# Application Note 20:NIT-38 Alcohol Analyser
# Determination of the Quality Parameters of Beer

## *Introduction:*

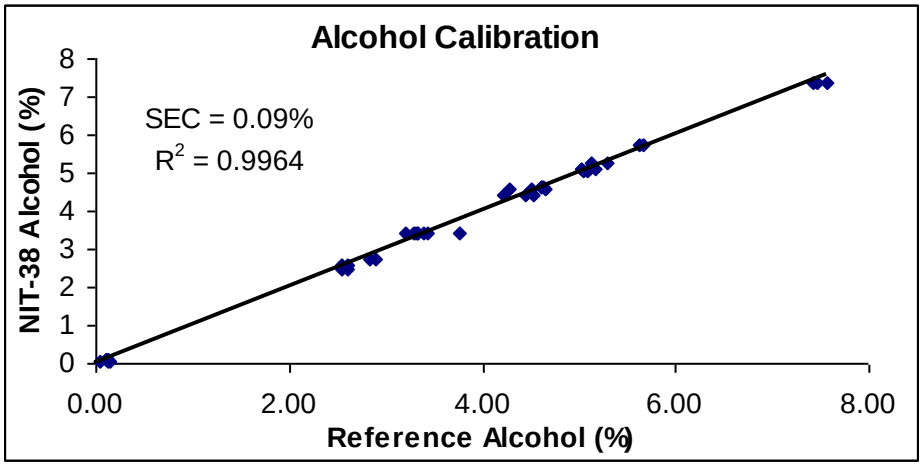
The NIT-38 Alcohol Analyser was originally designed to rapidly measure the alcohol content of both red and white wine with no sample preparation. The instrument measures samples in transmission mode, allowing the design of a "*pour in pour out*" sampling system. The analysis of beer is a little different, as the presence of gas bubbles can interfere with the light path being measured by the instrument and bubbles themselves can never be reproduced. This report outlines the procedure used to determine the alcohol content, specific gravity, density, energy per 100 mL, and original and apparent extract in beer samples. The report also discusses the data in terms of calibration statistics.

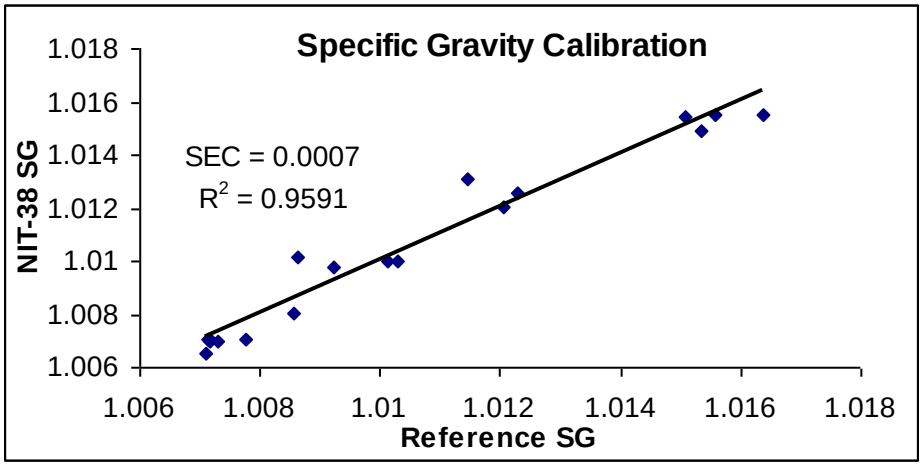
## *Procedure:*

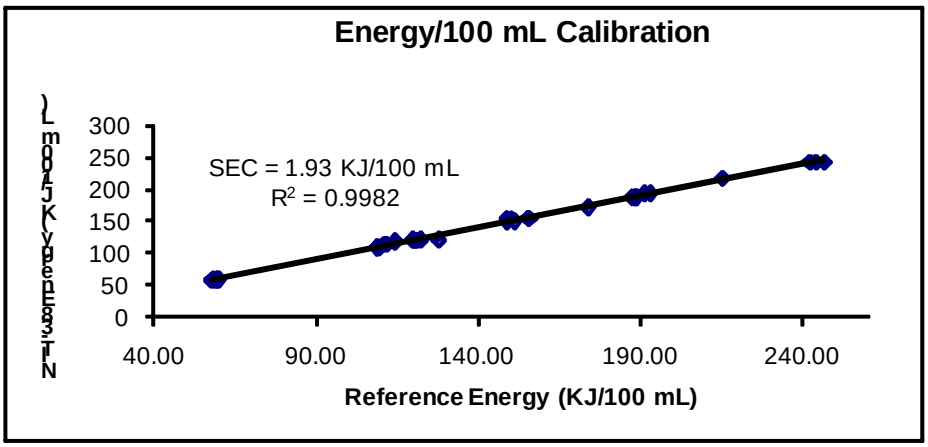
A calibration set of beer samples were selected covering a broad range of variety (i.e. light, dark, full strength etc) and a wide alcohol range (0.1-7.5%). The samples were equilibrated to 20ºC in a water bath, de-gassed using a sonic vibrator with a magnetic stirrer bar and filtered with a rapid paper to provide samples of high optical clarity. The samples were then analysed on an Anton Parr Beerscan® for reference analyses and then on the NIT-38 using a 30mm pathlength liquid cell. The samples were scanned in the wavelength region 720-1100nm and the data saved on the internal memory of the analyser. Partial Least Squares (PLS) calibration was performed on the data and a calibration model was developed for each of the individual constituents

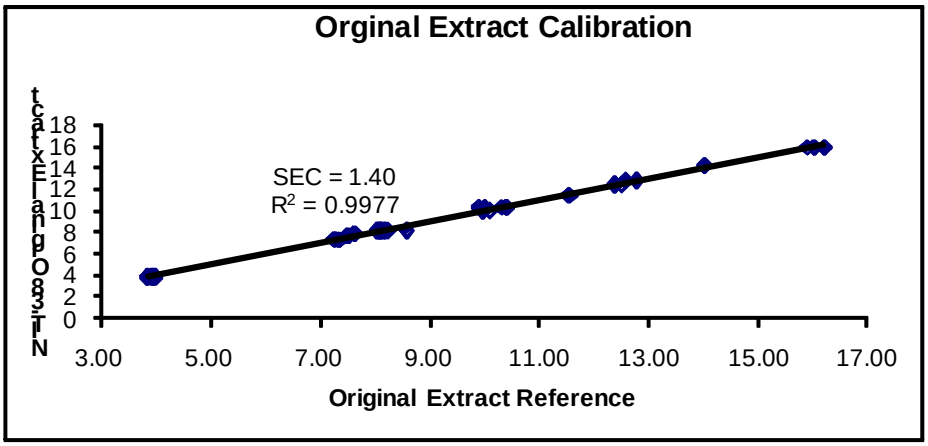
## *Results:*

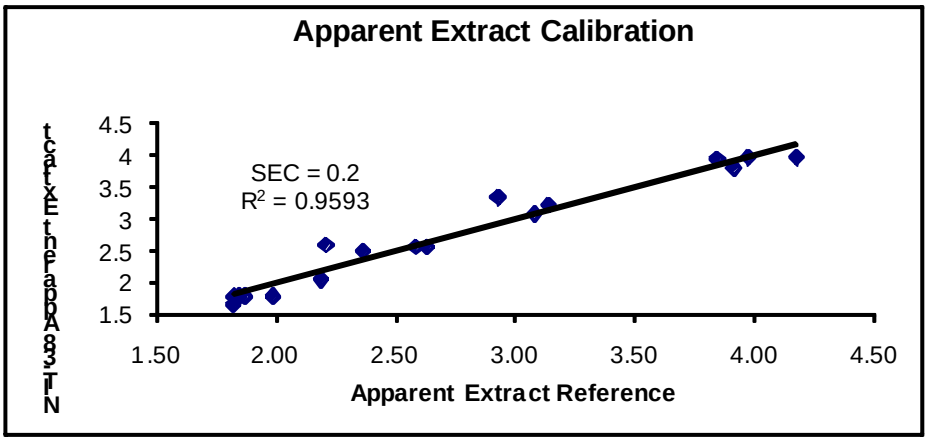
The results of the calibrations are shown graphically in terms of Predicted vs. Measured data. The plots show the Standard Error of Calibration (SEC) and the Correlation Coefficient ($R^2$) for the individual models. The data show that for all constituents, high correlations were observed.

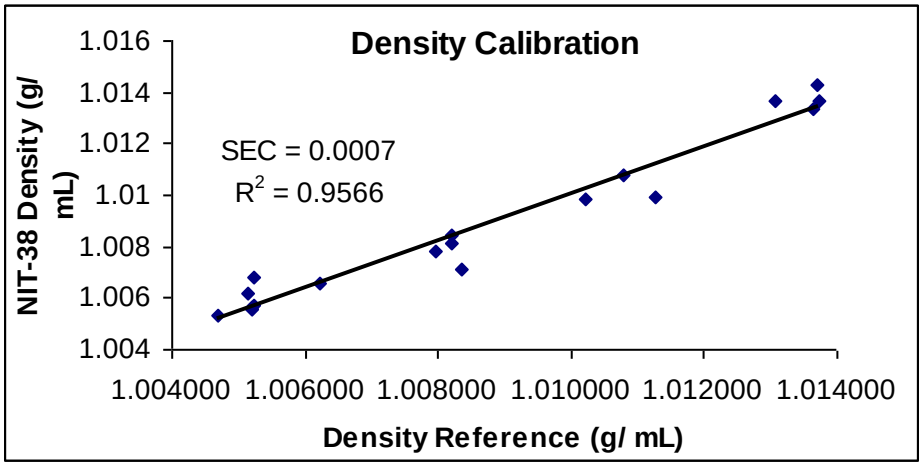



Specific Gravity Calibration
NIT-38 SG
Reference SG
SEC = 0.0007
R2 = 0.9591
1.018
1.016
1.014
1.012
1.01
1.008
1.006
1.006
1.008
1.01
1.012
1.014
1.016
1.018


Energy/100 mL Calibration
Reference Energy (KJ/100 mL)
SEC = 1.93 KJ/100 mL
R2 = 0.9982
300
250
200
150
100
50
0
40.00
90.00
140.00
190.00
240.00


Orginal Extract Calibration
Original Extract Reference
SEC = 1.40
R2 = 0.9977
18
16
14
12
10
8
6
4
2
0
3.00
5.00
7.00
9.00
11.00
13.00
15.00
17.00


Apparent Extract Calibration
Apparent Extract Reference
SEC = 0.2
R2 = 0.9593
4.5
4
3.5
3
2.5
2
1.5
1.50
2.00
2.50
3.00
3.50
4.00
4.50




## *Conclusion:*

The above graphical data show conclusively that the NIT-38 Transmission analyser can be calibrated to measure the quality parameters of beer samples. The analyser is extremely user friendly, providing step-by step instructions on the LCD display and it does not require injection or complex sample introduction, just a pour in and measure system. The average time for sampling is less than one minute and temperature stability is built into the calibration model providing robustness and the instrument does not have to internally equilibrate the sample temperature before measurement.

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