

Wood chips for pulp production

Preparation of tablets for the measurement of ISO brightness

0 Introduction

This SCAN-test Method replaces SCAN-CM 59:96, from which it differs in that the wood chip sample consists of a mixture of two classes from a chip size classification instead of a single class.

In addition, it only describes the procedures for the preparation of tablets from wood meal made from wood chips, the measurements being performed according to the current version of ISO 2470.

1 Scope

This Method describes a procedure for the preparation of opaque tablets from wood meal prepared from wood chips on which ISO brightness can be measured using the current ISO standard (ISO 2470).

The brightness of wood is important for the brightness of pulp, especially mechanical pulp. The procedure described in this Method makes it possible to determine the ISO brightness of bark-free wood meal as well as of wood meal containing bark. The purpose of the test will determine the procedure and the report shall state whether the result refers to bark-free or bark-containing wood meal.

Note – The ISO brightness is affected by many factors, such as the dry matter content and the size of the wood particles.

2 References

- SCAN-CM 41 Wood chips for pulp production – Sampling
- SCAN-CM 39 Wood chips for pulp production – Dry matter content
- SCAN-CM 40 Wood chips for pulp production – Size distribution
- ISO 2470 Paper, board and pulps – Measurement of diffuse blue reflectance factor (ISO brightness)
- ISO 2469 Paper, board and pulps – Measurement of diffuse reflectance factor

Note – SCAN-test has withdrawn a number of test methods and refers instead to the corresponding ISO and/or EN Standards.

3 Definitions

For the purpose of this Method, the following definitions apply:

- 3.1 *ISO brightness, R_{457}* – The intrinsic reflectance factor measured with a reflectometer having the characteristics described in ISO 2469, equipped with a filter or corresponding function having an effective wavelength of 457 nm and a width at half-height of

44 nm, and adjusted so that the UV-content of the illumination incident upon the test piece corresponds to that of the CIE illuminant C (ISO 2470).

3.2 *Reflectance factor, R* – The ratio, expressed as a percentage, of the radiation reflected by a body to that reflected by the perfect reflecting diffuser under the same conditions (ISO 2470).

4 Principle

Wood chips are pulverized in a rotary cutter and tablets are prepared from the wood meal obtained. The ISO brightness of the tablets is measured using the procedure described in ISO 2470.

5 Apparatus

5.1 *Rotary cutter*, of the Wiley type, with a knife distance of 0,7 mm and with a bottom screen having 1,0 mm circular holes, evenly spread over the bottom screen and with a relative open area (area of the holes to the total area) of 27 %. All holes must be complete (uncut).

5.2 *Equipment for pressing tablets from wood meal*. The equipment shall consist of the following components, *Figure 1*.

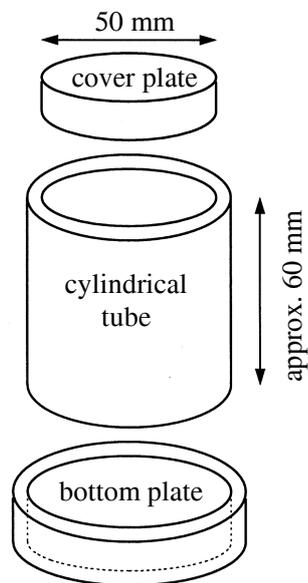


Figure 1. Equipment for pressing tablets from wood meal.

Note 1 – The equipment is available from Zeiss, Germany.

5.2.1 *A cylindrical tube*, of metal, open at both ends. The internal diameter of the tube is 50 mm and the length is approx. 60 mm.

5.2.2. *A bottom plate* of metal. The internal diameter of the edge is fitted to the outer diameter of the cylindrical tube.

5.2.3 *A cover plate*, made of polished stainless steel. The diameter of the plate is fitted to the internal diameter of the cylindrical tube, allowing the plate to move easily inside the tube.

Note 2 – The smoothness of the surface in contact with the tablet to be formed influences the brightness value obtained. Replace the plate if any damage is visible.

5.3 *Hydraulic press*, capable of giving a pressure of 30 MPa (300 bar).

5.4 *Reflectometer*, as described in ISO 2469.

5.5 *Black cavity*, as described in ISO 2470.

5.6 *Detergent*, as described in ISO 2470.

6 Sampling and preparation of sample

The sampling procedure is not covered by this Method. Make sure that the sampling has been carried out in a manner that ensures representative samples. A suitable sampling procedure is described in SCAN-CM 41. Prepare the sample as follows:

Screen the wood chip sample as described in SCAN-CM 40. Mix the large (13 mm hole) and the small (7 mm hole) accept-chips classes carefully. From the mixture take a representative sample of approximately 200 g.

If the purpose is to determine the ISO brightness of wood without any bark, remove any bark that may be attached to the wood chips.

If the purpose is to determine the ISO brightness of a wood-chip sample including bark, do not remove any bark attached to the chips.

It must be stated in the report whether the result is given for a bark-free or bark-containing sample.

Note 1 – If the wood chip sample has to be stored before determination, dry the chips as described in 7.1. When storing, keep the chips in black plastic bags away from daylight.

7 Procedure

7.1 Drying the wood chips

Note 1 – If the sample received is in the form of discs of wood, cut by hand the whole disc or a sector of the disc into wood chips.

The dry matter content of the wood chip sample shall be within the range of 80 % to 95 %. If the dry matter content is below 80 %, dry the wood chip sample in air at room temperature away from daylight.

Note 2 – If the ISO brightness measurements are made on wood meal with dry matter content below 80 %, the value of the dry matter content will influence the result.

7.2 Preparation of wood meal

Pulverize the wood chips into wood meal in a rotary cutter (5.1). Collect the wood meal which passes through the bottom screen of the cutter. Prepare tablets and measure the brightness within at the most 24 h.

If the wood meal has to be stored before the brightness determination, keep the meal at a low temperature in black plastic bags away from daylight.

7.3 Preparation of tablets

Use the equipment for making tablets (5.2) and prepare two tablets from each sample.

Place the cylindrical tube (5.2.1) in the bottom plate (5.2.2). Place about 10 g wood meal (dry basis) in the cylinder and make sure that it is evenly distributed in the cylinder, place the cover plate (5.2.3) on top of the wood meal and press the meal into a tablet under a pressure of 30 MPa applied with the help of the hydraulic press (5.3).

After releasing the pressure, remove the cylindrical tube from the bottom plate and apply a light pressure on the cover plate to eject the tablet. Check by visual inspection that the surface of the tablet in contact with the cover plate, i.e. the surface to be measured, is smooth and undamaged. If it is not, discard the tablet.

After each series of tablets has been prepared, clean the equipment with a soft brush using a detergent free from any optical brightening agent, and rinse thoroughly with distilled water.

7.4 Measurement of ISO brightness

Measure the ISO brightness according to ISO 2470 within 24 h from the preparation of the wood meal.

Measure the ISO brightness of that side of the tablet that has been in contact with the cover plate (cf. *Figure 1*), as soon as possible and the next day at the latest. Place a tablet in the measurement position, and read and record the ISO brightness to the nearest 0,1 reflectance factor unit. Repeat this for the second tablet.

Results for different tablets prepared from the same sample should fall within a range of 0,5 reflectance factor unit. If this cannot be achieved, check in the first place the procedure used for preparation of the tablets.

8 Calculation

Calculate the ISO brightness as the average of the two determinations. Report the ISO brightness as a percentage with one decimal.

9 Report

The test report shall include reference to this SCAN-test Method and the following particulars:

- date and place of testing;
- the sampling procedure;
- identification mark of the sample tested;
- the result, stating whether bark-free or bark-containing sample has been used;
- any departure from the standard procedure and any other circumstance that may have affected the results.

10 Precision

The method error has been calculated as:

$$s = \sqrt{\frac{\sum d^2}{2n}} \quad [1]$$

where

- s is the method error;
 d is the difference between the results of duplicate determinations;
 n is the number of duplicates.

Two laboratories tested ten wood chip samples. The results are given in the *Table*.

The repeatability and the reproducibility, measured as the standard deviation, s , within and between laboratories were 0,19 and 0,77 respectively.

Chip sample	Lab 1		Lab 2	
	Tablet 1	Tablet 2	Tablet 1	Tablet 2
1	65,9	66,3	65,7	65,9
2	47,2	47,1	47,3	47,6
3	54,8	55,1	54,5	54,5
4	52,7	53,0	50,9	50,6
5	38,9	39,3	40,8	40,8
6	48,7	49,0	49,3	49,3
7	24,5	24,8	25,4	25,1
8	50,1	50,4	48,8	48,9
9	53,6	53,3	52,3	52,1
10	55,2	54,7	55,2	55,4

11 Literature

11.1 Brecht, W, Meltzer, K-P: Über die messtechnische Beurteilung der Helligkeit von Holz. Wochenblatt für Papierfabrikation 93:18, p. 777 - 785 (1965)

11.2 Olszewski, J.: Pomiar bialosci zrebków drzewnych (Determination of wood chips ISO brightness). Przegląd Papier 30:9, p. 339 - 340 (1974)

11.3 Baetke F.: Die Praxis der Weissgradmessung von Zellstoffen. Das Papier 15:7, p. 287 – 295 (1961)

11.4 SCAN-G 5 Pulp, paper and board – Basic equations for optical properties