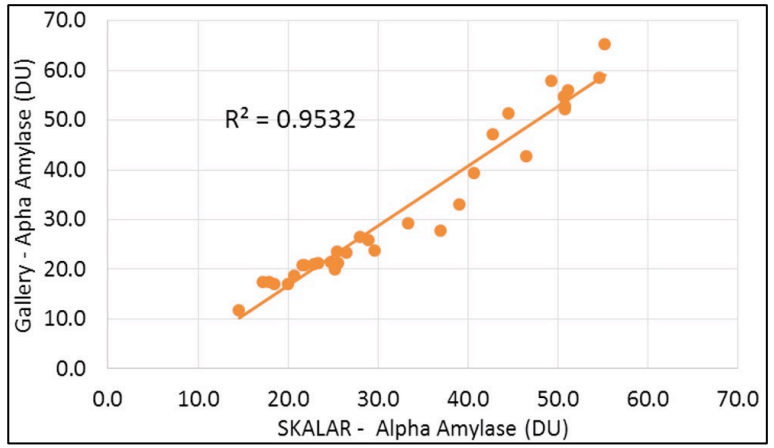




FAN
R = 0.93

Diastatic Power
R = 0.93

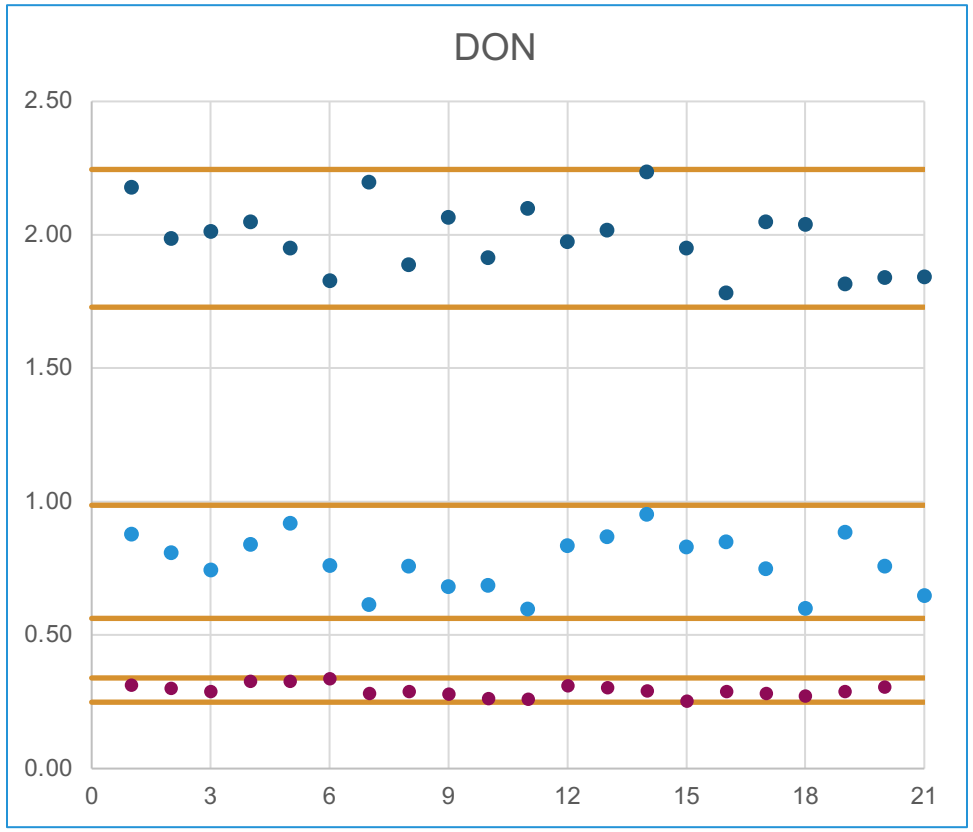




A-amylase
R = 0.95

Automated Malt Analysis using Discrete Analyzers by Aaron MacLeod, Separation Science

Other Tests Currently in use at MSU - Barley
Deoxynivalenol (DON)

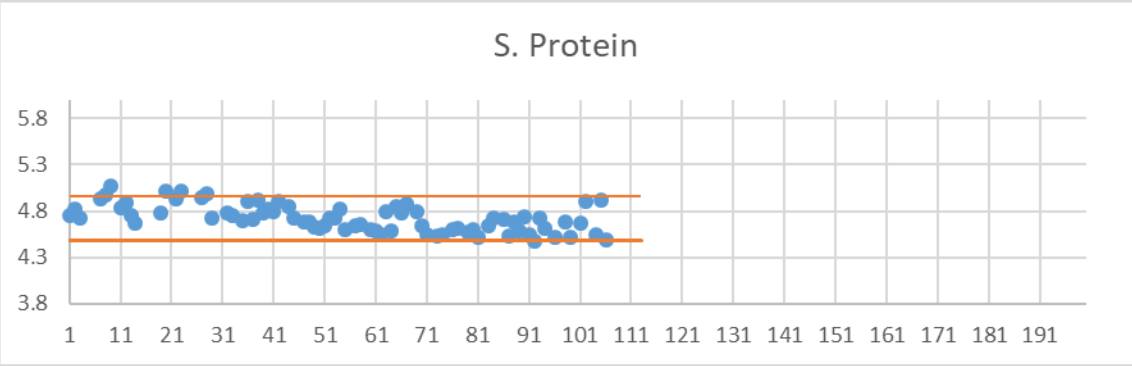


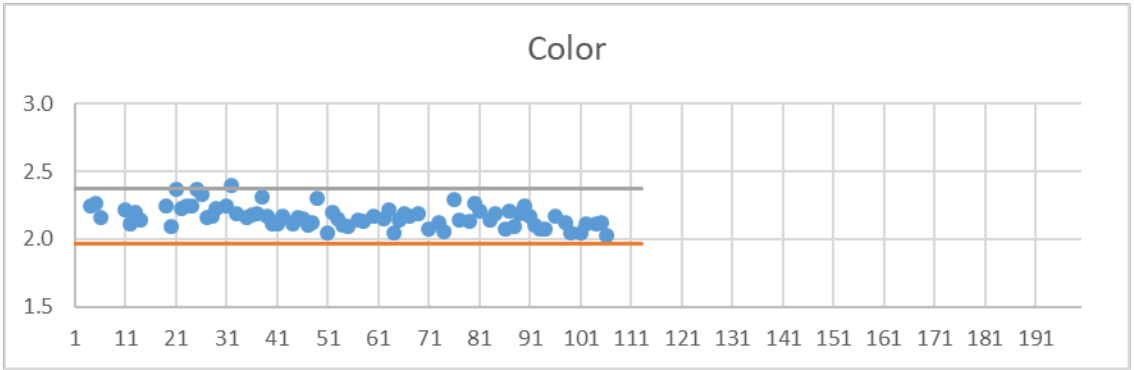
Parameter	Typical Measure
Mean	2.01
Standard Deviation	0.13
Range	1.8 – 2.2

Parameter	Typical Measure
Mean	0.77
Standard Deviation	0.11
Range	0.6 – 1.0

Parameter	Typical Measure
Mean	0.29
Standard Deviation	0.02
Range	0.25 – 0.34

Other Tests Currently in use at MSU - Malt



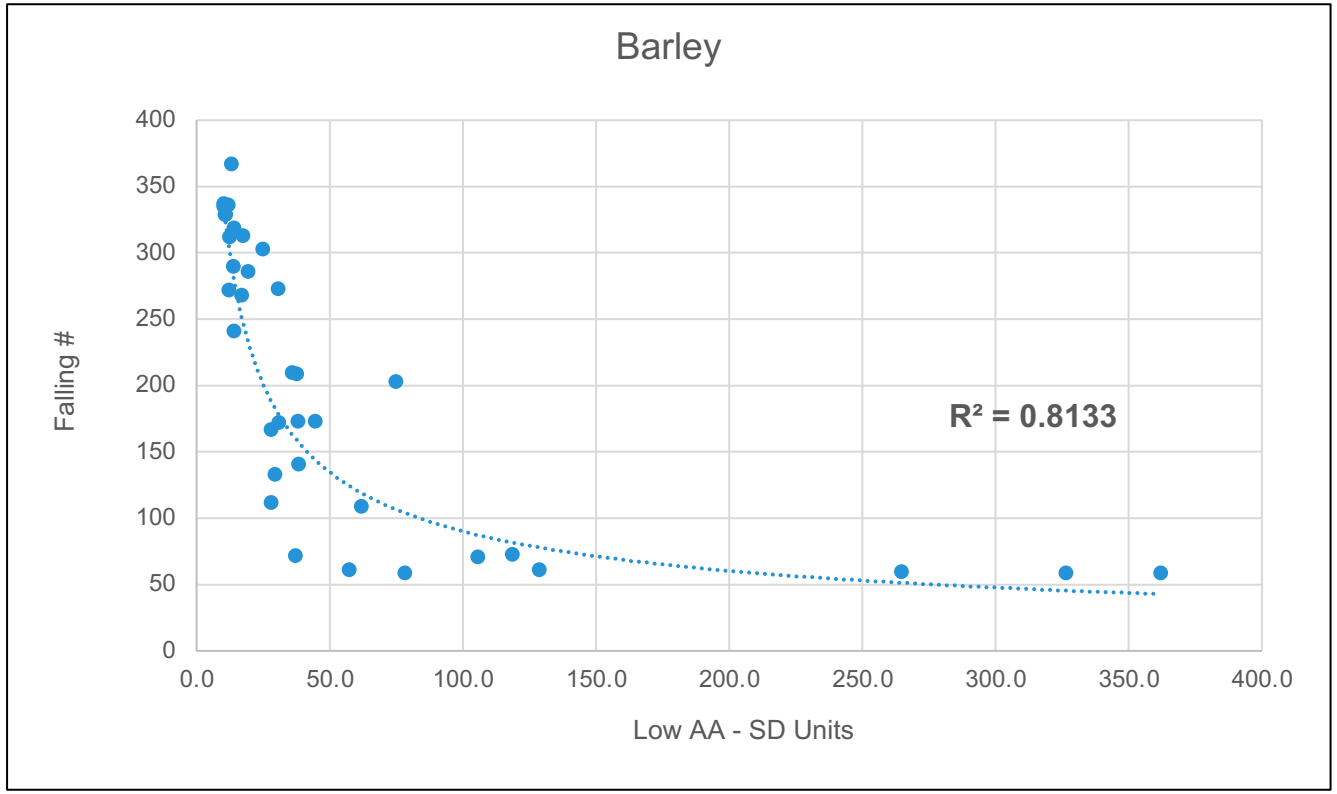


Parameter	Typical Measure
Mean	4.7
Standard Deviation	0.12
Range	4.5 – 5.0

Parameter	Typical Measure
Mean	2.17
Standard Deviation	0.08
Range	1.97 – 2.37

Tests In Development – Barley:

Low a-amylase evaluation – proxy for Falling #, sprout damage evaluation



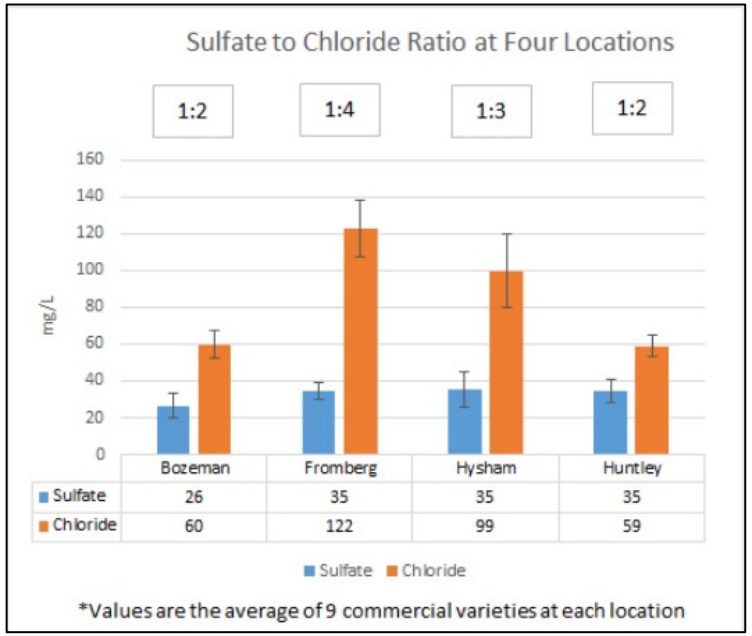
-Simple extraction
-Smaller sample volume
-Reduced expense
-Faster Processing
  -only 20-30 in day for F#
  -100 or more for low AA

Tests In Development – Malt:

Malt mineral content

- Impacts on beer flavor, brewery process, sustainability
- Definition of barley & malt terroir
- Maltster “house flavor”

- Analytes: Magnesium, chloride, potassium, calcium, phosphate, iron, silica, hardness, alkalinity



Additional Possibilities

Sugars - Sucrose/Glucose/Fructose

Total Polyphenol

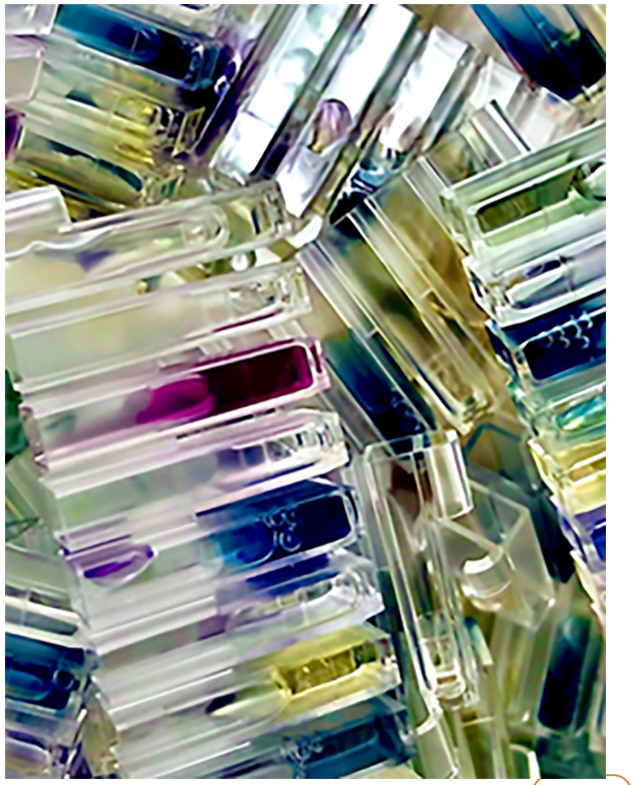
Trialed with good success

Arabinoxylan

Nitrates (forage barley)

Sulfur Dioxide

In development



Open system – program the Gallery for new methods!

Thank you!

Please reach out with any questions.

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