226

WORLD BREWING CONGRESS 2016

A New Micro Automated Bitterness Procedure by the Skalar SP2000 Robotic Analyzer According to ASBC Beer-23 and Wort-23 Methodology

Drazen Markovic[1], Vincent Francke[2], Kees Hollaar[2], Karlijn de Weijer[2] and Mark Payne[3]

1:Special Products Department, Skalar Analytical, Breda, the Netherlands; 2: Application laboratory, Skalar Analytical, Breda, the Netherlands; 3: Validation laboratory, Skalar Inc., Buford, GA. USA

World Brewing Congress
August 13-17, 2016
Sheraton Downtown Denver
Denver, CO 80202, U.S.A.

Introduction

Bitterness is a key component in a beer's flavor that is necessary to balance out the sweetness of the malts. The bitterness of beer is provided by compounds such as iso-alpha acids (iso-humulones) from hops. These acids are extracted by the brewer during the boil. In order to maintain consistency in quality of the beer, bitterness needs to be tightly monitored and controlled. On this poster are results and discussions on an automated determination of bitter substances (bitterness) in wort and beer. The bitter substances are extracted from acidified wort or beer with iso-octane. After mixing, the absorbance of the iso-octane layer is measured at 275 nm against a reference of pure iso-octane. The procedure follows ASBC approved methodology Beer-23 and Wort-23 for bitterness analysis on a micro scale. The complete automated method requires limited operator intervention, reduces reagent waste and disposal cost.

SP2000 Robotic Beer & Wort Analyzer

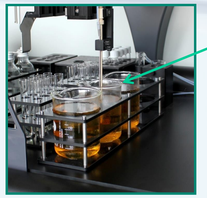
Principle

1) The sample, beer or wort, is degassed via the robot
2) Sample is automatically pipetted together with hydrochloric acid and iso-octane via defined values in the software
3) The iso-alpha acids are extracted into the iso-octane
4) After automated phase separation, the iso-octane layer is measured in the detector at 275 nm. Blank is pure iso-octane

*Reagent consumption is decreased by a ratio of 5 compared to the manual method (reduction of iso-octane from 20 ml to 4 ml) with this micro method

*Results are calculated as described in ASBC/ EBC method 9.8 at point 9: Bitterness units (BU) = Absorption at 275 nm (AU) * 50
No calibration standards are required.

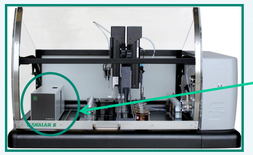
Materials



- Degassing
The beer or wort is poured into a beaker glass, a Teflon stirrer bar or flea is added and the beaker glass is placed on the analyzer

- Pipetting
After stirring to degas, an aliquot of sample is picked up and dispensed into a sample tube; additionally hydrochloric acid and iso-octane are added

-Shaking
The sample tube is capped and shaken to extract the iso-alpha acids into the iso-octane layer

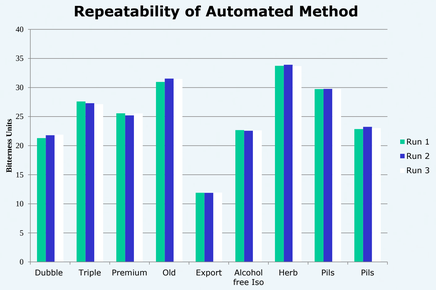


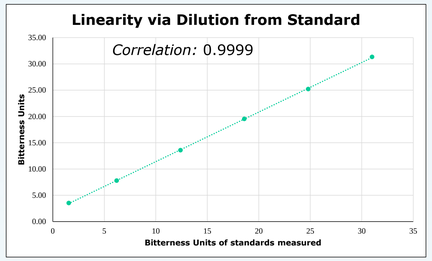
- Measurement
After automated phase separation, the tube is de-capped and the organic layer is measured in the detector at 275 nm. As a blank, pure iso-octane is used

Results

Repeatability of Automated Method vs. Manual ASBC

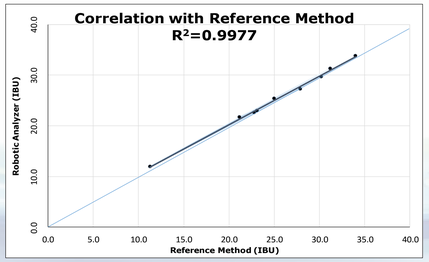
Reference Beer	Reference Bitterness	Run 1 Robot	Run 2 Robot	Run 3 Robot	Avg	SD	CV %
Dubble-Double	21.2	21.3	21.8	21.9	21.7	0.32	1.5
Triple	27.9	27.6	27.3	27.1	27.3	0.23	0.8
Premium	25.0	25.6	25.2	25.5	25.4	0.21	0.8
Old	31.2	31.0	31.5	31.5	31.3	0.31	1.0
Export	11.3	11.9	11.9	11.9	11.9	0.03	0.2
Alcohol Free	22.8	22.7	22.6	22.6	22.6	0.05	0.2
Herb	34.0	33.7	33.9	33.7	33.8	0.12	0.4
Pils 1	30.2	29.7	29.8	29.7	29.7	0.02	0.1
Pils 2	23.1	22.9	23.2	23.0	23.0	0.19	0.8





Optional Parameters

- Color
- pH
- FAN
- SO_2 (Total)
- Beta-Glucan



Conclusion

The fully automated analysis of Bitterness was performed by the SP2000 Beer & Wort analyzer according to ASBC Beer-23 and Wort-23 methodology. The beers were automatically degassed, acidified, extracted and measured at 275 nm by the robotic analyzer.

When the automated method is compared with the manual method similar results are reported with excellent repeatability via the automated method. **The coefficient of variation for the Skalar automated robotic method ranged between 0.1 to 1.5%. The correlation with the reference method is 0.9977.**

Sample throughput of four samples is 20 minutes in the standard configuration (5 minutes a sample), but if higher sample throughputs are required, the analyzer configuration can be easily extended.

The automated method provides the laboratory with a standardized bitterness measurement without operator errors, less iso-octane use, less waste, less disposal cost and a reduction in labor/operator time.

For more information, visit Skalar at booth 323.

References

1. ASBC, Methods of Analysis, Wort-23, Wort Bitterness
2. ASBC, Methods of Analysis, Beer-23, Beer Bitterness
3. EBC, Chemical procedure 8.8, Bitterness of Wort
4. EBC, Chemical procedure 9.8, Bitterness of Beer

Skalar