4ever green

Paper and Board – Recyclability Laboratory Test Method – Part II: Recycling mill with flotation-deinking process

Harmonised European laboratory test method to generate parameters enabling the assessment of the recyclability of paper and board products in recycling mills with flotation-deinking process (Part II)

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1. INTRODUCTION

The paper and paper board value chain is an example for circularity, displaying very high recycling rates. Moreover, technical innovation is creating new products from paper and board materials and other cellulose fibre-based products that are increasingly replacing other traditional packaging materials.

To maintain and further increase the sustainability and circularity of the paper and board value chain, and to help EU Member States and other European countries meet high recycling targets[1], it is important to ensure that paper- and board-based materials and other cellulose fibre-based products (e.g. moulded fibre products) are recyclable by the paper industry. The paper manufacturing and converting industry has issued joint guidance on paper-based packaging recyclability[2] at national and European levels. To confirm recyclability, it is necessary to define harmonised test methods as a basis for assessing the general recyclability of these materials and products.

The harmonised test methods emulate the most common phases of the industrial processes to measure the main parameters of recyclability of paper- and board-based materials, and other cellulose fibre-based products based on current knowledge and technology. This makes it possible to:

- Supplement the evaluation of recyclability required by EN 13430 with regard to paper- and board-based materials and other cellulose fibre-based products sent for recycling in the paper industry.
- Guide the eco-design (in terms of recyclability) of paper- and board-based materials and other cellulose fibre-based products currently in use, as well as new materials under development and additives used in the converting phase that can affect the recyclability of the final product.
- Support declarations related to the recyclability of materials or products based on grading systems developed by third-party organisations.

CEPI issued a laboratory recyclability test method mimicking a recycling mill with a conventional process already in 2020. Such conventional processes typically utilise paper for recycling belonging to the EN 643 grades 1-4, low consistency pulping, screening and cleaning stages but no flotation stages.

This document describes the laboratory test procedure for testing the recyclability of fibre-based packaging in a flotation-deinking process. It has been developed within the 4evergreen alliance and uses references to existing test methods such as INGEDE Method 11-2[3] and the Paper and Board – Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process.

2. SCOPE

This document describes a method for determining, at a laboratory scale, the key parameters for evaluating the level of recyclability of paper and fibre-based packaging materials and other cellulose fibre-based products using a white or off-white substrate, emulating the relevant phases of an alkaline flotation-deinking mill for the purposes of producing new paper and board.

[1] For example, Directives 2018/851/EU, 2018/852/EU set high recycling targets for municipal waste and paper-based packaging (85% by 2025, 90% by 2030).
[2] 4evergreen: Circularity by Design Guideline for Fibre-based Packaging, Version 3, Oct. 2024.
[3] INGEDE Method 11-2 Deinkability test – Part 2: Packaging products

3. REFERENCES

This document incorporates, by way of dated or undated references, provisions from other publications. These references are cited at the appropriate places in the text and the publications are listed below. For dated references, subsequent amendments to or revisions of any of these publications apply to this document only when incorporated into it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

Paper and Board – Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process
Harmonised European laboratory test method to produce parameters enabling the assessment of the recyclability of paper and board products in standard paper and board recycling mills

INGEDE Method 1
Test sheet preparation of pulps and filtrates from deinking processes

INGEDE Method 2
Measurement of optical characteristics of pulps and filtrates from deinking processes

INGEDE Method 11-2
Deinkability test – Part 2: Packaging products

EN 643:2014
Paper and board – European list of standard grades of paper and board for recycling

EN 13430
Packaging – Requirements for packaging recoverable by material recycling

ISO 638-1
Paper, board and pulps – Determination of dry matter content – Oven-drying method – Part 1: Materials in solid form

ISO 638-2
Paper, board and pulps – Determination of dry matter content – Oven-drying method – Part 2: Suspensions of cellulosic nanomaterials

ISO 1762
Paper, board, pulps and cellulose nanomaterials – Determination of residue (ash content) on ignition at 525 °C

ISO 2470-1
Paper, board and pulps – Measurement of diffuse blue reflectance factor – Part 1: Indoor daylight conditions (ISO brightness)

ISO 4046
Paper, board, pulps and related terms – Vocabulary

ISO 4119
Pulps – Determination of stock concentration

ISO 5269-2
Pulps – Preparation of laboratory sheets for physical testing – Part 2: Rapid-Köthen method

ISO 5631-2
Paper and board – Determination of colour by diffuse reflectance – Part 2: Outdoor daylight conditions (D65/10°)

ISO 15360-2
Recycled pulps – Estimation of Stickies and Plastics – Part 2: Image analysis method

ISO 15705
Water quality – Determination of the chemical oxygen demand index (ST-COD) – Small-scale sealed tube method

TAPPI ANSI T275
Screening of pulp (Somerville-type equipment)

DIN 38409-1
German standard methods for the examination of water, waste water and sludge; parameters characterizing effects and substances (group H); determination of total dry residue, filtrate dry residue and residue on ignition (H 1)

4. TERMS AND DEFINITIONS

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

4.1 Paper

Range of materials in the form of a coherent sheet or web, made by deposition of pulp from a fluid suspension onto a suitable forming device, with or without the addition of other substances, cf. sheet, web.

Note 1: Paper may be coated, impregnated or otherwise converted, during or after their manufacture, without necessarily losing their identity as paper. In conventional papermaking processes, the fluid medium is water; new developments, however, include the use of air and other fluids.
Note 2: The primary distinction between paper and board is normally based upon thickness or grammage, though in some instances the distinction will be based on the characteristics and/or end-use.
Note 3: Sheets or laps of pulp as commonly understood for papermaking or dissolving purposes are excluded.
Note 4 to entry: Pulp fibres are generally of vegetable origin, typically cellulose. For specialties, other origins are possible.

4.2 Board

Generic term applied to certain types of paper frequently characterised by their relatively high rigidity cf. paper

Note: The primary distinction between paper and board is normally based upon thickness or grammage, though in some instances the distinction will be based on the characteristics and/or end-use.

4.3 Fibre-based product

Finished objects (such as packaging, printed materials, articles for domestic use, etc.) comprised of over 50% (in weight) of paper and board.

4.4 Paper and board for recycling

Natural fibre-based paper and board suitable for recycling and consisting of paper and board in any shape products made predominately from paper and board, which may include other constituents that cannot be removed by dry sorting, such as coatings, laminates, spiral bindings, etc. [EN 643].

4.5 Recyclability

Ability of a product to be recycled into a new paper and board.

4.6 Deinkability

Removability of ink and/or toner from a printed product to a high extent by means of a deinking process.

Note: This shall restore as well as possible the optical properties of the unprinted product.

4.7 Deinked pulp; DP

Pulp obtained from printed fibre-based products, and deinked according to INGEDE Method 11-2.

4.8 Undeinked pulp; UP

Pulp obtained from printed fibre-based products, pulped with added deinking chemicals according to INGEDE Method 11-2, prior to flotation.

4.9 Stock concentration

Ratio of the oven-dry organic and inorganic mass of material that can be filtered from a stock sample to the mass of unfiltered sample.

4.10 Fibre concentration

Ratio of the oven-dry mass of fibrous material less its ash that can be filtered from a stock sample to the mass of the unfiltered sample less its ash.

Note: Fibrous material is the total material less its screenable non-paper constituents.

4.11 Fibre yield

Ratio of the oven-dry mass of organic material after flotation to the oven-dry mass of organic material before flotation.

Note 1: Organic material is the total material less its ash.
Note 2: The organic material mainly consists of cellulosic fibres and fines .
Note 3: In the presence of screenable non-paper constituents, the calculated fibre yield may differ slightly from the real value.

4.12 Total yield

Ratio of the oven-dry mass of total material (organic and inorganic) after flotation to the oven-dry mass of the total material before flotation.

4.13 Manual separation

Easy removal of non-paper constituents from a paper or board surface by hand and without using any tools.

Note to entry: Easy removal is considered fulfilled if the paper and board product contains instructions and/or devices how to separate the non-paper constituents.

4.14 Screenable non-paper constituents

Any non-paper material which is an intended part of a paper/board or products thereof which cannot be removed by manual separation and which can be retrieved on a screening plate after pulping.

Note: The fibre-free coarse reject determined by the Paper and Board – Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process is considered as the screenable non-paper constituents.

5. PRINCIPLE

The method defined in this document enables analysis of both the process parameters (coarse reject, fine reject, luminance gain within the flotation, filtrate darkening, soluble, and colloidal solids) and quality parameters of the pulp obtained from the processing of the fibre-based product (luminance and a* value of deinked pulp, dirt specks area of deinked pulp, sheet formation, interfering materials e.g. stickies and visual appearance).

This document considers the minimum characteristics of paper and board products that can be generally recycled in a flotation-deinking process and therefore it does not take into consideration parameters of recyclability in mills with other specialised processing technology.

In most parts it refers to INGEDE Method 11-2 and the Paper and Board – Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process, where the detailed testing procedures are described. Any deviations are described in this test method description.

The recyclability of materials or products made predominately from paper and board, introduced in the flotation deinking stream, is determined through a laboratory procedure emulating the relevant industrial phases in typical alkaline flotation-deinking mills dedicated to the recycling of paper and board. In particular, this method defines which parameters to measure in order to verify recyclability through:

- Repulping
- Filtrate analysis; including the evaporation residue (ER) and the chemical oxygen demand (COD)
- Determination of the 5 mm hole residue (coarse reject)
- Sheet adhesion test and visual appearance test of the accept of the coarse screening
- Determination of the 150 µm slot residue (fine reject)
- Sheet adhesion test and visual appearance test of the ‘accept’ from the fine screening
- Determination of the content of adhesive particles (macrostickies, optional)
- The optical properties of the undeinked and deinked pulp, according to INGEDE Method 11-2
- The optical appearance (dirt specks), according to INGEDE Method 11-2
- The luminosity gain, according to INGEDE Method 11-2
- Filtrate darkening, according to INGEDE Method 11-2

A block diagram showing the steps of the method is shown in annex ‘Part II Method Flowchart’.

6. EQUIPMENT, MATERIALS AND CHEMICALS

This chapter outlines all equipment and materials needed to run the described recyclability test. The listing refers to information described in the referenced methods: INGEDE Method 11-2 and Paper and Board – Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process.

6.1 Equipment

1. Analytical balance with accuracy of ± 0.01 g
2. Barrels for collecting the 'accept' from coarse- and fine-screening
3. Beakers
4. Büchner funnel (diameter 125 mm and 150 mm) equipped with suction flask and water jet pump
5. Calibrated scanner (e.g. scanner EPSON V-750-PRO) and image analysis software (e.g. PTS-DOMAS or SIMPALAP)
6. Couching roller for the sheet formation
7. Cutting mat for photo documentation (optional)
8. Cuvette heating block (temperature 150° C ± 5° C) for the COD determination (optional)
9. Cuvette rack for the COD determination (optional)
10. Drying oven (temperatures 60° C ± 2° C, 105° C ± 2° C and 130° C ± 2° C)
11. Eppendorf variable pipette 1,000 – 5,000 µL for the COD determination
12. Flotation cell (e.g. VOITH 25™)
13. Glass bottle to store the filtrate (optional)
14. Heating plate equipped with magnetic stirrer, or commercial-grade hot-water heater
15. Hobart N50 according to INGEDE Method 11-2
16. LED light panel for the visual documentation (optional)
17. Metal plates (pressure 1.18 kPa or 3.7 kg, 20 cm diameter) for the sheet adhesion test
18. Metal plates (pressure 0.95 kPa or 6 kg, 28 cm diameter) for the macro-stickies determination (optional)
19. Muffle furnace according to ISO 1762
20. pH measuring system with an accuracy of 0.1 points
21. Photometer measuring device for the COD determination
22. Photometer light source C/2° with an edge filter of 420 nm
23. Rapid-Köthen sheet former compliant with ISO 5269-2 (if another sheet former is used it must be proved that this makes no difference to the method)
24. Refrigerator to store the filtrate (optional)
25. Scissors/cutting machine/punch
26. Somerville-fractionator according to TAPPI/ANSI T275
27. Perforated plate (hole diameter 5 mm) for coarse screening in Somerville
28. Slotted plate (slot size 150 µm) for fine-screening in Somerville
29. Standard disintegrator compliant with ISO 5263-1
30. Stopwatch/timer Somerville-fractionator
31. Submersible pump (optional)
32. Temperature controlled water bath
33. Thermometer
34. Vacuum desiccator
35. Vacuum filtration unit with 39 mm bottom inner diameter of the funnel
36. Vacuum device that can produce pressure difference ≥ 60 kPa

6.2 Materials

1. Aluminium trays for the determination of the evaporation residue
2. Black water-based ink, e.g. Pelikan No. 4001 (optional)
3. Carrier board and cover sheets
4. Corundum powder (optional)
5. Cuvette tests e.g. COD cuvette test 15-150 mg/L O_2
6. Deionised water
7. Filter paper grade 388 diameter 125 mm (basis weight 84 g/m², filtration speed 10 s/10 ml, deposition range 12-15 µm)
8. Filter paper grade 388 diameter 150 mm (basis weight 84 g/m², filtration speed 10 s/10 ml, deposition range 12-15 µm
9. Filter paper grade 1289 diameter 240 mm (basis weight 84 g/m², filtration speed 20 s/10 ml, deposition range 8-12 µm) (optional)
10. Filter paper Munktell type 1289 diameter 120-195 mm
11. Pipette tips
12. Silicon paper (60 g/m²) compliant with ISO 15 360 for the determination of macrostickies (optional)

6.3 Chemicals

1. Saturated aluminium sulphate solution – $Al_2(SO_4)_3$
2. Sodium hydroxide (NaOH), pro analysis, CAS # 1310-73-2
3. Sodium silicate 1.3 g/cm³ to 1.4 g/cm³ (38 °Bé to 40 °Bé)
4. Oleic acid ($C_{18}H_{34}O_2$), purified, CAS # 112-80-1 with following specifications
   - > acid number: 198 to 240;
   - > iodine number: 92 to 100;
   - > linoleic acid (C18:2): max. 18 %;
   - > oleic acid (C18:1): min. 72 %;
   - > palmitic acid (C16:0): max. 8 %;
   - > palmitoleic acid (C16:1): max. 1 %;
   - > stearic acid (C18:0): max. 4 %.
5. Hydrogen Peroxide (H_2O_2), e.g. 35 %
6. Calcium chloride dihydrate ($CaCl_2 \cdot 2\ H_2O$), CAS # 10035-04-8

7. PREPARATION OF SAMPLES

The quantity of tested material or product must be sufficient to carry out all the measurements indicated by the method. An indicative quantity is 1500 g air-dry weight. Perform a double determination of the dry matter content of the product or material in compliance with ISO 638-1.

Weigh approximately 600 g air-dried material for each batch.

If the product or material weighs more than 600 g, it is necessary to ensure that the sample contains the same proportion of elements different from the base product or material (e.g. labels, seals, hot-melt application, metallisation, ink application, etc.) as the tested product or material. Any relevant information allowing a correct and proportional sampling must be present in the technical data sheet provided with the sample.

The technical data sheet must contain the minimum information indicated in chapter 9. Material needed for Batch 1 has not undergone accelerated ageing, but if the sample contains wet strength agents (WSA) and was produced less than the 30-day minimum, it is important to store it for the remaining time before proceeding with the test. For samples without WSA, make sure the material is at least 15 days old from the date of production, and therefore no ageing is necessary.

The sample for Batch 2 is accelerated aged for 72 h at 60° C, according to INGEDE Method 11-2.
After the preparation, cut the sample into pieces of 3 cm x 3 cm with a tolerance of 0.5 cm in each direction. To avoid problems with the functioning of the pulper, easily-removable non-paper components posing a potential risk for the equipment, such as metal clips and parts of rigid plastic material, can be removed before cutting and weighed separately to better calculate the share relative to the total sample weight. The weight of the removed non-paper components should not be included in the 200 g oven-dry material for repulping.

All sample quantities indicated hereafter refer to the calculated dry weight of material dried in an oven at (105 ± 2) °C.

For more detailed information regarding the sample preparation, the chemicals used, and the dilution water, see the relevant annex ‘Detailed work description sample preparation’.

8. GENERAL PROCEDURE

Two subsequent pulping batches are required: the first batch is used to determine soluble and colloidal solids, COD, the coarse screening and the fine-screening reject amount as well as an assessment of the adhesives. The second batch is to ascertain the flotation-deinking criteria. For the pulping for the deinking test the amount of screenable non-paper constituents that can be removed in coarse screening needs to be considered for the second batch calculations (i.e. to adjust chemical dosages and fibre concentration).

The procedure comprises the following steps (for more details see also annex Part II Method Flowchart):

Pulping Batch 1

- HC pulping (standard chemical dosage)
- Pulp dilution and splitting for screening and other measurements
- Coarse screening immediately after pulping, fine screening, sheet adhesion test of the 'accept' from the coarse- and fine-screening, and optional macro-sticky test in the follow-up
- Content of dissolved and colloidal solids and COD after a storage time of 60 min. at 45° C

Pulping Batch 2 (deinking test)

- HC pulping taking coarse reject amount into account (deinking chemicals adoption to meet pH target)
- Storage of pulp
- Pulp dilution
- Flotation-deinking
- Determination of the optical properties of the undeinked and deinked pulp according to INGEDE Method 11-2

8.1 Procedure Batch 1

8.1.1 Repulping

Repulping of the Batch 1 is done according to INGEDE Method 11-2 with a standard chemical dosage and dilution water. The chemicals are not adjusted, even if the pH value does not meet the requirements of INGEDE Method 11-2. Also, the amount of screenable non-paper constituents are not considered.

After pulping, the pulp is diluted to 5 % consistency and split into individual samples:

- Approx. 50 g oven-dry pulp for the filtrate analysis
- Three times approx. 50 g oven-dry pulp for coarse screening

The overall amount of pulp is diluted to 5 %. Then one sample of about 50 g oven-dry pulp (calculated amount using the formula 9 in INGEDE Method 11-2 'Determination of the pulping concentration') is taken and stored in a water bath, as described in INGEDE Method 11-2 chapter (7.4.4) 'Storage', for 60 min. at 45° C. After the storage time the pulp is diluted to 2.5 % concentration (using 1000 ml of prepared dilution water).

The other three samples of the pulp of about 50 g oven-dry pulp each (again, calculated using formula 9 (*INGEDE Method 11-2 Determination of the pulping concentration*) are then used for coarse- and fine-screening without further storing time, as described in chapter 8.1.3.

8.1.2 Filtrate analysis

After storage time and dilution to 2.5 % concentration the filtrate analysis is performed – as described in the filtrate analysis chapter of the Paper and Board – Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process, and considering the relevant method in the annex 'Detailed work description Part II'. Perform both tests on the filtrate, the evaporation residue and the COD.

8.1.3 Measurement of the coarse reject and fine reject

The measurement of coarse reject and fine reject is done according to the procedure described in "Paper and Board – Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process', chapter 8.3, describing the determination of the 5 mm hole residue for coarse reject and chapter 8.6 on how to determine the 150 µm slot residue or fine reject.

As a deviation from "Paper and Board –Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process", use the pulp described in chapter 8.2 for coarse screening. The coarse screening is performed three times. Calculate the dry weight of the coarse reject and add the weight of the prior removed non-paper components (see chapter 7), and express the result as a percentage of the coarse reject with respect to the dry weight of the tested material or product, rounding the result to the first decimal place.

The reject characterisation is done according to the annex on reject characterisation. Determine the ash content of

the coarse reject according to ISO 1762, which is needed for pulping Batch 2 as described in chapter 8.2.1.

8.1.4 Sheet adhesion test

The sheet adhesion test of the coarse-screening and fine-screening accept is done according to the procedure described in Paper and Board – Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process, chapter 8.5 'Sheet adhesion test and visual appearance test of the accept of the coarse screening' and chapter 8.7 'Sheet adhesion test and visual appearance test of the accept of the fine screening'.

8.1.5 Measurement of adhesive particles – macrostickies (optional)

The macrostickies analysis is performed according to chapter 8.9 of the Paper and Board – Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process.

8.1.6 Batch 1 measurements

Parameter	Pulp	Specimen	Method
Coarse reject	--	Reject of coarse screening	Paper and Board –Recyclability Laboratory Test Method – Part I: Recycling mill with conventional process
Fine reject	--	Reject of fine screening	
Total screening reject	--	Sum of rejects	
Total screening yield		100 % minus rejects	
Sheet adhesion	Accept coarse and fine screening	RK sheet 60 g/m²	
Chemical oxygen demand		Filtrate	
Dissolved and colloidal substances		Filtrate	

Table 1: Measured parameters in Batch 1

8.2 Procedure Batch 2 (deinking test)

Pulping of Batch 2 for the flotation is done according to INGEDE Method 11-2 with the adjusted chemical dosage and taking into account the amount of screenable non-paper constituents (percentage of coarse reject and its ash content).

8.2.1 Pulping Batch 2 for deinking test

The repulping of Batch 2 is done according to INGEDE Method 11-2, while the pH after pulping described in the procedure needs to be reached (adjustment of chemical dosages if needed). The amount of screenable non-paper constituents as well as the ash content of the coarse reject is used for calculating the sample amount needed for pulping, as described in INGEDE Method 11-2.

8.2.2 Deinking test

The deinking test is done according to INGEDE Method 11-2. It is recommended to use the flotation cell Voith Delta 25™.

8.2.3 Batch 2 measurements

Measurements for the undeinked pulp (UP) and deinked pulp (DP) are provided in the table below.

Parameter	Pulp	Specimen	Method
Dirt specks A_{50} and A_{250}	DP	RK sheet 42.6 g/m²	INGEDE Method 11-2, chapter 7.7.1 optical properties
Optical properties Y, a*	UP and DP	Filter pad	
Filtrate darkening	DP	Membrane filter	
Luminosity gain	UP and DP	Filter pad	

Table 2: Measurements to be done of the undeinked pulp (UP) and deinked pulp (DP)

9. TEST REPORT

The test report must include at least the following information:

a) Reference to this test method
b) Date and place of the test
c) Any photographic documentation of the material or product if it is not possible to give a precise description
d) Photo of fibre-based product, handsheet , filter pads (UP/DP) membrane filters and filtrate
e) Reference of the tested sample (product name or number), reference to the technical data sheet, production date of sample
f) Summary of the main information included on the sample data sheet (grammage, materials and shares in case of multilayer materials, adhesives, sealing, printing, metallisation, accessory components, or other specific features useful to identify the sample)
g) Specific sample preparation, if any (e.g. emptying, removal of manually separable accessories intended to be removed before disposal)
h) Print processes including printing and drying/curing parameters and press settings
i) Name and exact identification of inks or toner and varnishes (if applicable)
j) Pre- or post-treatment applied (if any)
k) Paper grade, manufacturer and brand name (if applicable)
l) Ash content of the sample
m) Mass-related proportion of all inserts (removed as well as tested with the print product (when it is a constituent paper-based element of the print product), expressed as a percentage (for each single insert)
n) Indication which inserts/supplements were used in the test (if any)
o) Share and type of non-paper constituents (screenable or not)
p) Number and type of adhesive applications
q) Finished product or intermediate (component/ constituent)
   - > Semi-finished – sheets of packaging material/ substrate (paper, cardboard, solid board, corrugated board)
   - > Semi-finished – sheets of packaging material/ substrate with 'upgrading' (polymer/metal coating, print, varnish)
   - > Finished product – intermediate, not yet ready to be used
   - > Finished product – ready to be used
   - > Finished product – used

The results of the test expressed in compliance with the criteria established respectively in respective chapters

r) Coarse reject, expressed as a percentage
s) Results of the filtrate analysis, evaporation residue and optional COD
t) First adhesiveness, expressed as 'absent', 'partly present' or 'present', and optical impurities , expressed with a level rating
u) Fine-screening reject expressed as a percentage, description of fibres/non-fibres and fragmentation
v) If performed, area of the adhesive particles with a diameter less than 2000 µm, expressed in mm^2/kg; and a note or indication when it is not performed
w) Second sheet adhesion test result, expressed as 'Level 1 absent', 'Level 2 partly present', or 'Level 3 present'
x) Indication whether flake is composed of fibre only or whether other non-paper components are present
y) Chemical dosage for pulping Batch 2
z) pH after pulping, before and after storage, and before flotation

aa) Feed mass of undeinked pulp for flotation mUP
ab) Flotation time
ac) Ash content of undeinked and deinked pulp
ad) Overall yield of the flotation in % (calculated automatically if using LabResult template)
ae) Fibre yield of the flotation in % (calculated automatically if using LabResult template)
af) Overflow mass mfroth
ag) Overflow stock concentration cfroth
ah) Luminance Y of deinked pulp, filtrate and control water
ai) L*, a* and b* of undeinked and deinked pulp, filtrate and control water
aj) Filtrate darkening ΔY of the deinked pulp sample filtrate (calculated automatically if using LabResult template)
ak) Type of software used for image analysis
al) Dirt particle area of deinked pulp in mm^2/m^2 in six size classes with the dirt particle area 50 to 100 µm, 100 to 150 µm, 150 to 200 µm, 200 to 250 µm, 250 to 500 µm, and >500 µm as well as the two categories >50 µm and the dirt particle area >250 µm (the two categories are calculated automatically if using LabResult template)
am) Dirt particle quality of deinked pulp in $1/m^2$ in six size classes with the dirt particle area 50 to 100 µm, 100 to 150 µm, 150 to 200 µm, 200 to 250 µm, 250 to 500 µm, and >500 µm as well as the total

count (calculated automatically if using LabResult template)

an) Any further optical characteristics of undeinked and deinked pulp yielded as well as their respective filtrate quality (e.g. R700 and/or ERIC)

ao) Brightness R457 of undeinked and deinked pulp, filtrate and control water

ap) R∞700 of undeinked and deinked pulp, filtrate and control water

aq) The exact designation of the laboratory testing equipment used – pulper, flotation cell, image analysis

The test report may also include the following information:

ar) Indication of the adhesive particles (macrostickies) content as a total area (including those greater than 2 mm equivalent diameter), expressed as mm of the macrostickies area per kg of the sample, in compliance with the ISO 15360-2 standard

as) Indication of the ash content of the paper product or material determined in compliance with the ISO 1762 standard

at) Results of the test expressed in compliance with the criteria established respectively in paragraphs 7.5 and 7.8 performed on the 'accept' from the coarse-screening phase

au) Any specific comments, such as specific observations, e.g. changes in concentration after pulping, long drainage time during sheet formation, foam formation

av) Further photographic documentation regarding the results

In the event that it is not possible to perform all steps of the test method in accordance with this method or it is not possible to determine one or more measurement parameter(s) due to the nature and/or characteristics of the sample material or product, the circumstance must be reported by the laboratory in the test report.

Examples of notes:

Pulping resistance prevents the pulper from working or there is a risk of damage to the equipment.

The presence of dense flakes or foam prevents the transfer of the accept to the next stage.

The presence of metal particles or wet resistant resins distorts the assessment of macrostickies.

ABOUT 4EVERGREEN

4evergreen is a cross-industry alliance perfecting the circularity of fibre-based packaging to contribute to a climate-neutral and sustainable society. Our goal is to raise the overall recycling rate of fibre-based packaging to 90% by 2030. We bring a particular focus on packaging with a lower circularity performance today, namely the types used for household, out-of-home and on-the-go consumption.

The alliance brings together industry representatives from across the fibre-based packaging value-chain, from pulp, paper and board manufacturers and recyclers to packaging producers and converters, including brand owners, retailers and waste management companies. It also comprises non-fibre material suppliers (e.g., adhesives, inks, coatings), technology providers (e.g., machinery, collection, and recycling solutions), and leading research institutes.

4ever green

For general enquiries please contact 4evergreen@cepi.org