

# SMARTCHEM 200 DISCRETE ANALYZER vs. TECHNICON II AUTO ANALYZER

David Thurston, Global Laboratory Services Inc., Wilson, NC

**Introduction:** Global Laboratory Services, Inc. is currently comparing a Technicon II Auto Analyzer to a SmartChem 200 Discrete Analyzer. We have found the SmartChem 200 to have a higher sample throughput than the Technicon II Auto Analyzer. The SmartChem 200 results are comparable to those from the Technicon II Auto Analyzer for chlorides and alkaloids, but are more specific for sugars and nitrates.

SMARTCHEM 200 DISCRETE ANALYZER



Table 1. Chloride Comparison

Sample Number	SmartChem 200 Result	Continuous Flow Result
1	1.02	1.16
2	1.13	1.12
3	1.25	1.36
4	1.50	1.51
5	1.04	0.96
6	1.84	1.76
7	0.93	0.81
8	0.94	0.88
9	1.03	1.01
10	0.97	0.86

Note: Results are in percent chloride.

Table 2. Total Alkaloid Comparison

Sample	Auto Analyzer	SmartChem	Sample	Auto Analyzer	SmartChem	Sample	Auto Analyzer	SmartChem
1	3.77	3.86	2	2.46	2.26	3	1.46	1.35
1	3.83	3.86	2	2.42	2.37	3	1.44	1.36
1	3.86	3.78	2	2.43	2.32	3	1.35	1.36
1	3.90	3.81	2	2.44	2.23	3	1.34	1.37
1	3.84	3.66	2	2.41	2.24	3	1.35	1.35
1	3.90	3.71	2	2.37	2.24	3	1.34	1.4
AVG	3.85	3.78	AVG	2.42	2.28	AVG	1.38	1.37
STDEV	0.049	0.081	STDEV	0.031	0.056	STDEV	0.055	0.019

Note: Results are in percent total alkaloids

The SmartChem 200 and Technicon II Auto Analyzer use methods that are comparable for testing Chloride and Total Alkaloid concentrations in tobacco, thus producing results that are similar.

Table 3. Instrument Comparison

	SmartChem 200 Discrete Analyzer	Continuous Flow Auto Analyzer
Testing Capabilities	<ul style="list-style-type: none"> <li>Capable of testing Total Alkaloids, Reducing Sugars, Chlorides, Nitrates, Nitrites, Cyanide for Smoke, and more.</li> <li>One instrument performs all tests without any hardware changes.</li> <li>Capable of performing up to 6 test methods in a single run.</li> <li>Tests are performed in a temperature controlled compartment.</li> </ul>	<ul style="list-style-type: none"> <li>Capable of testing Total Alkaloids, Reducing Sugars, Total Sugars, Chlorides, Nitrates, Nitrites.</li> <li>Each test requires a separate channel module to perform the specified test.</li> <li>Depending upon proportioning pump space, the amount of test methods performed simultaneously is limited. Three test methods performed in a single run is typically the maximum.</li> <li>Test samples are mixed with chemical reagents in tubing that is exposed to laboratory environments which may produce an effect on the reaction process.</li> </ul>
Sampling Rate	<ul style="list-style-type: none"> <li>Sampling rate is up to 180 samples per hour.</li> </ul>	<ul style="list-style-type: none"> <li>Sampling rate is up to 60 samples per hour.</li> </ul>
Ease of Use	<ul style="list-style-type: none"> <li>No baseline stabilization.</li> <li>Instrument ceases operation upon sampling completion.</li> <li>Able to be programmed to automatically run dilutions of samples that may have concentrations above the calibration range.</li> <li>Uses less reagent volume to perform testing.</li> <li>Produces less waste during testing.</li> <li>Capable of creating a calibration curve from a stock standard.</li> <li>Capable of spiking samples and calculating recoveries.</li> <li>Capable of performing duplicate injections.</li> </ul>	<ul style="list-style-type: none"> <li>Instrument software uses a baseline to determine sample concentration. This is prone to stabilization problems and baseline drift.</li> <li>A technician needs to be present during instrument operation in order to shut down the instrument upon completion of sample testing.</li> <li>Samples with concentrations above the calibration range need to be diluted and a new run performed in order to bring them into the calibration range.</li> </ul>

CONTINUOUS FLOW AUTO ANALYZER



The SmartChem 200 and the Technicon II Auto Analyzer use different methods of detection for the determination of Reducing Sugars. The Auto Analyzer uses potassium ferricyanide as the color reagent. The reduction of ferricyanide to ferrocyanide yields a color loss at the 420nm wavelength. However, any substance that can reduce the ferricyanide to ferrocyanide will yield this color change, therefore on the Auto Analyzer more than just sugars are detected. The SmartChem 200 uses an enzymatic method to detect the presence of sugars. Glucose is phosphorylated and then reduces NADP to NADPH in the presence of the enzyme glucose-6-phosphate dehydrogenase. The conversion of NADP to NADPH produces a color change at the 320nm wavelength. This reaction is specific to only sugars.

The SmartChem 200 uses a cadmium coil reduction system for the determination of nitrates in tobacco. This system produces results that are comparable to the results of other laboratories. The auto analyzer uses a hydrazinium sulfate solution reduction system. This solution has to be optimized to determine the concentration of hydrazinium sulfate in solution for the optimal reduction of nitrate. This process leaves the decision of the optimal amount of hydrazinium sulfate in solution up to an analyst and thus can present problems in determining the correct amount, which can lead to some differences in results and is also more time consuming.

Table 4. Nitrate Comparison

Sample Number	SmartChem 200 Result	Outside Laboratory Result	Technicon II Auto Analyzer Result
1	0.16	0.18	0.23
2	0.21	0.26	0.31
3	1.61	1.72	2.25
4	0.53	0.48	0.63
5	0.17	0.12	0.26
6	1.34	1.42	1.82
7	0.86	0.87	1.04
8	1.27	1.24	1.59
9	0.28	0.31	0.36
10	0.95	0.97	1.22

Note: Results are in Percent Nitrate.

**Conclusion:** The SmartChem 200 is more automated, faster, and easier to use than the Auto Analyzer. The data shows that the methods on the SmartChem 200 are comparable with those of the Auto Analyzer.