



DRAFT TANZANIA STANDARD

Polyethylene Terephthalate (Pet) Bottles for Packaging of Edible Oils - Specification

Draft for Stakeholders' Comments Only

TANZANIA BUREAU OF STANDARDS



0. Foreword

Polyethylene terephthalate popularly known as PET Containers are getting popular for packaging of food and edible oil, their glass like clarity, lightness and better barrier properties for moisture and air permeation make them popular for food packaging industry. PET can be used in pure form without any additive. This standard provides requirements on the constitution of polyethylene terephthalate plastics used for the packing of edible oil

In reporting the result of a test or analysis made in accordance with this standard, if the final values observed or calculated, is to be rounded off it shall be done in accordance with TZS 4 *Rounding off numerical values*.

In the preparation of this standard assistance has been derived from: IS 12887:1989 polyethylene terephthalate (PET) bottles for packaging edible oils-specifications published by Bureau of Indian Standards (BIS)

1. Scope

This standard prescribes the requirements, methods of sampling and testing for the polyethylene terephthalate (PET) bottles for packaging of edible oils.

2. Normative references

The following standard, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies

AFDC2(231) P1: *Specification for plastic materials for food contact applications part 3: pigments and colorants*

AFDC 2 (230) P3: *Specification for plastic materials for food contact applications part 2: Polyethylene (PE)*

AFDC 2(229) P1: *Determination of overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs - Method of analysis*

AFDC2 (227) P2: *Guide on suitability of plastics for food packaging*

AFDC 2 (228) P1: *Code for evaluation of the effect of packaging and storage on the sensory qualities of foods and beverages*

TZS 4: *Rounding off numerical values*

TZS 816: *Packaging- glossary of terms in plastics and flexible packaging*

TZS 928: *Plastics-Films and Sheeting-Determination of Thickness by Mechanical Scanning*

TZS 1876: *Plastics vocabulary*

TZS 2247 *Prerequisite Programme on Food Safety-Part 4: Food Packaging Manufacturing*

3. Terms and definitions

for the purpose of this standard the definitions prescribed in TZS 816 and TZS 1876 and the following shall apply.

3.1 Polyethylene Terephthalate (PET)

the basic material produced by the catalytic condensation at high temperature and reduced pressure of dimethyl terephthalate (DMT) terephthalic acid (PTA) and if required, relatively small amounts of dimethyl isophthalate (DMI) isophthalic acid (IPA) with monoethylene glycol.

3.2 Polybutylene Terephthalate (PBT)

the basic material produced by the catalytic condensation at high temperature and reduced pressure of DMT/PTA (and, if required, relatively small amounts of DMI/IPA) with 1,4 butanediol.

4. Requirements

4.1 materials

the bottles shall be made by blow moulding process from polyethylene terephthalate materials conforming to the requirement laid down in 4.1.1 to 4.1.5

4.1.1 Basic Raw Materials

the following basic raw materials may be used

- i) Mono ethylene glycol (MEG)
- ii) 1, 4 Butanediol
- iii) Dimethyl terephthalate (DMT)
- iv) Dimethyl isophthalate (DMI)
- v) Terephthalic acid (TPA)
- vi) Isophthalic acid (IPA)

4.1.1.1 the polymer shall exist at least 50 percent of units derived from TPA.

4.1.1.2 to the thermoplastic polyesters made from the above raw materials polyethylene up to 5 percent used conforming to AFDC2(230) P3, may also be added.

4.1.2 residual catalyst

Table 1: maximum limits for the residual catalysts

| Residual catalyst | Maximum limits (mg/kg or ppm) | Test methods |
|-------------------|-------------------------------|----------------|
| Antimony | 350 | AFDC2 (229) P1 |
| Gallium | 20 | |
| Germanium | 100 | |

| | | |
|-----------|-----|--|
| Cobalt | 125 | |
| Lithium | 130 | |
| Manganese | 80 | |
| Zinc | 80 | |
| Titanium | 120 | |

4.1.3 Crystallization accelerators

Table 2: maximum limits for the crystallization accelerators

| Crystallization Accelerators | Maximum limits (percent) | Test methods |
|------------------------------|--------------------------|---------------|
| Talc, free of asbestos | 0.25 | AFDC2(229) P1 |
| Sodium benzoate | 0.25 | |

4.1.4 Auxiliary items for Working

the following auxiliary items may be present with limits prescribed against each.

Table 3: maximum limits for the auxiliary items in percentage

| Auxiliary items | Maximum limits (percent) | Test methods |
|---|--------------------------|---------------|
| Calcium stearate and zinc stearate together | 0.5 | AFDC2(229) P1 |
| Synthetic paraffin | 0.25 | |
| Iso-butyl stearate | 0.2 | |
| Even numbered, saturated, aliphatic primary alcohols of the chain length C ₁₂ to C ₂₀ | 0.5 | |
| Low molecular polyolefins | 0.5 | |
| silicon oil | 0.3 | |
| Penta-erythrite-ester of saturated even numbered aliphatic mono carbonic acids of the chain length C ₁₄ to C ₃₂ | 1.0 | |

4.1.5 Pigments and Colourant

the pigments and colourants shall be as specified in AFDC 2 (231) P1

4.2 cap

The bottles shall be provided with a cap and if required with an insert plug, the material for cap and plug shall be food grade HDPE injection moulding grade according to the relevant standards or any other suitable materials as agreed to between the purchaser and the supplier.

4.3 wad

The wad, if required, shall be of cork board or pulp-board or any other suitable material compatible with the contents and suitable for food contact applications



5. Capacity

5.1 brimful capacity

The brimful capacity of bottles when measured by method given in annex A shall exceed the nominal capacity by a minimum of 2 percent.

6. Mass

mass of the bottles shall be as agreed between the purchaser and supplier with a tolerance of ± 5 percent

7. Shape and Design

7.1 the shape and design shall be as agreed between the purchaser and the supplier.

7.2 Wall Thickness

the minimum wall thickness of the bottle shall be 0.25mm when determined according to TZS 928 or any other relevant method.

8. Workmanship and finish

8.1 the bottle and closures shall be manufactured according to the good manufacturing practices (GMP) and shall be free from any burnt, oxidized or un-homogenized particles. The bottles shall be clear and transparent and free of any scratches.

9. Tests

9.1 closure leakage test

The bottle filled with water at ambient temperature and closed tightly with the cap when subjected to vibration on the vibration table as detailed in annex A, shall not show any leakage through the closure after one hour of testing.

9.2 drop impact test

the bottle and the cap when subjected to the drop test as given in Annex B, shall not show any sign of cracking. Slight deshaping of the body shall not render the bottle unacceptable in the test.

9.3 Stacking test

9.3.1 the bottles shall not show any leakage, cracks, or permanent buckling when subjected to test as described in 9.3.2.

9.3.2 arrange four bottles, filled with water at ambient temperature to their nominal capacity and closed with their caps to the normal torque on a flat level surface in a block of 2 x 2 without any other support. Apply a top load evenly distributed on a flat level surface placed on the unsupported bottles and examine after 24 hours.

9.4 storage test

this shall be a type test. The storage test shall be carried out both at $38\pm 1^{\circ}\text{C}$ and 90 ± 2 percent RH (relative humidity) (accelerated condition) and $27\pm 1^{\circ}\text{C}$ and 65 ± 2 percent RH (Relative humidity) (standards conditions). the change in free fatty acids (as percentage of oleic acid), moisture content, peroxide value as milliequivalent of oxygen per kilo fat (wherever applicable) and rancidity as per AFDC 2 (228) P1, of the content shall be noted at the end of 60 and 180 days when tested under accelerated and standards conditions respectively. Bottles shall be accepted if edible oil does not show rancidity or increase in the value of the moisture contents, free fatty acids and peroxide value above the permissible limits specified in the relevant Tanzania standards on edible oils at the end of 60 days and 180 days under accelerated and standards conditions respectively.

10. Packing, Marking and Labeling

10.1 Packing

The material should be suitably packed with suitable liner (food grade) in a container as agreed between the purchaser and the supplier, in a manner so as to ensure that the items do not become contaminated during storage.

10.2 Marking and Labeling

Each package shall be marked legibly and indelibly with the following :

- a) Name and type of the material
- b) Manufacturing date material
- c) Country of origin
- d) Name of the manufacturer and/or trade mark, if any.
- e) The packages shall carry the symbol for food grade (Fig. 1) or the word "for food grade" on it



11. Sampling

11.1 Sample of bottles shall be drawn and the criteria for conformity determined as described in Annex C.



Annex A

Closure Leakage Test

A-0. General

A-0.1 the method helps to determine the ability of a closure (on a container) to prevent leakage due to transformational vibration

A-1 apparatus

A-1.1 a vibrating table conforming to a relevant standard

A-2 Procedure

A-2.1 Fill the bottles to its nominal capacity with the product or water and close it with the usual closure in the manner in which it is intended to be used.

A-2.2 Mount the bottle upside down rigidly on the vibrating table and subject to vibration for 1hour at a peak acceleration of 1g

A-2.3 at the end of the test period, the closure shall show no indication of leakage, loss of tightness, backing-off or popping

A-3 precautions

A-3.1 before the test is carried out, it should be ensured that the inner plag, if provided, and cap are fully tightened

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Annex B

Drop Impact Test

B-1 Apparatus

B-1.1 the apparatus shall consist of a vertical scale marked in 15mm increments from 1m to 4m fixed above a rigid flat base of steel or smooth concrete as a dropping surface.

B-2 procedure

B-2.1 the bottles shall be filled to their nominal capacity with water at ambient conditions and closed tightly with the cap. each bottle shall be dropped freely from a height of 1.2m in the following sequence:

- a) Vertical position, so that the bottom strikes the impact surface flat; and
- b) Horizontal position, so that the bottle strikes the impact surface horizontally with its side flat.

B-2.2 bottles shall not show any leakage of water through cracks or closures. Slight denting shall not be taken as failure of the bottle in the test.

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Annex C

Sampling

C-1 Scale of Sampling

C-1.1 Lot

In any consignment all the bottles of the same material, nominal capacity and drawn from a single batch of manufacture shall be grouped together to constitute a lot.

C-1.2 Scale of Sampling

For ascertaining the conformity of the lot to the requirements of this standard, test shall be carried out for each lot separately. The number of bottles to be sampled from a lot shall be in accordance with table 1.

Table 1 scale of sampling and acceptance of number

| Lot size | For visual examination | | For closure leakage test | |
|----------------|------------------------|-------------------|--------------------------|-------------------|
| | Sample size | Acceptance Number | Sample size | Acceptance Number |
| Up to 500 | 13 | 1 | 5 | 0 |
| 501-1000 | 20 | 2 | 8 | 0 |
| 1001-3000 | 32 | 3 | 13 | 0 |
| 3001-5000 | 50 | 5 | 20 | 1 |
| 5001 and above | 80 | 7 | 32 | 2 |

C-1.3 the bottles shall be selected at random from the lot according to the relevant Tanzania standard

C-2 Criteria for Conformity

C-2.1 visual examination

The sample bottle selected as per column 2 of table 1 shall be examined for workmanship and finish (8.1). any bottle failing in one or more of the requirements shall be termed as defective. The lot shall be accepted under this head if the number of defective bottles in sample does not exceed the acceptance number given in column 3 of table 1