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Aluminium and aluminium alloys — Guideline for the production of foil-stock in the field of semi rigid foodstuff containers

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Aluminium and aluminium alloys - Guideline for the production of foil-stock in the field of semi rigid foodstuff containers

Aluminium et alliages d'aluminium - Lignes directrices relatives à la fabrication de feuilles minces dans le domaine des récipients alimentaires semi-rigides

Aluminium und Aluminiumlegierungen - Leitfaden zur Fertigung von Folienvorwalzbändern für halbstarre Lebensmittelbehälter

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 16773:2016) has been prepared by Technical Committee CEN/TC 132 “Aluminium and aluminium alloys”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2016, and conflicting national standards shall be withdrawn at the latest by July 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This standard gives indication on production’s practices to obtain rolled products with specific surface quality properties, necessary for the production of disposable food containers. It contains references to smell and cleanliness requirements of the rolled products, evaluation criteria linked to specific tests; furthermore it contains selection’s criteria for rolling oil and pre-lubricant to be used in the manufacturing process.

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Introduction

The European Regulation (EC) 1935/2004, regarding materials and objects intended to come in contact with foodstuff and abrogating Directives 80/590/EEC and 89/109/EEC at point 3, states:

"The principle underlying this Regulation is that any material or article intended to come into contact directly or indirectly with food must be sufficiently inert to preclude substances from being transferred to food in quantities large enough to endanger human health or to bring about an unacceptable change in the composition of the food or a deterioration in its organoleptic properties."

Food containers represent a typical example of products often used in direct contact with food, for which reason they need to be produced in order to avoid particular smells and with an adequate level of "surface cleanliness" (which can otherwise adversely modify food organoleptic properties).

1 Scope

This European Standard provides a guideline about manufacturing practices for rolled products in the thicknesses range between ≥ 35 µm and ≤ 200 µm having surface quality characteristics essential for production of aluminium semi-rigid containers, lids and disposable platters which are used in contact with foodstuff.

This European Standard can be applied to the production cycle of the "rolled semi-finished goods". The European Standard cannot be applied to the production process of containers, lids and disposable platters.

2 Normative references

The following documents, 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.

EN ISO 6886, *Animal and vegetable fats and oils - Determination of oxidative stability (accelerated oxidation test) (ISO 6886)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
tray
equivalent of disposable "single-use" containers intended to be used in contact with foodstuff, produced by aluminium rolled strip having a thickness in the range ≥ 35 to ≤ 200 µm, soft or partially annealed temper

Note 1 to entry: The strip is normally supplied pre-lubricated in order to allow drawing or stamping. The tray as finished good can have wrinkle or smooth walls.

3.2
lid
disposable aluminium rolled product used for container closure and based on plain foil or paper coupled (the side in contact with food will be the laminated one)

Note 1 to entry: It can close the container with mechanical seaming or by folding an adequate "L shaped" border.

3.3
platter
containers produced by aluminium rolled strip with platter shape, always used with disposable features

3.4
typical rolled strip smell
low intensity and constant through time smell, presenting small variations depending on various rolled aluminium manufacturers and the subjective olfactory perception

Note 1 to entry: For typical smells comparison reference test we can consider the pre-lubricant's smell as it is (with no definite odour), which resists to photo-oxidation processes and to temperature ranges comparable to the conditions existing during transport and storage of containers.

3.5
pungent rolled strip smell
smell clearly different from the typical one, with an intensity that can modify the perception of the food contained

Note 1 to entry: Typical examples are acrid, rancid or unpleasant smells (which may arise also after several months of storage period) or pleasant but intense odours which may modify the original food smell.

3.6
chemical degreasing
operation done in order to eliminate eventual unwanted substances on the rolled surface by acid or basic chemical reagents containing surfactants

3.7
lubricant
substance introduced to reduce friction between moving surfaces

3.8
pre-lubricant
technological adjuvant or processing aid to the drawing or forming process

3.9
rolling oil
oil lubrication-cooler used in the process of cold rolling

4 Pre-lubrication oils selection criteria for rolled semi-finished products

4.1 General

Depending on the final use of the semi-finished rolled product, the purchaser can ask for the foil to be supplied with a pre-lubrication layer. Such a layer is necessary for drawing or forming processes taking place normally through a male–female dies with deformation depth depending on the shape of the tray.

Consequently the stress on the material is a combination of the forming force, transmitted from the die to the material and the surface friction between die and metal.

Surface friction represents an important limit on the deformation possibilities because the breaking strength of the rolled material is limited and cannot assume higher values than the metal specific ones. Furthermore, the sliding between the die and the metal sheet leads to continuous die and metal sheet wearing. From this basis results the unavoidable necessity to use a pre-lubricant which has the following tasks:

— to establish a balance between friction reduction and the blank holder braking power;

— to ensure a film between metal sheet and dies in order to avoid grip between aluminium and tool;

— to minimize punches and matrix wearing;

— to uniform deformations distribution;

— to remove heat from the working area;

— to facilitate the detachment of the formed container from the die;

— to prevent corrosion of the formed part and the die.

4.2 Pre-lubricant selection criteria

In the production of food containers and their lids it is allowed to use pre-lubricant oil.

NOTE Some national regulations do not limit the maximum lubricant quantity per surface units but limits only the chemical features of the lubricant itself.

Oils and fats used as pre-lubricants, according to good manufacturing practice, should have an oxidation stability equivalent to a minimum of 100 h at a temperature of 100°C, determined by the method described in EN ISO 6886.

The lubricant selection shall be done among the following categories:

1) Paraffinic hydrocarbons of medicinal level type, either semi-solid (Vaseline) or liquid (Vaseline oil);

2) Synthetic and natural esters, obtained through reaction of natural acids and polyalcohols or by glycerines modification, or their mixtures. Synthetic esters are defined as esters of natural origin submitted to chemical processes of trans-esterification or re-esterification in order to eliminate unwanted compounds that can bring about negative features to the food they are in contact with. Basically these processes are essential to eliminate compounds easily oxidizable which may lead to the oil deterioration (going rancid).

3) Hydrocarbons mixtures mentioned at point 1 with esters mentioned at point 2 are allowed.

Pre-lubricants used shall not contain potentially allergenic substances.

In any case the producer choosing the pre-lubricant shall verify together with the manufacturer if there are additional limitations related to substances used in the specified product.

The quantity of pre-lubricant put on upper and lower surfaces of the rolled strip can vary according to the difficulty of the tray design; however, the maximum quantity applied should not be higher than 900 mg/m^2 as sum of the surfaces (maximum quantity used for particularly severe tray design).

5 Cleanliness and smell of rolled products

5.1 General

During Cold Rolling process usually are in use lubricant and cooling fluids, said rolling oils, generally constituted by hydrocarbons mixtures, normal- or iso-paraffin (with aromatic content < 0,05 %) with added mixtures of long chain alcohols (normally from C12 to C14) or methyl esters and/or fatty acids mixtures.

Such fluids are generally evaporated from the rolled strip during the heat treatment processes following the rolling.

The rolling oil quality management is very important for the production of rolled semi-finished products intended to be used in contact with food, both regarding fluids filtration and pollution of the rolling oil by the other service oils used for lubrication of mechanic components or for hydraulic system normally used in the rolling-mills. Service oils of compatible nature to rolling fluid should be used in order to prevent the risk of surface staining during the annealing process.

In order to get higher cleanliness level, a chemical degreasing treatment can be added as final working step of the manufacturing process. Such operation is normally obtained by washing the strip surface with water solutions based on acid or alkaline or surface-active degreasing agents, followed by rinsing it with demineralized water.

This degreasing step, when used, improves the rolled strip surface's cleanliness by means of the chemical and the hydro-mechanical effect. Normally few second of "Contact time" are sufficient. After

degreasing, the aluminium strip passes through special squeezing rolls and then is rinsed by demineralized water, usually having a Conductivity < 100 μS.

Finally the strip passes through a hot air drying tunnel.

The advantages obtained by adding this chemical degreasing step can be appreciated both in terms of "smell" and "surface cleanliness".

Furthermore the oil used for the pre-lubrication of rolled strip shall be selected in order to avoid phenomena of degradation and rancidity through time (see EN ISO 6886).

Oil can be applied using a mechanical device by special rollers ("Rotogravure") or by electro-static field. The continuous filtration of prelubricating oil minimizes solid contaminants.

5.2 Rolled strip smell evaluation

Rolled material may have a "pungent smell" different from the "typical smell". In this situation it could be difficult to give an objective evaluation, since in presence of "pungent smell" the organoleptic characteristics of the food in contact could be modified.

NOTE 1 In the case of doubt or dispute between purchaser and manufacturer, sensorial tests conforming to UNI 10192 need to be carried out by an accredited laboratory.

NOTE 2 Such methodology could also be used for smell evaluation on finished trays, lids and platters.

5.3 Cleanliness level evaluation

5.3.1 General

In order to verify the cleanliness level of the rolled material a rubbing test is herewith described. It is based upon grading the blackening of a rubbed white paper against the aluminium sample, under fixed pressure and speed conditions.

The test shall be carried out according a frequency based on an agreement between purchaser and manufacturer, the sampling criteria shall be agreed between manufacturer and purchaser.

5.3.2 Equipment

The equipment consists of:

1) adequate horizontal plane surface where the rolled strip sample is fixed;

2) sliding-block of determined mass with white paper of determined properties fixed on the lower surface;

3) proper device for moving the sliding-block on the sample's surface which allows the scrubbing cycle setting: scrubbing times (full cycle) and path length on the paper;

4). white paper having proper roughness characteristics, agreed between purchaser and manufacturer,

5) aluminium sample taken from the rolled strip by proper cutting devices which allow to take three adjacent sheets (only the sample related to the middle sheet will be used);

6) load of 1 kg applied on the sliding-block.

Test speed shall be recorded in the test report.

5.3.3 Execution of the rub test

The sample is put on the plane of the equipment with the surface to be evaluated on the upside, properly blocked in order to avoid moving during the test.

The white paper shall be fixed on the sliding-block in order to avoid displacements during the test.

The proof starts with the slide performing at least 12 rub cycles, each of them doing a full-cycle. The length of each trip shall be not less to 110 mm. The paper on the slide can make semi-circular or linear path.

For this purpose instruments indicated in BS 3110 can be used.

This test can be undertaken on metal either plain or pre-lubricated, considering the result is comparable only among tests under the same surface conditions, using the same reference scale as shown in the Table 1.

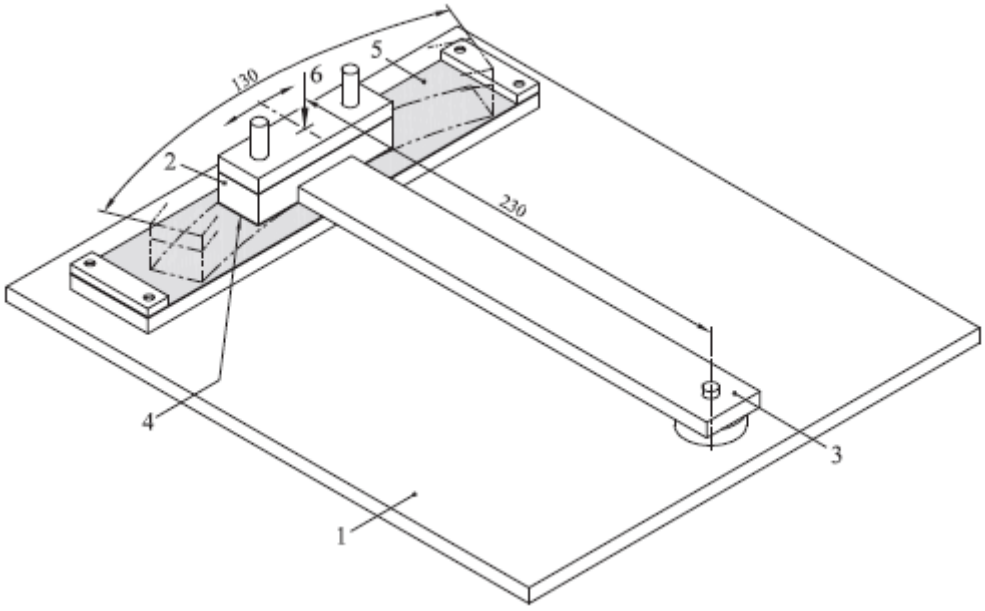
Test should be performed controlling environmental conditions and wearing protective gloves.

Figure 1 presents a scheme of the equipment.

5.3.4 Results evaluation

At the end of the test the paper shall be compared in terms of blackening with reference result as listed in Table 1. The acceptance criterion is defined as A or B grade or according specific agreement with the purchaser (see Figure 2).

Dimensions in millimetres



Key

1 horizontal plane

2 sliding-block

3 proper device for the Slide-block's driving

4 testing white-paper

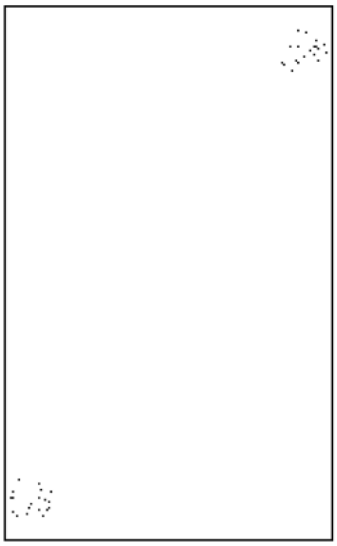
5 aluminium sample

6 mass applied on the sliding-block

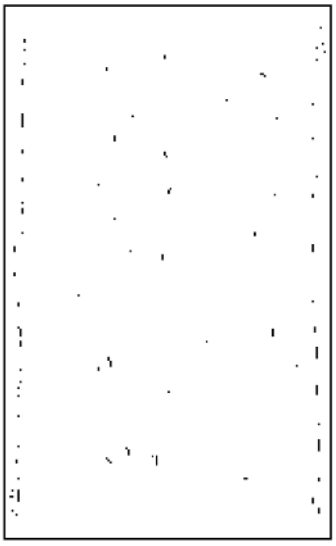
Figure 1 — Equipment's scheme

Table 1 — Cleanliness degree after Rub-test

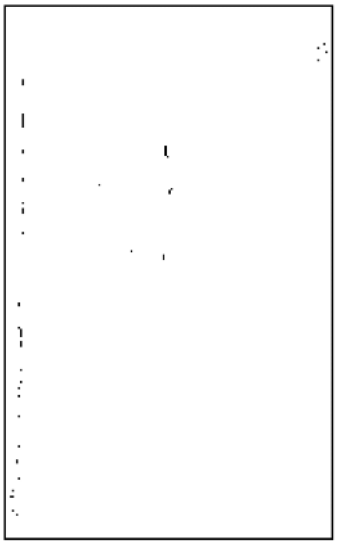
Grade	Description
A	Fully clean
B	Presence of some stain spot on the borders
C	Stains spread
D	Fully dirty with evident stains



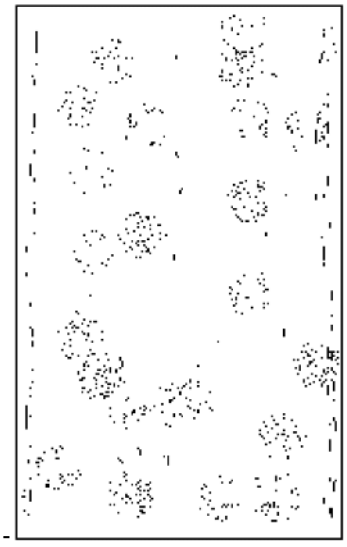
a) Grade A



c) Grade C



b) Grade B



d) Grade D

Figure 2 — Grades

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[3] Regulation EC Directive 1935/2004/EC of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC

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