INTERNATIONAL STANDARD

ISO 5264-2

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Pulps — Laboratory beating —

Part 2: PFI mill method

Pâtes — Raffinage de laboratoire —

Partie 2: Méthode au moulin PFI

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 5264-2 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 5, *Test methods and quality specifications for pulps*.

This third edition cancels and replaces the second edition (ISO 5264-2:2002), which has been technically revised.

With regard to ISO 5264-2:2002, the following changes have been made:

a) the normative references have been updated;

b) a more precise description of the PFI mill has been given in Annex A;

c) a new reference pulp for internal control beating has been added to Annex C;

d) editorial updating.

ISO 5264 consists of the following parts, under the general title *Pulps — Laboratory beating*:

— *Part 1: Valley beater method*

— *Part 2: PFI mill method*

Introduction

In view of the widespread use of the following beaters:

— Valley beater,

— PFI mill,

it has been decided to provide guidance on the use of these beaters in order to achieve consistency of results with each instrument. Although both beaters show similar trends in the effect on pulp properties, there is no correlation between the actual results obtained with the different types of beaters.

ISO 5264-1 specifies a method of laboratory beating using a Valley beater.

Beating is a preliminary step in the preparation of laboratory sheets for testing the physical properties of pulps. In the PFI mill, each beating is performed separately, i.e. a new test portion of unbeaten pulp is taken for each beating.

NOTE A complete test of physical properties normally comprises unbeaten pulp and several beatings of the same pulp, where the beating is carried out for different numbers of roll revolutions. The number of roll revolutions depends on the type of pulp and the beating load. After beating, the drainability is measured according to ISO 5267-1 or ISO 5267-2, and laboratory sheets are prepared according to ISO 5269-1[1], ISO 5269-2[2] or ISO 5269-3[3]. Physical testing of the laboratory sheets is performed according to ISO 5270[4].

Pulps — Laboratory beating —

Part 2:
PFI mill method

1 Scope

This part of ISO 5264 specifies a method for the laboratory beating of pulp using a PFI mill. The description is limited to the sampling, preparation and beating of the pulp and the beating equipment.

NOTE Beating is a preliminary step in testing the physical properties of pulp.

In principle, this method is applicable to all kinds of chemical and semi-chemical pulps. In practice, the method might not give satisfactory results with certain pulps having extremely long fibres.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 638, *Paper, board and pulps — Determination of dry matter content — Oven-drying method*

ISO 4119, *Pulps — Determination of stock concentration*

ISO 5263-1, *Pulps — Laboratory wet disintegration — Part 1: Disintegration of chemical pulps*

ISO 5267-1, *Pulps — Determination of drainability — Part 1: Schopper-Riegler method*

ISO 5267-2, *Pulps — Determination of drainability — Part 2: "Canadian Standard" freeness method*

ISO 7213, *Pulps — Sampling for testing*

ISO 14487, *Pulps — Standard water for physical testing*

3 Principle

A measured amount of pulp at a specified stock concentration is beaten between a roll with bars and a smooth beater housing, both rotating in the same direction, but at different peripheral speeds.

4 Apparatus and auxiliary materials

Use ordinary laboratory equipment and the following.

4.1 PFI mill, as specified in Annex A.

See Annexes B and C.

4.2 Disintegrator, as specified in ISO 5263-1.

4.3 Balance, capable of weighing the sample with an accuracy of at least ±0,2 g.

4.4 Standard water, purified to have an electrical conductivity ⩽ 0,25 mS/m at 25 °C, as specified in ISO 14487.

4.5 A reference pulp, as described in Annex C, kept for beating-control purposes and stored for a sufficient time for the physical properties to stabilize. The reference pulp should, if possible, be of the same grade as that normally beaten in the beating equipment concerned. Since some pulp grades are not stable, it might be necessary to choose another grade.

To minimize a change in the pulp over time, the reference pulp should be kept at room temperature at a relative humidity range of 40 % to 60 % in a dark and dust-free place.

NOTE Stored under the recommended conditions, the reference pulp will, in most cases, be stable for approximately 10 years. Changes in the level of the tensile strength and tear strength values might be an indication that the reference pulp is no longer stable. The stability can be checked by measuring the viscosity of the reference pulp, e.g. twice a year.

5 Sampling

If the beating is being done to evaluate a lot of pulp, the sample shall be selected in accordance with ISO 7213.

If the beating is done on another type of sample, report the source of the sample and, if possible, the sampling procedure used.

Select the test portions so that they are representative of the gross sample received.

6 Preparation of sample

If the sample is wet or air-dry, weigh a test portion for the determination of the dry-matter content in accordance with ISO 638. If the sample is in the form of an aqueous pulp suspension, determine the dry-matter content in accordance with ISO 4119.

Take a test portion of the sample corresponding to (30,0 ± 0,5) g of oven-dry pulp. Do not cut pulp sheets and avoid the use of cut edges. If the sample is in the form of machine-dried sheets or flash-dried slabs, soak the pulp thoroughly in 0,5 litre of standard water (4.4) at room temperature for at least 4 h. Tear the soaked pulp into pieces approximately 25 mm × 25 mm in size. It is essential that the pulp sample be thoroughly softened by soaking, to ensure that the preliminary disintegration leads to only a minimal beating effect. Wet pulps may be disintegrated without soaking.

7 Procedure

For each test portion (each degree of beating), carry out the procedure described in 7.1 to 7.3.

7.1 Disintegration

Disintegrate the initially wet portion or the soaked test portion as described in ISO 5263-1. Use standard water (4.4) at (20 ± 5) °C to give a total volume of (2 000 ± 25) ml. The mass fraction in the disintegrator (4.2) will then be about 1,5 %.

Pulps having an initial mass fraction of dry matter of 20 % or more shall be disintegrated for 30 000 revolutions of the propeller, whereas pulps having an initial mass fraction of dry matter of < 20 % shall be disintegrated for 10 000 revolutions of the propeller.

After disintegration, check visually that the pulp is completely disintegrated. If not, continue the disintegration until complete separation of fibres is achieved.

NOTE A temperature outside the range (20 ± 5) °C can be used for climatic reasons, provided that this is stated in the test report.

7.2 Thickening

After disintegration, drain the pulp suspension on a Büchner funnel or other suitable device to a mass fraction between 11 % and 20 %. To avoid any loss of fibres, refilter the filtrate through the fibre mat, if necessary several times.

Using a balance, dilute the thickened pulp with standard water (4.4) to a total mass of (300 ± 5) g, corresponding to a mass fraction of 10 % stock.

7.3 Beating

7.3.1 Beating conditions

Check that the beating conditions are correct (see A.2).

The beating force per unit bar length shall be (3,33 ± 0,10) N/mm, assuming that only one bar at a time makes contact with the housing. It is important that the distance screw is disengaged during beating, i.e. no fixed gap shall be used.

Experience has shown that, for some pulps, a lower beating force per unit bar length may be needed to be able to evaluate the physical properties of the pulp in a correct way. In such cases, the beating force per unit bar length could be (1,77 ± 0,10) N/mm. This deviation from the standard procedure should be reported.

7.3.2 Beating procedure

Bring the beating elements of the PFI mill (4.1) and the thickened test portion of pulp, prepared in accordance with 7.1 and 7.2, to a temperature of (20 ± 5) °C (see Note to 7.1). Transfer the test portion of pulp to the beater housing, and distribute it as evenly as possible over the wall. A uniform band of pulp will ensure a smooth start-up, thus reducing unnecessary vibrations and attaining a more stable beating. Ensure that no pulp remains on the bottom of the beater housing within an area corresponding to the cross-section of the roll. Insert the roll in the beater housing, and press the cover correctly into position in the housing.

WARNING — When beating for a high number of revolutions, the temperature of the beating elements may increase. If necessary, cool the beating elements with water to bring the temperature within the specified range before the next beating. The temperature can be measured with an infrared (IR) thermometer or similar.

Set the beater housing in rotation so that the pulp is slung against the wall and start the roll motor. When both beating elements have attained full speed, apply the required beating force per unit bar length. Apply the beating load at a constant rate over a period of 2 s. At the instant of full application of the load, release the revolution-counter lever arm to engage the counter.

When the required number of roll revolutions has been reached, stop the beating by releasing the beating force. Switch off the motors, and allow the roll and beater housing to come to a complete stop. Lift the lid and bring the roll to its starting position.

Transfer the stock to a measuring cylinder or container with a capacity of at least 2 litres. Rinse the mill with standard water (4.4), and add the rinsings to the cylinder/container. Ensure that all material is included in the beaten test portion.

Dilute the stock with standard water (4.4) to (2 000 ± 25) ml, and disintegrate it for 10 000 propeller revolutions in the disintegrator (4.2). Proceed with the processing and/or testing of the beaten pulp in accordance with the