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For Somex Ltd
Assessment of the Somex laboratory de-gasser

Prepared by Ian Slaiding
March 2011

Background

Somex Ltd has developed a unit for degassing carbonated beverages before analysis. It has already been assessed for use with carbonated soft drinks and is in use in the laboratories of some major soft drinks producers.

Several of the standard laboratory methods of analysis for beer require a degassing step before the analysis, e.g. the measurement of alcohol, haze, bitterness and colour. Residual CO2 can affect analyses in several ways: volumetric transfers are difficult, bubbles interfere with some instrument readings, and the CO2 affects analyses of acidity.

Beer presents particular problems when degassing is undertaken. The extent and means of degassing of beer can affect the accuracy of various analyses. Incomplete degassing affects measurements such as pH, colour and gravity, whilst excessive degassing can affect measurement of alcohol and, where fobbing occurs, bitterness. The foam generated during degassing preferentially binds bittering substances, thereby lowering bitterness values for the residual beer. Collapsed foam also affects haze readings. Brewing analysts have used a variety of methods of degassing over the years including sonication, filtration, repeated pouring between vessels and standing over glass beads for extended periods, amongst others. Each has limitations in terms of repeatability, time and labour input and the range of analyses to which it is applicable. An instrument that could address some or all of these issues and provide rapid and consistent degassing of beer with savings in time and improvement in the accuracy of results would be of value to the industry.

Evaluation

In this evaluation the Somex degasser has been tested against established laboratory methods of degassing. Five key brewing parameters were measured on the beers degassed by the degasser and by the method used in the Campden BRI laboratory for its accredited analytical methods. The results were then compared for accuracy and precision.

The degasser is a benchtop unit in a single box. The degasser operates by passing a set volume of compressed air or nitrogen, at a regulated flow rate, through a nozzle dipped into the beer. Both the volume and flow rate can be adjusted to suit the requirements of the analyst. The nozzle incorporates several holes to achieve a flow of small bubbles. The nozzle assembly is fitted to a linear axis to allow its movement into and out of the beer sample to be controlled. The beer sample is held in a beaker or bowl contained in a cradle at the base of the unit. A plastic bowl was used in these trials but there is flexibility to allow various shapes and sizes of vessel according to the volume requiring degassing.

The instrument was originally designed for degassing of soft drinks and the volume, flow rate and nozzle design have all been optimised for that purpose. For the analysis of beer Somex have fitted a new flow valve, re-designed the nozzle and, following initial trials, established lower volume and flow rates for selected analyses. Further work at Campden BRI has optimised the volume and flow rate.

The final operating conditions are dependent on the volume of beer to be degassed. The degasser can accommodate vessels containing up to 500ml, depending on the shape of the vessel. For the analyses here a volume of 250ml was degassed. For the analyses undertaken here the prescribed laboratory method of degassing was to stand the beer over glass beads overnight.

No detailed instructions were provided but the training at installation was sufficient. The instrument requires only a single power socket and a supply of compressed air or nitrogen; regulation of the supply is controlled by the instrument. The setting up is straightforward. The instrument is controlled through a simple keypad and has capacity to store several sets of operating conditions. Once methods have been set the instrument can be started with minimal keystrokes. There is no stabilisation time required when it is switched on. The instrument supplied had a single degassing head and nozzle; instruments with up to twelve heads for simultaneous operation can be supplied.

The only maintenance required is cleaning of the nozzle. This is easily detached and cleaned; rinsing in soapy water was adequate and no build-up of beer components was apparent over several days use.

After initial trials, focussing primarily on bitterness analysis the operating conditions were set at one litre compressed nitrogen at a flow rate of 0.2 litre per minute: resulting in a degassing time of 5 minutes for each sample.

The analyses carried out were:

1 Haze (90 degree Dr Lange instrument)

2 Colour by spectrophotometer EBC Analytica 9.6

3 Present gravity by density meter EBC 9.43.2

4 Bitterness EBC 9.8

5 Alcohol by gas chromatography EBC 9.2.4

For all the analyses the laboratory has ISO17025:2005 accreditation.

A major brand commercial canned lager was used for the testing. Ten replicates were degassed by the degasser and ten by the laboratory method for each analysis. Each degassed sample was then subjected to the analyses above. In addition the residual CO2 content of the degassed samples by measured using a Corning meter (EBC 9.28.2).

The mean and standard deviations for each of the analyses are summarised in the table. The residual CO2 values are also summarised.

Analysis	*Degassing*	Mean	Standard deviation
Haze (°EBC)	*SOMEX*	0.44	0.024
	Glass beads	0.41	0.012
Colour (°EBC)	*SOMEX*	10.64	0.081
	Glass beads	10.67	0.029
Present Gravity	*SOMEX*	5.83	0.074
	Glass beads	5.84	0.043
Bitterness (BU)	*SOMEX*	14.48	0.123
	Glass beads	14.52	0.314
Ethanol (%v/v)	*SOMEX*	4.00	0.012
	Filtration	4.01	0.016
Residual CO2 (g/litre)	*SOMEX*	1.19	0.140
	Normal	1.07	0.060

The results were subjected to statistical testing (T and F tests) to establish if the two methods of degassing were giving significantly different results.

The results for the five analyses tested here show good agreement between samples degassed by the two methods; the statistical testing confirmed that the differences in results were not significant. On precision the degasser had poorer precision on three analyses but was still comfortably within the expected precision for the analysis.

The residual CO2 was slightly higher for the degasser under the conditions used here. Some degassing methods in use in brewing laboratories give lower levels of CO2. A level of around 1 g/litre, however this has been shown in the Campden BRI laboratory not to affect a range of standard analyses. Where the level of residual CO2 might be an issue there is further scope for fine tuning the Somex degasser to achieve lower levels.

Conclusions and recommendations

The degasser has been shown to give an acceptable decarbonated beer for a range of standard analyses under the conditions used. Processing times of five minutes are possible for a single sample; the total processing time for a batch is dependent on the number of linked units. It is easy to operate and of robust design. It is sufficiently flexible in terms of operating conditions to allow individual laboratories to adjust to their particular requirements. Only a limited range of key analyses have been tested here; it is possible that two separate sets of conditions might be required to generate suitable samples for all the tests a laboratory might require to do. However this probably reflects the situation with current methods of degassing.