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Manufacturers' Confederation

GLASS

CONTAINER

TOLERANCES

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1. INTRODUCTION

This revised publication is intended to give guidance to packers and glass container manufacturers regarding the dimensional of capacity tolerances which can be economically achieved during the automatic production of glass containers on modem glass forming machines. The information does not apply to semi-automatic practice. Drawn up under the supervision of the British Glass Technical Committee, the document takes into account European as well as UK practice. It is based on principles which are generally accepted throughout Europe, but its contents are in no way mandatory.

The first European document on recommended glass tolerances was produced and published by the Glass Manufacturers' Federation (GMF) in 1965. Since that time, several other countries have carried out their own investigations and have published their findings, conforming closely with those produced by the GMF. Since the accession of the UK to the EEC (now the EU), the British glass manufacturers have taken the opportunity of exchanging their knowledge and findings with glass makers and packers throughout Europe with the aim of harmonising definitions, standards, and control methods where practicable. This was necessary because packaging has become, to a large extent, an international operation with regard to markets, points of manufacture, sources of packaging machinery and components.

Since then, a number of EEC/EU Directives relating, among other things, to the capacities and tolerances of Measuring Container Bottles (MCBs), have been incorporated into UK law. These have brought a special need for uniform methods of interpretation to be available.

As stated in the original GMF publication, the overall objective is to recommend standards of glass container manufacture which will help to minimise the overall cost of manufacturing, purchasing, filling and marketing the containers. This objective is unlikely to be met if unnecessarily severe control methods are adopted because glass containers which would give satisfactory performance might well be rejected. But equally, excessive dimensional variation could easily affect filling line efficiency and field performance so the need clearly exists for a well judged set of tolerance standards to balance these factors to ensure good performance without being unreasonably costly.

In addition to economic considerations there is now a need to optimise the use of the available energy and environmental considerations are becoming more important. This has many repercussions which support the main objective to ensure that every glass container made is functional and acceptable. With these aims in mind it is imperative that an 'holistic' approach is taken when improvements in performance are being sought i.e. the 'best' solution taking the whole glass production, filling line etc into account.

Improvements in glass manufacturing and inspection techniques over recent years have led to better dimensional controls. These improvements have coincided with greatly increased filling speeds, which demanded better consistency for certain dimensions, especially for those containers destined for particularly fast filling lines. Previously, and in accordance with general UK and European practice, both dimensional and capacity tolerances were defined as two standard deviation limits and conformed to a 2.5% AQL for each dimensional limit. Improved control has meant that in practice the more important dimensions, e.g. maximum body diameter can usually be controlled within an AQL of 1.0% and maximum height within an AQL of 1.5%. Dimensions of less significance such as minimum height and minimum body diameter still conform to a 2.5% AQL, which is perfectly satisfactory in the majority of cases. However it must be emphasised the if a particular dimension requires a more tightly controlled or narrower tolerance band this can discussed separately with glass suppliers who will do their best to achieve the tighter standard. Compliance with dimensional tolerances can be readily checked by using sampling data from any of the recognised sampling tables for attributes such as MIL-STD 105E, DEF131A, or BS 6001, checking each dimensional limit with GO/NO GO gauges and applying the appropriate AQL value.

European tolerance recommendations are given in CETIE DT2 - 'Standard Tolerances for bottles' and CETIE DT6 - 'Standard European Tolerances for normal wide mouth jars'. The interpretation of glass container tolerances and the values of the tolerances themselves, specified in these European Data Sheets, are currently consistent with those in this edition of 'Glass Container Tolerances'.

As far as capacity is concerned, the majority of glass bottles are now manufactured as Measuring Container Bottles (MCBs) in conformity with EC Directive 75/107/EEC. This is enacted in UK Law as Statutory Instrument SI 1977 No. 932, as amended by The EEC Requirements (Amendments) Regulations 1985 (SI 1985 No. 306) in the case of MCB bottles. These Regulations define precisely the tolerances required (See Table 4) and the legally prescribed methods of checking and the compliance criteria. See section 3.2. They are subject to scrutiny and independent assessment by Trading Standards Officers in the glassworks as well as in retail sale. Neither the glass manufacturer nor the packer has any remit to alter these criteria or tolerances.

For bottles not manufactured as MCBs, notably bottles for household, toiletry and pharmaceutical products or certain bottles which have abnormal shape characteristics, different tolerances and capacity controls are available. The choice is usually determined by either the bottle shape or the value of the contents (see Table 5). In these cases, the capacity may be checked by a simpler method which determines the mean capacity of the samples of 12 containers (the traditional bulk test) using the tolerances in Table 5.

It should be noted that although the capacity tolerances of MCBs are numerically somewhat larger than those in Table 5, the associated test method is well designed so that capacity control is just as stringent. Indeed, the statistics underlying the test ensure that capacity variations are limited. This involves the use of calculations using formulae from BS 6002: 2005 or MIL- STD 414 “Sampling procedures and charts for inspection by variables for percent defectives” with parameters appropriate to an AQL of 2.5% (single sampling).

When revisions to the weights and measures legislation were introduced, not only was the basis shifted from minimum contents to average contents, but attention was drawn to the concept of fill height MCBs and the use of filling level templates. This greatly simplified control of the contents in the bottling hall, the packer being able to depend on the capacity of MCBs.

When MCBs are being used, if the Trading Standards Officer, using an approved template, satisfies himself that the fill height in mm of the liquid is at, or above, the filling height in mm embossed on the bottle, then he passes the batch. Only if bottles have been filled below the nominal fill height does he need to carry out further testing which may lead ultimately to a full reference test.