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Paper and board — Estimation of contraries

Papiers et cartons — Estimation des défauts

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Foreword

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International Standard ISO 15755 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods and quality specifications for paper and board*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "...this European Standard..." to mean "...this International Standard...".

Annexes A and B form a normative part of this International Standard. Annex C is for information only.

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Foreword

The text of EN ISO 15755:1999 has been prepared by Technical Committee CEN/TC 172 "Pulp, paper and board", the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 6 "Paper, board and pulps".

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of an identical text or by endorsement, at the latest by December 1999, and conflicting national standards shall be withdrawn at the latest by December 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard is based on a visual inspection, and a normative Annex B is added where the inspection is perfomed using instrumental devices. This is justified by the present state of instrument development. For the time being, the visual procedure is the foremost European Standard. This can eventually be changed when more experience with instrumental devices is gained and it has been shown that such equipment can estimate contraries to a level of precision at least equal to visual inspection.

Estimation of dirt and shives by a visual technique is a well established method in the pulp and paper industry and the estimation of these contraries is important for trade purposes.

1 Scope

This European Standard specifies the test method for the estimation by reflected light of the visible contraries in paper. Visual inspection is applicable to most kinds of paper and board.

Paper and board with an apparently high content of contraries require to be inspected by instrumental means as described in Annex B, as the tedium of large counts diminishes the judges' precision.

However, papers which are not flat, have a low lightness (Y value below 30 %) and contain holes may cause particular problems for instrumental techniques (see Annex B). Fluorescent spots will not be detected by the methods described in this European Standard.

2 Normative References

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN ISO 186
Paper and board – Sampling to determine average quality (ISO 186 : 1994)

3 Definitions

For the purposes of this Standard, the following definitions apply:

3.1 sheet: a sheet of paper or board taken from a packet, bale or roll of paper.

3.2 test piece: an area recognized for inspection.

3.3 contrary (in paper or board): any unwanted particle or spot of specified minimum size and having a sufficiently contrasting light reflectance with respect to the surrounding area of the sheet, according to the comparison chart in Annex A (see figure A.1).

NOTE: A contrary can include any blemish on the paper surface.

4 Principle

The test pieces to be examined have to be inspected in reflected light. The area of each contrary larger than a specified value and showing contrasting light reflectance with respect to the surrounding area of the sheet, according to the comparison chart presented in Annex A has to be estimated. The areas of the contraries are added and the total area of contraries is reported as square millimetre per square meter of paper (mm^2/m^2).

If required, the areas of contraries in different classes can also be reported.

5 Apparatus

5.1 Illumination device: a suitable light source for investigation of the paper in reflected light. The light shall be strong enough to ensure that all contraries having the minimum area agreed upon (see subclause 7.2) are visible. Natural daylight or direct light from any external source shall be avoided.

5.2 Comparison chart: a film with a series of black and grey spots of different shapes, areas and contrasts. This shall be used for visual inspection and for checking the performance of an instrument. The chart is included in Annex A of this European Standard.

Do not use the illustration in Annex A, or any copy thereof in any inspection, because reproduction can change the size and the contrast of the spots.

6 Preparation of sample

6.1 Sampling

If the dirt count is to represent the contraries in a lot of paper, the number of samples to be inspected and the method of selecting them shall be in accordance with EN ISO 186.

For minimum size of sample see 6.2.

6.2 Selection of areas for inspection

Identify a number of areas (test pieces) randomly distributed over the different parts and equally representing both sides of the samples. The total area to be inspected is such, as to allow for the counting of at least 300 contraries. However, if very few contraries can be found, as in a very clean paper, the area to be inspected need not exceed 3 m².

However, the judgement on a lot of paper or board shall be based on not less than 1000 contraries or 10 m² of paper or board.

NOTE 1: The above number of contraries are arrived at by accepting a relative error of 10% at a confidence level of 90% [1].

NOTE 2: The contraries are likely to be unevenly distributed in the paper and the result can vary considerably depending on how the test areas are selected. It is important that these areas are randomly distributed over the whole sample if this is larger than the minimum size indicated above.

NOTE 3: In some cases only one side of the sample is inspected. This should be stated in the test report.

7 Procedure

7.1 Examination

Examine the test pieces (6.2) visually to determine the area of the contraries. Use the comparison chart in Annex A. Normally, only contraries having an area of at least 0,04 mm² shall be noted.

Classify the contraries according to their area (see table 1).

Do not count any atypical, non-representative piece of dirt, such as a crushed insect or a blotch of dirt, but report it together with the result. Do not count fluorescent spots.

NOTE: On request, the size of contraries of different types can be noted separately, as for example plastics, dirt, shives etc.

7.2 Classification of contraries

It is usual to report only the total area, though when required the contrary area in each class can be reported. In this case the classification given in table 1 shall be used. Size class 6 is used only by special agreement and this shall be stated in the test report.

Table 1: Recommended classification of contraries according to area

Size class	Area mm²	Logarithmic mean area mm²
1	above 5	-
2	1,00 to 4,99	2,234
3	0,40 to 0,99	0,629
4	0,15 to 0,39	0,242
5	0,04 to 0,14	0,075
6	0,01 to 0,03	0,017

NOTE: The number of classes used can be varied to some degree depending on the grade of paper or board tested and agreement between the parties concerned.

8 Expression of results

8.1 Calculation

For all contraries calculate the total area, or the area in each size class (see table 1), according to the formula:

$$X = \Sigma \frac{c_i \, n_i}{b} \qquad (1)$$

where

X is the total area of contraries (or of the contraries in each size class per area of paper), expressed in square millimetres per square meter;
c_i is the logarithmic mean area of each class, as reported in table 1, expressed in square millimetres;
n_i is the number of contraries in the class;
b is the area of the inspected sample, expressed in square metres.

For contraries exceeding 5 mm² $c_i n_i$ must be replaced by the contraries' true area, which shall be evaluated separately for each contrary and stated in the test report.

NOTE: The logarithmic mean area of a class is justified, as there is a tendency towards enrichment of contraries towards the lower limit of the class.

EXAMPLE

If 8 contraries are counted within the size class 0,15 to 0,39, their area $c_i \cdot n_i$ is calculated as follows:

$8 \times 0{,}242 \text{ mm}^2 = 1{,}9 \text{ mm}^2$ (see table 1).

8.2 Results

Report the total area of contraries per area of paper to the nearest integer. Results below 5 mm²/m² shall be reported to one decimal place.

NOTE: On request, the result can be expressed separately for each size class. However, categories containing few contraries will be subject to much higher sampling uncertainty.

8.3 Precision

It is difficult to obtain exact precision data for a visual dirt count because of the subjective nature of the test method. It is an established fact that the reproducibility is unsatisfactory because of differences in personal judgement.

Five laboratories tested 16 paper samples visually. The coefficient of variation between the laboratories was found to vary from 62 % to 99 %, the mean value being 82 %.

9 Test report

The test report shall refer to this European Standard and state:

a) all information necessary for complete identification of the sample or lot;

b) the result expressed in square millimetres per square metre of paper or board. On request, the result can be divided into classes according to size or type;

c) the area of paper inspected in square metres;

d) whether the result is based on a visual or an instrumental inspection;

e) any optional points observed in the course of the test;

f) any departure from this European Standard, or any circumstances regarded as optional that may have affected the result.

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