

# **BRITISH BEER & PUB ASSOCIATION**



## **GUIDELINES**

**FOR THE CONTROL OF ALCOHOL CONTENT  
FOR THE PURPOSES OF DUTY PAYMENT**

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## **1. INTRODUCTION**

### **1.1 Purpose of Guidelines**

The aim of these guidelines is to provide consistent advice to brewers and packers about what controls and records are required in order to comply fully with Regulations and HM Revenue & Customs [HMRC] requirements. The Guidelines are also underpinned by two fundamental principles that signatories are committed to (section 1.3), providing full transparency to customers regarding the approach taken by brewers in calculating ABV for duty payment and how this is communicated.

### **1.2 Official Requirements**

HMRC Notice 226 sets out the main features of the beer duty system, and specifies official requirements only when they are necessary for revenue protection. In many instances it will be for brewers and packers themselves to determine how to meet their legal obligations. HMRC compliance activity will primarily be based on auditing traders' systems to ensure that they provide adequate revenue protection. In order to co-ordinate its approach to operational matters, HMRC have created an 'Alcohol Unit of Expertise' [UoE], whose major aim is to ensure a consistent approach by all HMRC staff to the assurance of beer duty collected from brewers and packagers. This service is specifically for HMRC staff and is not available to the trade. In addition to HMRC requirements, under Regulations governing food labelling and consumer information (FIC), brewers have a duty to ensure that product information is not misleading, in particular with respect of its nature, composition and characteristics etc. and that such information is communicated accurately, clearly and is easily understood by the consumer.

### **1.3 Key principles**

Brewers will abide by the following key principles when calculating their duty liability:

- Brewers collect all applicable duty on behalf of HMRC and are committed to doing so in an ethical, responsible and transparent manner
- Brewers will pay duty on the ABV as communicated to customers on packaging, delivery notes, price lists and other similar documents; and brewers will make every endeavour to brew accurately to the same ABV level

### **1.4 Context of Guidelines**

HMRC emphasise that it will be for brewers and packagers themselves to determine how to meet their obligations. To achieve a consistent approach across the industry, the British Beer and Pub Association [BBPA] has produced five sets of guidelines underpinned by the above principles:

- Guidelines for the Management of Beer Warehousing and Duty Suspension on Registered Premise
- Guidelines for the Control of Volume for the Purposes of Duty Payment for Beer in Large and Small Pack
- Guidelines for the Control of Alcohol Content for the Purposes of Duty Payment
- Guidelines for Obtaining Duty Relief on Unmerchantable Beer
- Guidelines for Exporting and Importing Beer

## 1.5 Scope of Guidelines

These guidelines refer only to the duty management of beer in brewery registered premises.

Different rules apply to authorised warehouses which are approved to hold and move duty suspended beer – these are covered by HMRC Notice 197.

## 1.6 Involvement of HMRC in the preparation of these Guidelines

These guidelines, which have been compiled with help from and in consultation with HM Revenue & Customs, complement the relevant HMRC Notice and offer advice: they do not relieve brewers and packagers of their legal obligations. All HMRC Notices are available on their website ([www.hmrc.gov.uk](http://www.hmrc.gov.uk)).

## 1.7 Importance of Record Keeping

Notice 206, sets out the law concerning the keeping of records by all Revenue Traders.

### Are there other records I need to keep?

<b>If you are...</b>	<b>you...</b>
responsible for payment of excise duty	must maintain a permanent record, in summary form, of all the excise duty payable in each duty accounting period. These periods are prescribed in the publications about the specific kinds of excise duties or duty suspension regimes. This record is called the "excise duty account"

<p>a registered consignee or a warehousekeeper or are otherwise involved with duty suspended goods</p>	<p>may also need to maintain records relating to the production, transportation, or storage of excise goods and to operations or processes carried out on them.</p> <p>Examples of some of these additional records are:</p> <ul style="list-style-type: none"> <li>• receipt and delivery notes;</li> <li>• stock records;</li> <li>• checks by trading standards officers;</li> <li>• guarantees;</li> <li>• records of clients' VAT registration numbers and</li> <li>• DANs;</li> <li>• stocktaking records;</li> <li>• records of losses or increases in transit, stock,</li> <li>• operations, processes, packaging or production;</li> <li>• analysis results;</li> <li>• equipment records.</li> </ul>
<p>a wholesaler, retailer or distributor of excise goods</p>	<p>should ensure that duty has been paid on excisable goods in your possession, as you may need to satisfy us of this.</p> <p>If HMRC have evidence to show that duty has not been paid you will not be able to rely on your business records to show otherwise. In these circumstances, we may seize your goods.</p>

**What must an excise duty account show?**

<p><b>The excise duty account must show:</b></p>	<p><b>for:</b></p>
<ul style="list-style-type: none"> <li>• every figure that goes on a return;</li> <li>• the total duty due to us;</li> <li>• the total duty due from us;</li> <li>• the net duty due from, or to, us;</li> <li>• payment details or a payment reference</li> </ul>	<ul style="list-style-type: none"> <li>• each kind of duty and/or duty suspension regime; and</li> <li>• each duty accounting period.</li> </ul>

The account must have an audit trail. This means that each entry in the account must be traceable back to the relevant source document. Similarly it must be possible to trace any source document to the relevant entry in the duty account.

The account should be audited by an independent accountant.

Amendments to standing data on a computer system also require an audit trail. This will involve a log of any amendments to the tables (e.g. product and duty) in the system

Notice 206 also deals with the use of computers for record keeping purposes.

### **What if I keep my records on computer?**

If you keep all or part of your records and accounts on a computer, you must make sure that you can account for duty properly so that HMRC can carry out full inspections when they visit. If your system does not meet their requirements they can ask you to change it.

Examples of computer documentation include:

- user guide;
- system specification;
- file layouts;
- system flowcharts;
- database management documentation;
- data dictionary;
- program specifications;
- schemas and sub-schemas.

If you have any queries on the computer records you hold, please contact the HMRC National Advice Service or your allocated Large Business Office.

## **2. DUTY PAYMENT – BASIS OF THE CHARGE**

### **2.1 Calculation of duty**

Duty is based on the quantity, alcoholic strength of the beer and the rate of duty applicable when it passes the duty point.

The Beer Regulations require duty to be accounted for on the actual alcoholic content by volume (ABV) of beer in each container as it passes the duty point. However, where packers operate a system with satisfactory controls and records, the ABV for duty purposes will be the strength declared on the bottle label, can, invoice, delivery note or similar document. Such a system is described in Section 4 of these guidelines.

It is recognised that under an average ABV system, any individual pack may have an ABV above or below the declared strength but that duty is based on the declared strength.

### **2.2 Due Diligence**

The concept of due diligence is enshrined in the Food Safety Act, 1990. A person charged with an offence under the regulations has a defence if he can demonstrate that “he took all reasonable steps and exercised all due diligence to avoid committing the offence”. Whilst under the Food Safety Act there is no absolute requirement to exercise due diligence, it is much more difficult to defend successfully against a prosecution if due diligence cannot be demonstrated.

In the context of beer duty payment, HMRC has accepted that a defence of due diligence can equally be applied where a challenge is made as to the correct amount of duty being paid. If the brewer/packer can demonstrate that he has been diligent in the control of ABV and that corrective action has been applied where necessary, then HMRC should be satisfied that the ABV as declared is correct and that the right amount of duty is being accounted for.

### 3. GUIDELINES – BASIC REQUIREMENTS

A brewer needs to meet certain criteria in order to justify that he has exercised “due diligence” in the control of ABV for the purposes of duty payment. These criteria are as follows:-

1. No beer shall be sold which contravenes the labelling regulations. That is, actual ABV must be within 0.5% ABV either way of the declared ABV for beers with a declared strength up to and including 5.5%, and within 1% ABV of declared ABV for beers with a declared ABV greater than 5.5%.
2. In order to control the ABV for duty purposes, the target ABV of the final product must not exceed the declared ABV.
3. For duty purposes, ABV is expressed to the first decimal place by truncation that is 4.19% becomes 4.1%. The ABV must be measured for each discrete batch of beer produced. This would normally be in the bright beer or cask racking vessel. Alternatively, samples may be taken from the packaged product on a code by code basis.
4. The brewer must clearly define what is meant by a batch i.e. a single or multiple brews collected into a single fermentation vessel, an individual bright beer or cask racking vessel, or a single batch code of packaged beer.
5. Where beer from a single batch is packed in both cans and bottles, the ABV measurement from the bright beer vessel(s) can be combined for control purposes.
6. Where the same beer from different batches is packed into different end packages (e.g. kegs, cans and bottles) over a period of time, the results of ABV measurements can be considered together for control purposes.
7. Control limits (see section 4) around the declared ABV will be set by the brewer for each product such as to define the range of ABV within which the brewer would expect the product to be under normal production conditions.
8. Product strength should be maintained within the set control limits and remedial action must be taken when alcoholic strength exceeds the control limits.
9. The brewer will be required to record and review the cause of deviations from control and the action taken.  
  
In many cases corrective action will need to be taken whilst results are still within the control limits, for example, when an ABV is slightly but consistently higher than the declared ABV, a note of these corrective actions must also be recorded.
10. For cask beers, appropriate checks from cask shall be carried out to confirm that ABV at time of consumption is as declared.
11. All brewery records appropriate to justifying that the brewer has acted with “due diligence” shall be made available to HMRC.

## 4. GUIDELINES – CONTROL METHODS

### 4.1 Control limits

The guidelines (3.6) advise that control limits be defined for any given product in order to exercise appropriate control of the production process. In most companies these control limits will be specified in the form of an ABV range, with minimum and maximum limits, usually but not always, equidistant from the target value. Such control limits should be established from existing data where available, or be compiled from initial production runs for new products or processes where no such data exists.

However, as observed in the guidelines basic requirements, paragraph 3.9, just because ABV measurements fall within the control limits, the average ABV for the period could still be higher than the target ABV. In such cases, even though it is still under the maximum control limit value, action must be taken to reduce the average ABV back to the target value.

In a process that is under control, there will be a variation around the target ABV. Such variation will be normally distributed, that is to say, the variation from the target will be equally above and below the target ABV. Control limits, that include all the values which would normally be expected when producing a particular product to a particular specification, may then be set. The limits can be set empirically by observation or can be derived statistically by calculating and applying the standard deviations. Such statistical techniques for controlling quality parameters are quite common and can be useful but these Guidelines do not require that such techniques must be employed.

### 4.2 Monitoring results

The following questions and answers are intended to explain a process for establishing control limits and monitoring results using a set of data which has been prepared for illustrative purposes and is given in Annex 1.

The example data is for a beer produced during a 12 month period, specified and declared ABV is 4.0% in a range between 3.7% and 4.3%. The monthly ABV arithmetic averages have also been shown. The results indicate that the process in this example is under control; the monthly average ABV varies between 3.9% and 4.1%.

#### 4.2.1 How can the alcohol content data be presented?

The data could be presented in tabular form. Indicating the alcoholic strength for duty purposes as derived from the monthly ABV results. Whilst the ABV may vary from month to month, the duty will be payable on the declared ABV of the product. The results are determined from the illustrative data, shown in Annex 1, and are shown in the table below.

Month	Actual ABV%	Declared ABV%	Month	Actual ABV%	Declared ABV%
Jan	3.9	4.0	Jul	3.9	4.0
Feb	4.0	4.0	Aug	4.0	4.0
Mar	4.1	4.0	Sep	3.9	4.0
Apr	4.0	4.0	Oct	4.0	4.0
May	4.1	4.0	Nov	3.9	4.0
Jun	3.9	4.0	Dec	3.9	4.0

The results, as shown, are for a product which is being brewed under good control and where there could be no question of surcharging for higher than allowed ABV.

#### 4.2.2 Will varying batch sizes affect the results?

One weakness in presenting results in such a form is that no account is taken of batch size. If the batches, be they bright beer/cask racking vessel or packaged product, are not all the same size, particularly where they vary significantly, this can influence the monthly average. Where this is the case, it may be preferable to calculate the monthly average based on the volume percent e.g. hectolitre percent, of individual batches.

In most cases the monthly average derived by both methods will be the same to one decimal place, but occasionally the weighted approach will produce a different average value. Arithmetically, this is a more accurate method of determining the average ABV.

#### 4.2.3 What are the advantages and disadvantages of tabular vs. graphical presentation?

An advantage of the graphical approach is that it allows for easy visual analysis of trends, although if results are only plotted using the monthly average there is a risk that adverse trends may not be spotted in sufficient time to respond and thus prevent the actual ABV exceeding the declared ABV. A disadvantage of the graphical approach is that the value of individual points on the graph is not always easily apparent. Also, where several products are involved, graphical presentations may not offer the clearest overview.

Where several products are produced, the tabular approach may provide the clearest picture of the month on month position when the monthly results are compared with previous periods on the same table. This approach has the same disadvantage as the graphical one, in that the results must be reviewed on a regular basis throughout the month to ensure that adverse trends are detected in time to ensure that the actual ABV does not exceed the declared ABV. If the actual ABV value for a particular product exceeds the declared value there may be a risk of a surcharge, depending on the reason for the failure and how long the product has been out of control (see section 4.2.16). Close monitoring is particularly critical for products brewed at or near the lower or higher duty rate bands.

Weighted Actual ABV% by Month													
Product	Declared ABV%	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
A	4.0	4.0	4.1	3.9	4.0	4.0							
B	3.8	3.8	3.8	3.7	3.7	3.8							
C	4.4	4.4	4.5	4.5	4.4	4.4							
D	5.0	5.0	5.0	5.0	4.9	5.0							

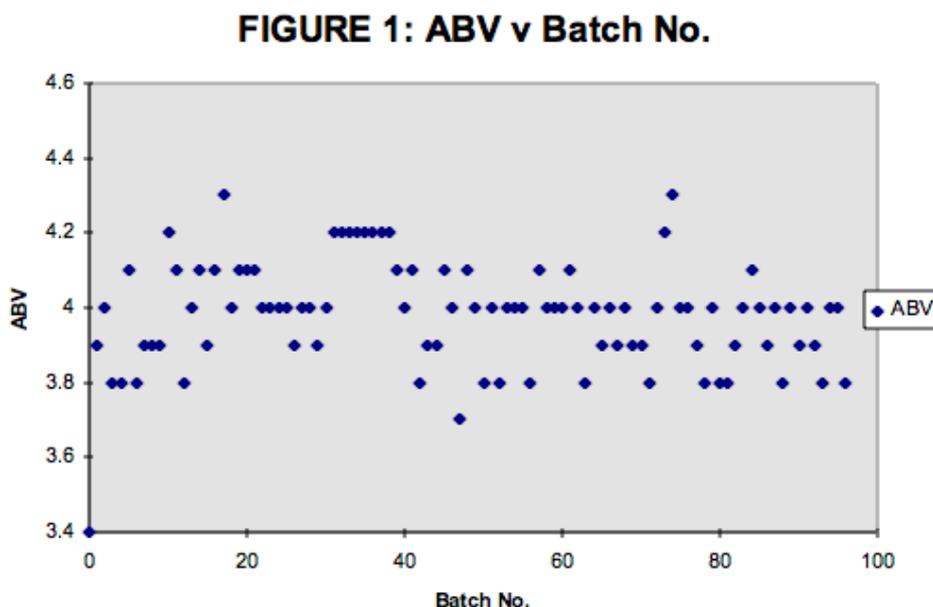
In the above example the actual ABV of product C has exceeded the declared ABV for two consecutive months and the brewer would need to demonstrate to HMRC that he had taken timely action to remedy the situation. Otherwise he may be at risk of a retrospective surcharge.

A weakness in presenting results in a monthly tabular or graphical form arises when difficulties are encountered when individual results may assume significance.

Ideally, ABV should be monitored on a batch by batch basis and action taken to address adverse trends as soon as results are seen to fall outside of the control limits. However, such an approach requires ABV results to be available immediately a batch has been produced, so that if remedial action is required information is to hand before production of the next batch begins.

#### 4.2.4 Is there a better way to present the data?

The results for the period can be plotted graphically as shown in Figure 1.



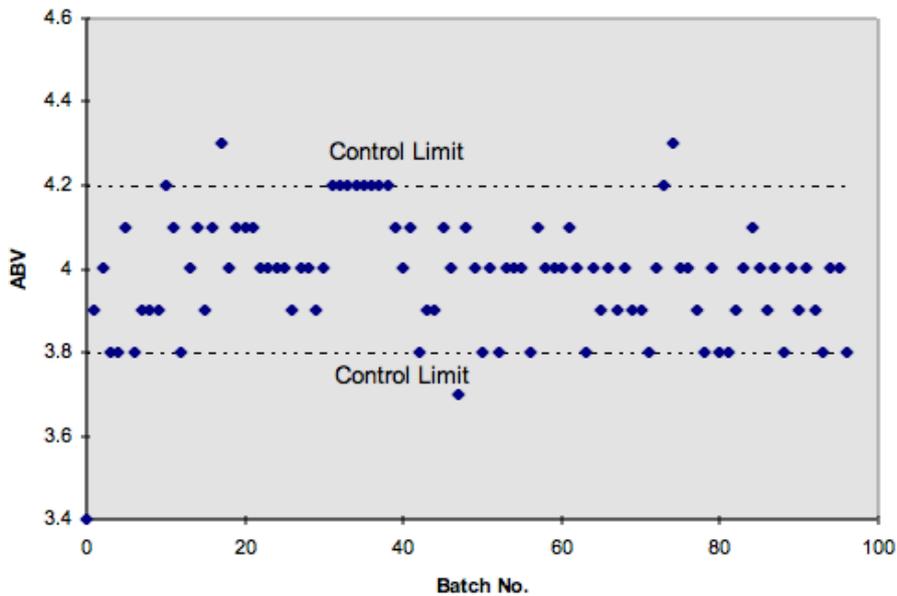
The results plotted in Figure 1 show there is an inherent variability in the alcohol strength, as measured, around the declared ABV. In order to decide whether the process is varying beyond the limits of normal variability for the particular brewery and product, a set of control limits can be drawn on the chart. Results lying outside such control limits would then be identifiable and a course of action decided upon if deviation from the norm is considered to be due to external factors that can be corrected. Products showing ABV outside the control limits would come within the “ACTION” zone and appropriate investigations and decisions can be taken.

#### 4.2.5 How do I decide on the control limits?

Some production processes are more controllable than others. For example, one would expect beer diluted to target ABV immediately before packaging to be controlled between tight limits: on the other hand, much wider limits would be appropriate for traditionally produced cask conditioned beer where the process is more complex, process control is more difficult and there may be a considerable time lapse between cause and effect. In these circumstances, and particularly where brews are infrequent, it will be necessary to plot results over an extended period of time in order to view results in a proper perspective.

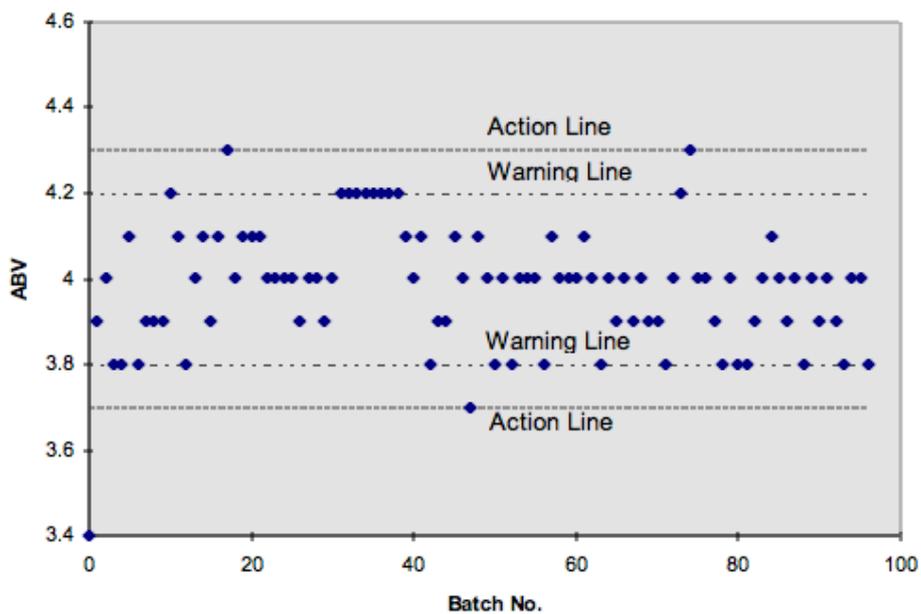
The aim is to achieve consistent results that are equally distributed either side of the target ABV. Looking at the results shown in Figure 1, it might appear that the majority of the ABV readings for this product lie between 3.8 % and 4.2 %, that is,  $\pm 0.2$  % from the declared (mean) value of 4.0 %. Lower and upper control limits can be drawn at 3.8 % and 4.2 % respectively. This is shown in Figure 2.

**FIGURE 2: ABV v Batch No.**



The pattern of results in Figure 2 shows that while the majority of the ABV results lie within the two control lines, a number of them lie just outside. It would be reasonable to take the view that these lie within normal process variability and that taking action on the basis of a single ABV outside these limits would be counter-productive. It might therefore be more sensible to set the control limits at  $\pm 0.3\%$  so that action would be taken when the alcoholic strength lies outside these limits. Results lying outside the limits would then be more significant and trends indicating that the process was no longer delivering the product to the specification would be more easily identifiable. A control chart showing both a warning and an action limit superimposed is shown in Figure 3.

**FIGURE 3: ABV v Batch No.**



Brewers may wish to include both sets of control limits such that results lying within the band between 0.2% and 0.3% from the declared ABV would be regarded as being within specification.

Results in these outer ranges would serve as a warning that drift away from the specified alcohol content may be occurring. The control limit at 0.3% from the declared ABV would then become the action limit, above which the brewer should consider action. Generally, a single result above the action line would not in itself be significant, but a series of consecutive results above the action line would indicate that some part of the process is not meeting the specification. A number of separated high results outside the action limit may indicate an intermittent fault, and should be investigated.

#### **4.2.6 Do I need to set both an action and a warning limit?**

No. It would be acceptable to use only one set of control limits beyond which action would be taken. In the particular example shown, such a limit could be either  $\pm 0.2\%$  or  $\pm 0.3\%$  or somewhere in between.

#### **4.2.7 What do I do if our results are within the control limits but are consistently and significantly higher than the declared ABV?**

In such a case either the control limits are inappropriate or the process parameters have changed such that the product is not within original specifications.

If it can be demonstrated that the average alcohol content is consistently higher than that declared, the brewer must do one of two things:

1. revise the declared ABV and pay duty at a higher rate; or,
2. take action to reduce the ABV back to that specified as soon as practicable by altering appropriate process parameters.

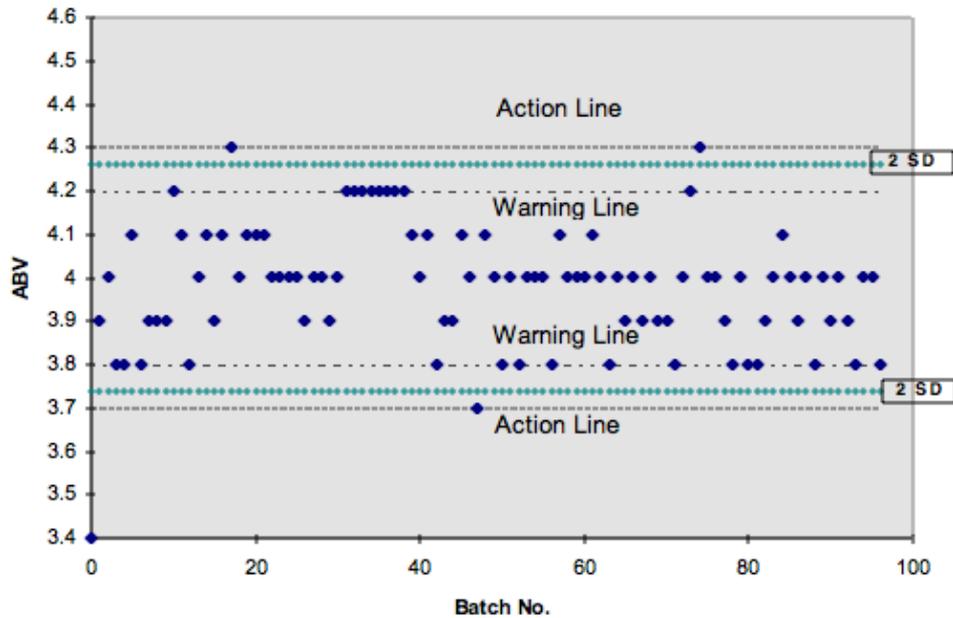
#### **4.2.8 Could control limits be verified statistically?**

The variability of processes can be measured statistically by applying an approach using standard deviations. The ABV results given in the examples can be analysed to indicate the variability around the average. By calculation, the standard deviation is 0.13%. From this it can be deduced that 96.875% of the sample ABVs lie between 3.74% and 4.26%, that is,  $\pm 0.26\%$  (two standard deviations) from the average.

The standard deviation (SD) can be calculated from the results (for the formula refer to Annex 2). Computer spreadsheets have a function that will enable the standard deviation to be calculated by applying the standard deviation operator to a column/row of figures. (It is also a standard function on electronic calculators).

Figure 4 shows limits of two standard deviations (2 SD) either side of the declared ABV superimposed on the example graph.

**FIGURE 4: ABV v Batch No.**



The control lines drawn at two standard deviations from the declared ABV lie between the two control lines that were set empirically. This indicates that the control limits are set in the right area and that using any of these control limits would enable the process to be controlled satisfactorily. It is for the brewer to decide where, practically, he would best set such control limits so that the process delivers product to specification.

#### 4.2.9 Do I have to use statistical analysis?

No. However, such analysis is useful and may be used to satisfy yourself and to demonstrate that the control limits used are reasonable.

#### 4.2.10 If I use standard deviations do I have to revise control limits accordingly?

Standard deviation is a measurement of the process variability which will also vary itself over time dependent on the scatter of data points. Consequently, whilst it is a useful measure, a brewer would not be expected to revise control limits on an on-going basis since this would negate the concept of control. However, where it becomes apparent that the control limits are inadequate they should be changed to reflect actual brewing practices. It is recommended that control limits for each product are reviewed on a regular basis.

#### 4.2.11 Would I have different control lines for different products?

Each product type is likely to be unique in respect of the way the process affects the variability of the ABV. The variation away from the specified (declared) ABV will differ and the consequent action points will be different. Consequently, a control chart should be prepared for each product line.

#### 4.2.12 What do I do when introducing a new product?

In the first instance you should ensure that a proper specification of the product has been prepared which indicates the target ABV. The knowledge and experience of the brewer will be used so that the beer is designed to deliver the target ABV.

Where the product is similar to existing product, initial control lines can be derived from data

relating to the existing similar product. These lines will provide a guide to the control of ABV in the early stages. As the number of production runs increases, the results from such runs will be used to build up a picture of the product performance. The basis of control can then be revised empirically in the light of the experience gained.

#### **4.2.13 How do I cope with short run or one-off products?**

Again, the knowledge and experience of the brewer will be used in the initial design of the product. You should be able to demonstrate to HMRC that due care was taken in deciding at what ABV the product should be declared. Test run results should be available, if such tests are carried out, to substantiate the ABV declaration.

#### **4.2.14 Will I be liable for excess duty if the actual ABV comes out higher than that declared?**

Such a situation might arise, particularly where labels are prepared in advance of a particular production run. In such cases, where the brewer can demonstrate that he has taken all reasonable care to ensure that the alcohol content meets the required strength, there should be no additional liability for duty.

#### **4.2.15 What action do I take if the ABV results fall outside the control limits?**

Isolated incidents of high ABVs may not be significant but should be investigated if there is a likely identifiable cause. A series of high results will indicate that the process is out of control and action should be taken. The cause should be identified and steps taken to correct the situation such that the product is brought back within control as soon as possible.

Records should be kept, identifying the cause of the problem (e.g. a faulty conversion vessel probe) and the action taken to remedy it. Such records should demonstrate to HMRC that the defence of "due diligence" can be justified.

#### **4.2.16 Is there a limit on how long a product can be "out of control"?**

It would not be meaningful to set a defined limit or number of batches during which a fault could persist, since it would be contingent on the type of problem involved, frequency of production and the capability of materials, process and plant. What the brewer must do is to ensure that once a problem is identified, all reasonable steps are taken to remedy the situation as quickly as possible.

#### **4.2.17 What if the problem is persistent and ABV continues to be too high?**

It is strongly recommended that, in such instances, the brewer contacts HMRC as soon as it is apparent that there is a continuing problem which may not be solved quickly.

#### **4.2.18 Where do the responsibilities lie in the case of a remote packer of a product that is packed in several locations?**

The supplying brewer is responsible for ensuring that he can justify the declared ABV of beer supplied in duty suspension to a remote packer. The packer may use the declared ABV (as opposed to the actual ABV over which he has no control) as the basis for labelling and for duty payment on release from duty suspension.

#### **4.2.19 Will assessments for additional duty be levied by HMRC?**

The onus is on the brewer to ensure that problems are identified and action taken within a reasonable time. Provided his records demonstrate to HMRC that he has acted with "due diligence"

assessments will not be levied. It will be up to the brewer to demonstrate that he has behaved reasonably in the particular circumstance involved.

Examples of the type of evidence HMRC would expect to see include:-

- Records of the monitoring of actual ABV performance and investigations and corrective actions into adverse trends
- Correspondence between departments within the brewery discussing a problem and resolutions to address it
- Correspondence between a remote packer and the brewer regarding ABVs exceeding specification and actions required to address the issue
- Records of discussions and correspondence between the brewer and HMRC on the matter

When a brewer's records show that the strength of a product is greater than the target ABV and he fails to take action to correct the problem within a reasonable time an assessment will be issued by HMRC.

#### **4.2.20 Is there anything else I can do to ensure that I am demonstrating due diligence?**

HMRC should be made aware of the procedures for ABV control and should always be contacted in the event of problems arising. All such contacts should be fully documented.

**ANNEX 1**

<b>MONTH</b>	<b>BATCH NO.</b>	<b>ABV</b>	<b>MONTHLY AVERAGE</b>	<b>MONTH</b>	<b>BATCH NO.</b>	<b>ABV</b>	<b>MONTHLY AVERAGE</b>
<b>JANUARY</b>	1	3.9	3.9	<b>JULY</b>	49	4.0	3.9
	2	4.0			50	3.8	
	3	3.8			51	4.0	
	4	3.8			52	3.8	
	5	4.1			53	4.0	
	6	3.8			54	4.0	
	7	3.9			55	4.0	
	8	3.9			56	3.8	
<b>FEBRUARY</b>	9	3.9	4.0	<b>AUGUST</b>	57	4.1	4.0
	10	4.2			58	4.0	
	11	4.2			59	4.0	
	12	3.8			60	4.0	
	13	4.0			61	4.1	
	14	4.1			62	4.0	
	15	3.9			63	3.8	
	16	4.1			64	4.0	
<b>MARCH</b>	17	4.3	4.1	<b>SEPTEMBER</b>	65	3.9	3.9
	18	4.0			66	4.0	
	19	4.1			67	3.9	
	20	4.1			68	4.0	
	21	4.1			69	3.9	
	22	4.0			70	3.9	
	23	4.0			71	3.8	
	24	4.0			72	4.0	
<b>APRIL</b>	25	4.0	4.0	<b>OCTOBER</b>	73	4.2	4.0
	26	3.9			74	4.3	
	27	4.0			75	4.0	
	28	4.0			76	4.0	
	29	3.9			77	3.9	
	30	4.0			78	3.8	
	31	4.2			79	4.0	
	32	4.2			80	3.8	
<b>MAY</b>	33	4.2	4.1	<b>NOVEMBER</b>	81	3.8	3.9
	34	4.2			82	3.9	
	35	4.2			83	4.0	
	36	4.2			84	4.1	
	37	4.2			85	4.0	
	38	4.2			86	3.9	
	39	4.1			87	4.0	
	40	4.0			88	3.8	

<b>JUNE</b>	41	4.1	3.9	<b>DECEMBER</b>	89	4.0	3.9
	42	3.8			90	3.9	
	43	3.9			91	4.0	
	44	3.9			92	3.9	
	45	4.1			93	3.8	
	46	4.0			94	4.0	
	47	3.7			95	4.0	
	48	4.1			96	3.8	

N.B. The above implies that batch sizes are of equal volume which may not be the case.

## ANNEX 2

### CALCULATION OF THE STANDARD DEVIATION

The standard deviation,  $\sigma$ , (sometimes referred to as the root-mean square deviation) is the square root of the mean value of the squares of all the deviations from the distribution mean (the average) and is calculated by:

- calculating the deviation of each result from the mean;
- squaring each deviation;
- calculating the mean of all the squares;
- finally calculating the square root of the mean of all the squares.

The formula is given as:

$$\sigma = \sqrt{\frac{\sum (x - x^{\dagger})^2}{n}}$$

- where:
- $\sigma$  is one standard deviation
  - $x^{\dagger}$  is the mean (average) value of the batch
  - $x$  is the value of any particular value in the batch of 'n' numbers in the range  $x_1, x_2, x_3$ , etc.
  - $\sum$  indicates that all the possible values of  $(x - x^{\dagger})^2$  are to be added together.

## **ANNEX 3**

### **CODE SIGNATORIES**

Adnams plc  
Anheuser-Busch InBev  
Arkell's Brewery  
Asahi UK Ltd  
Black Sheep Brewery  
Budweiser Budvar UK  
C&C Group  
Camerons Brewing Ltd  
Carlsberg UK  
Daleside Brewery  
Daniel Batham & Son Ltd  
Daniel Thwaites plc  
Diageo plc  
Everards Brewery Ltd  
Frederic Robinson Ltd  
Fuller Smith & Turner plc  
George Bateman & Son Ltd  
Greene King PLC  
Hall & Woodhouse Ltd  
Harvey & Son (Lewes) Ltd  
Heineken UK  
Hogs Back Brewery Ltd  
Holden's Brewery Ltd  
Hook Norton Brewery Co Ltd  
Hydes Brewery  
Innis & Gunn  
Kingfisher Beer Europe  
J W Lees & Co  
Joseph Holt Ltd  
Liberation Group  
Marston's plc  
McMullen & Sons Ltd  
Molson Coors Ltd  
Moorhouse's Brewery (Burnley) Ltd  
Palmers Brewery  
R W Randall  
S A Brain & Co Ltd  
Shepherd Neame Ltd  
St Austell Brewery Co Ltd  
T & R Theakston  
Thomas Hardy Brewing & Packaging  
Timothy Taylor & Co Ltd  
Titanic Brewery  
Wadworth & Co Ltd