

Duty calls: the importance of accurate ABV determinations in the brewing and distilling industry.

Peter Maskell
Graeme Walker
Dawn Maskell

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The importance of accurate ABV determinations in the brewing and distilling industry.

Peter Maskell, Graeme Walker and Dawn Maskell

In the UK, taxable duty payable on alcohol is based not only on the volume of the alcoholic beverage that is produced but also the exact strength of the beverage. This amount of alcohol is expressed as the percentage of alcohol (ethanol) by volume (or ABV) to one decimal place. This means that for every 0.1% ABV difference between the actual ABV of the beverage and the declared ABV may result in an over or underpayment of duty. Brewers and distillers pay the duty on the labelled ABV of the product. However, recent clarification in a Her Majesty's Revenue and Customs (HMRC) tax tribunal in the UK has determined that the duty to be paid can be on the actual measured ABV of the beverage rather than labelled ABV (as long as the measured ABV is in within the allowable regulatory variation (UKFTT, 2017). This clarification means that if brewers and distillers have very accurate measurements of ABV of beers and distilled spirits then they can potentially save significant amounts of money. For example, in the Molson Coors HMRC tax case a saving of around £50 million was made over a 0.3% ABV difference. Although these savings are likely to be smaller in companies with lower production volumes, they are still likely to be significant.

For breweries, Table 1 shows the savings that could be made for each 0.1% ABV difference between declared ABV and actual ABV for a variety of different brewery sizes over a year, assuming that the brewery had declared above the actual ABV of the beverage. These savings are based on the current UK duty regulations (HMRC, 2019).

Table 1 Estimated brewery savings based on ABV measurements of beer

Brewery Size (HL)	Assumed annual production (HL)	Estimated Total Savings per Annum per 0.1% ABV Difference below declared ABV
≤999	500	£477.00
1000 to 4999	2500	£2,385.00
5000 to 29999	15000	£23,850.00
30000 to 59999	45000	£83,474.05
60000 to 200000	100000	£190,800.00

It is important to note, however, that Excise Notice 226 has remained unchanged following this judgement and also regulation 18 of the Beer Regulations 1993 state that "strength of the beer is deemed to be the greater of its actual strength or that stated on a packaging label, invoice, delivery note or similar document" (HM Government, 1993). Therefore, brewers would need to be careful when using the actual strength rather than the labelled strength as there is still potential to be in breach of current legislation. It is also important to note that the negative publicity from any difference between declared (actual) and labelled alcohol strength may also substantially outweigh any cost savings.

Recent research has shown that at least with packaged beers from smaller “craft” breweries, such companies are not determining the actual ABV of their beverages as accurately as some of the larger companies. In the UK there is no definition of “craft” beer, so the researchers used products from breweries that self-declared as “craft” breweries. For the “larger international companies” the top 20 lagers and the top 15 by annual sales volume in the UK were included.

Maskell *et al.* (2018) and Reid *et al.* (2019) looked at the difference between the actual ABV and the labelled ABV for 107 different “craft” beers and for 35 beers produced by larger international companies. Fig 1 shows the variation of the ABV from the labelled variation of a) craft beers and b) larger international companies.

Figure 1 here?

The results of these studies showed that for “craft” breweries there was a range of -1.6 to +1.5 %ABV of actual ABV when compared to the labelled ABV (mean 0) whilst the larger brewing companies’ products had a range of -0.3 to +0.1 %ABV with a mean of -0.1% ABV. This research indicated that around 15 - 20% of the tested beers were outside of the legally allowed tolerance. If it was assumed that labelled ABV was used for duty purposes then the large international breweries will be legally “safe” regarding alcohol duty whereas the “craft” breweries could either be losing money from overpayment alcohol duty or, potentially in some cases, even underpaying the duty that is due to HMRC. Such situations may end up with some breweries facing fines and extra duties to pay.

It is likely that the larger brewing or distilling companies with larger amounts of money to be saved in Alcohol Duty, and potentially larger fine/duties to pay, will invest in more accurate, but costly, equipment for the determination of ABV. In the UK, the gold standard (and HMRC approved methodology for determining ABV) is via the distillation analysis method (HMRC, 2017). However, in smaller breweries and distilleries, the most common method for the determination of the ABV of an alcoholic beverage is by measuring the change in specific gravity between the wort before fermentation (OG, original gravity) and beer (or wash) at the end of fermentation (FG, final gravity). Such measurements rely on the use of a hydrometer.

Picture of a hydrometer in use

Using these values, HMRC allow the use of the equation based on specific gravity determinations from which the %ABV of the beverage can be determined. A study of 500 different fermentations showed that hydrometers, when used properly and using the approved HMRC equation, are accurate to within $\pm 0.13\%$ of the actual ABV (Maskell, Speers, & Maskell, 2017).

This research suggests that it is possible that the large variation in actual ABV compared to the labelled ABV in “craft” breweries could be due to the incorrect usage of the hydrometer. Therefore, it is essential that the user of a hydrometer will need to ensure the following:

- The hydrometer is clean before use
- The hydrometer is used in the appropriate container
- That the sample to be measured has been correctly degassed
- Correct readings are made on the meniscus of the liquid with the hydrometer

- Any readings taken with a hydrometer have been adjusted for temperature, using the appropriate temperature correction table.

For beer, the EBC (European Brewery Convention) and ASBC (American Society of Brewing Chemists) provide recommended methods not only for the correct use of a hydrometer in determining ABV but also appropriate methods of sample preparation (e.g. degassing) before measurement.

The proper use of a hydrometer (with appropriate training in its usage), or the investment in equipment with greater accuracy for the determination of ABV could not only save money in the longer term but also save the brewery or distillery from potential fines or worse from tax-raising authorities.

Peter Maskell and Graeme Walker are from Abertay University, Dundee and Dawn Maskell from the International Centre for Brewing & Distilling, Heriot-Watt University

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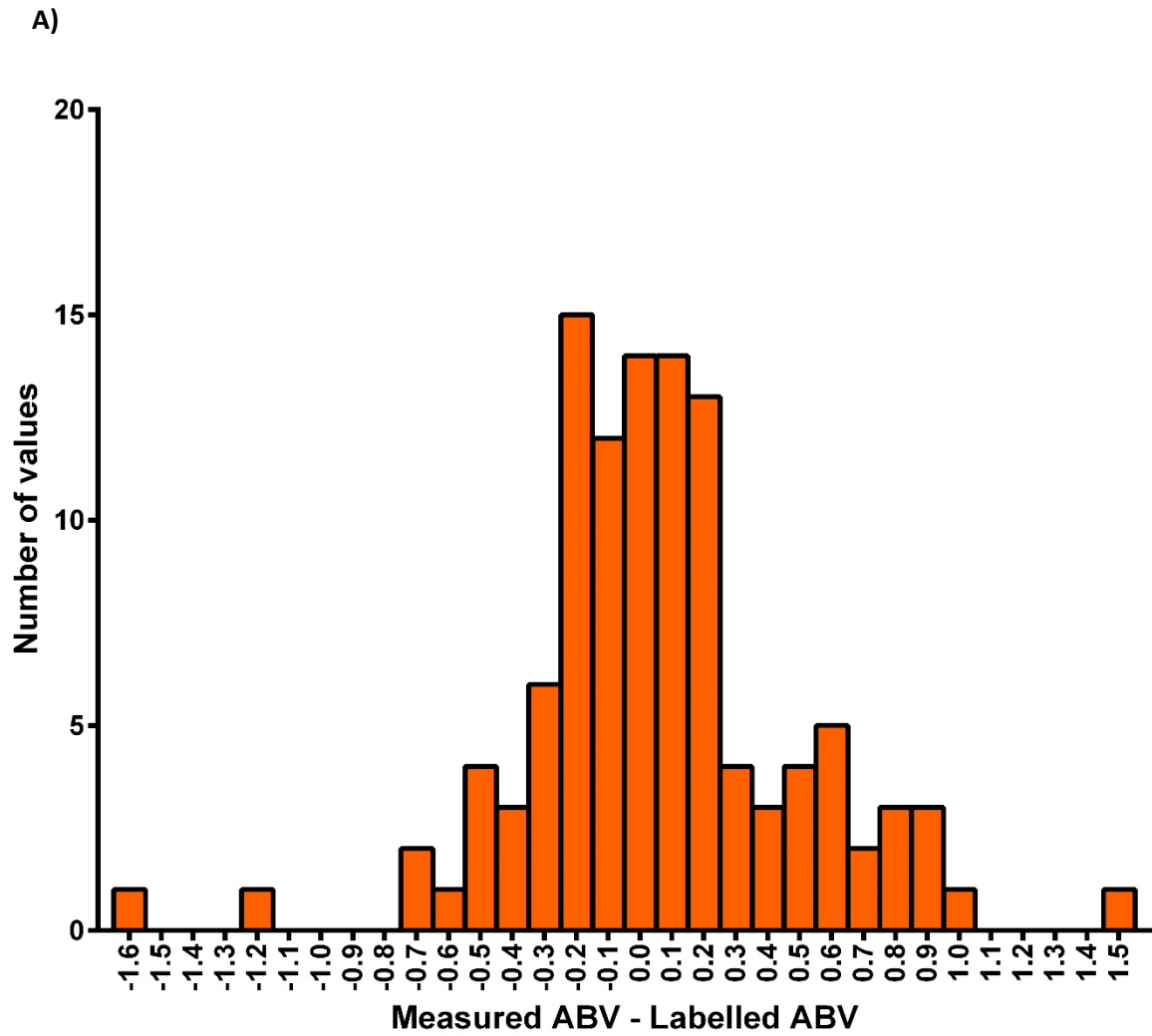
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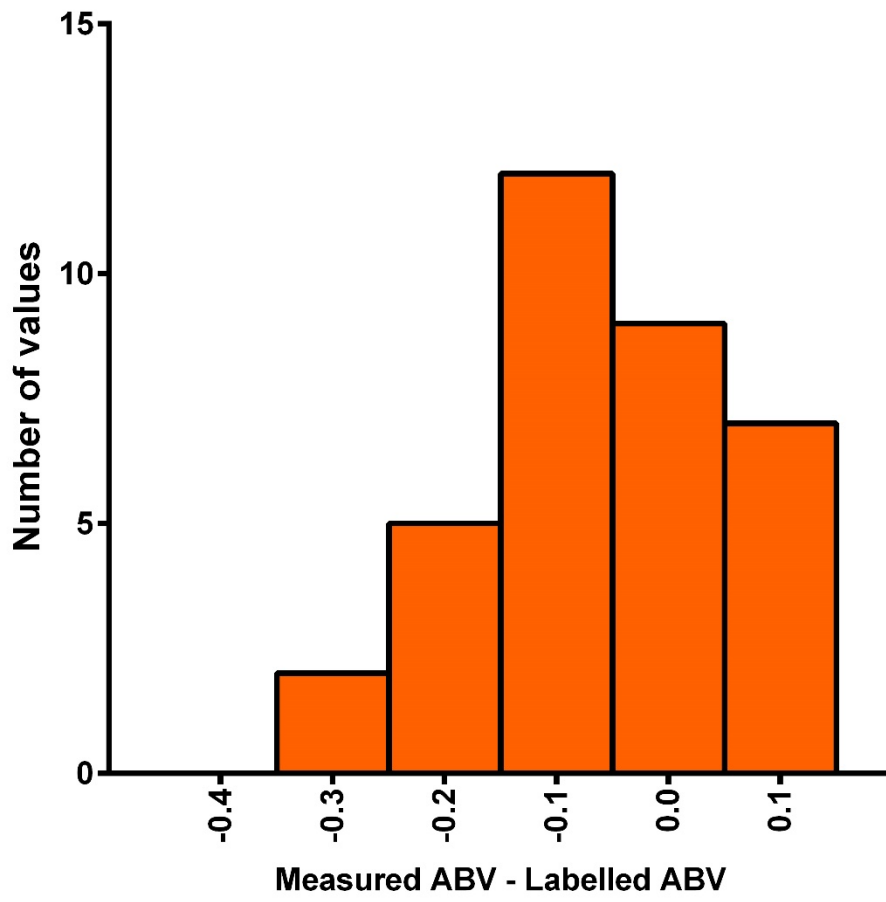
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Figure 1: Histogram of the variation of ABV between actual ABV and labelled ABV in a) 112 different “craft” beers and b) 35 different beers from large international companies. Adapted from (Maskell et al., 2018; Reid et al., 2019)



B)



PANEL:

ALCOHOLIC STRENGTH OF BEER

The actual alcoholic strength by volume of beverages containing more than 1,2 % by volume of alcohol shall be indicated by a figure to not more than one decimal place. It shall be followed by the symbol ‘% vol.’ and may be preceded by the word ‘alcohol’ or the abbreviation ‘alc’.

The alcoholic strength shall be determined at 20 °C.

Positive and negative allowed tolerances in respect of the indication of the alcoholic strength by volume and expressed in absolute values shall be as listed in the following table. They shall apply without prejudice to the tolerances deriving from the method of analysis used for determining the alcoholic strength.

<i>Description of beverage</i>	<i>Positive or negative tolerance</i>
<i>1. Beers having an alcoholic strength not exceeding 5,5 % vol</i>	<i>0,5 % vol.</i>
<i>2. Beers having an alcoholic strength exceeding 5,5 % vol</i>	<i>1 % vol.</i>