

# ANNEX DOCUMENTS PART I – PAPER MILL WITH CONVENTIONAL RECYCLING PRO- CESS

APRIL 2025 - UPDATED EDITION (JUNE 2026)  
TO ALIGN TERMINOLOGY WITH PPWR



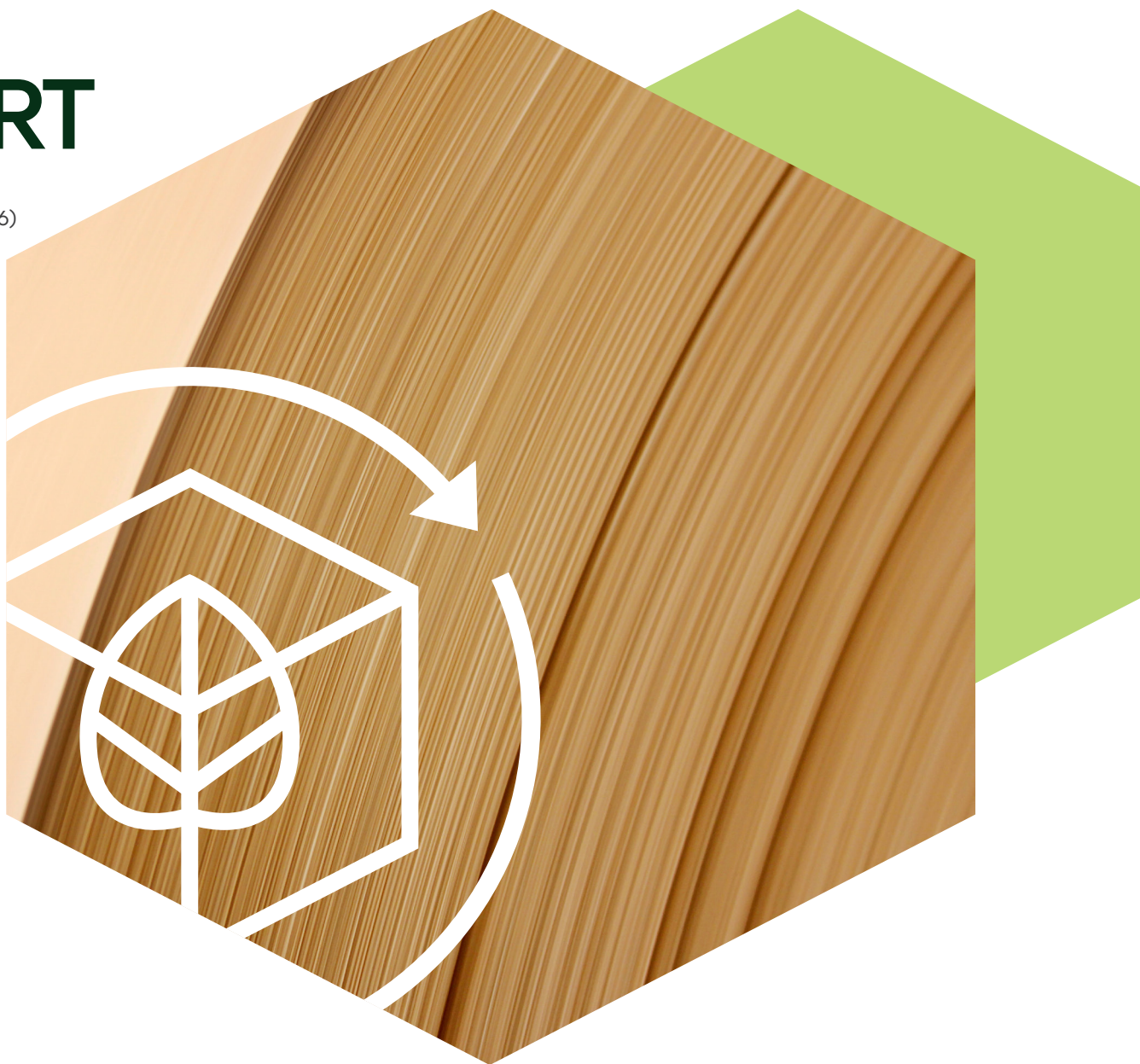
# Table of contents

|    |                                                                                                                                               |    |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1. | <b>ANNEX PART I METHOD FLOWCHART</b>                                                                                                          | 3  |
| 2. | <b>ANNEX VISUAL IMPURITIES</b>                                                                                                                | 5  |
| 3. | <b>ANNEX SHEET ADHESION</b>                                                                                                                   | 8  |
| 4. | <b>ANNEX REJECT CHARACTERISATION</b>                                                                                                          | 18 |
| 5. | <b>ANNEX 2-SIDE BARRIER COATED SAMPLES</b>                                                                                                    | 27 |
| 6. | <b>ANNEX DETAILED WORK DESCRIPTION: SAMPLE PREPARATION</b>                                                                                    | 32 |
| 7. | <b>ANNEX DETAILED WORK DESCRIPTION: RECYCLABILITY<br/>LABORATORY TEST METHOD – PART I: PAPER MILL<br/>WITH CONVENTIONAL RECYCLING PROCESS</b> | 48 |

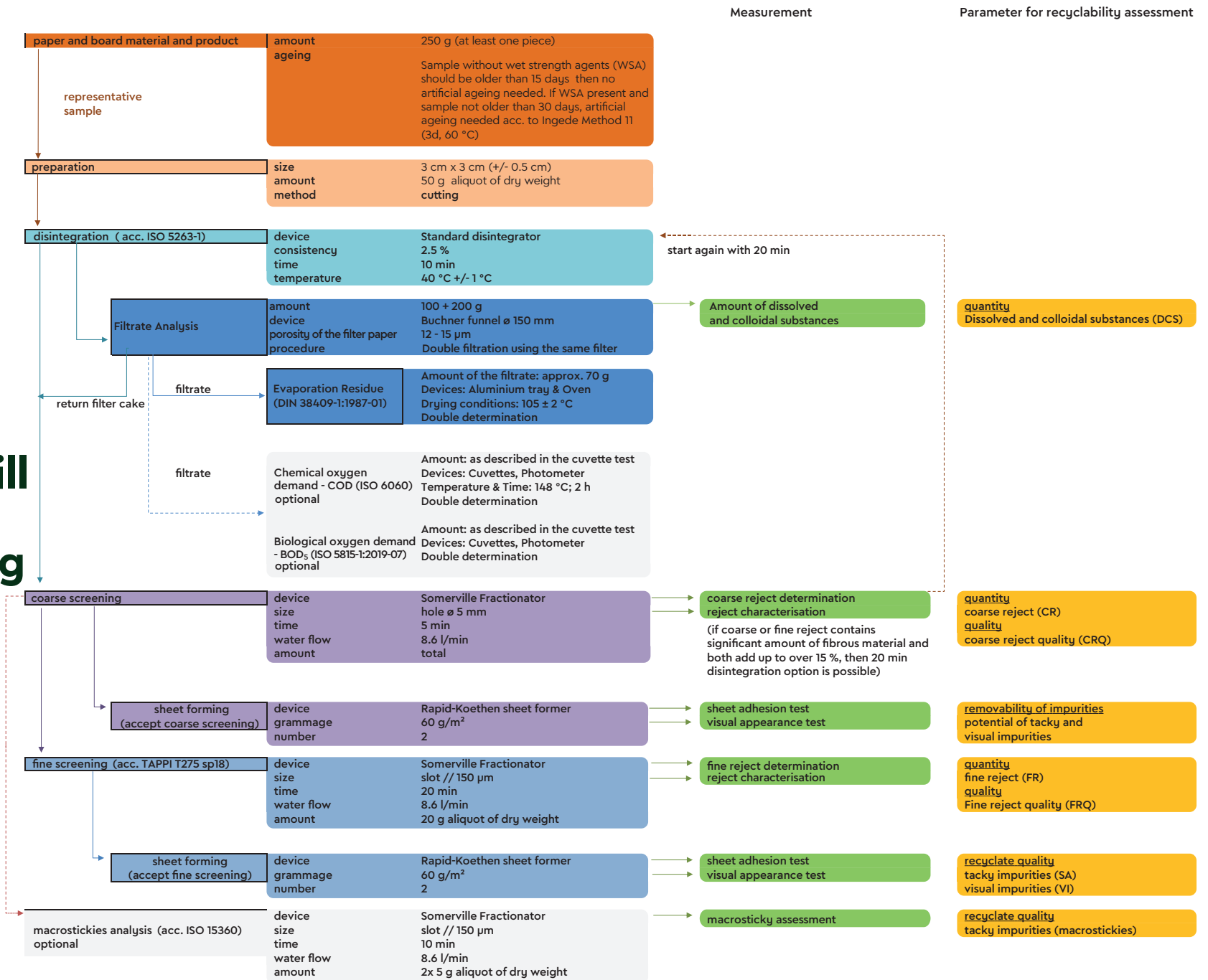


# 1. ANNEX PART I METHOD FLOWCHART

VERSION 3 (2025) - UPDATED EDITION (JUNE 2026)



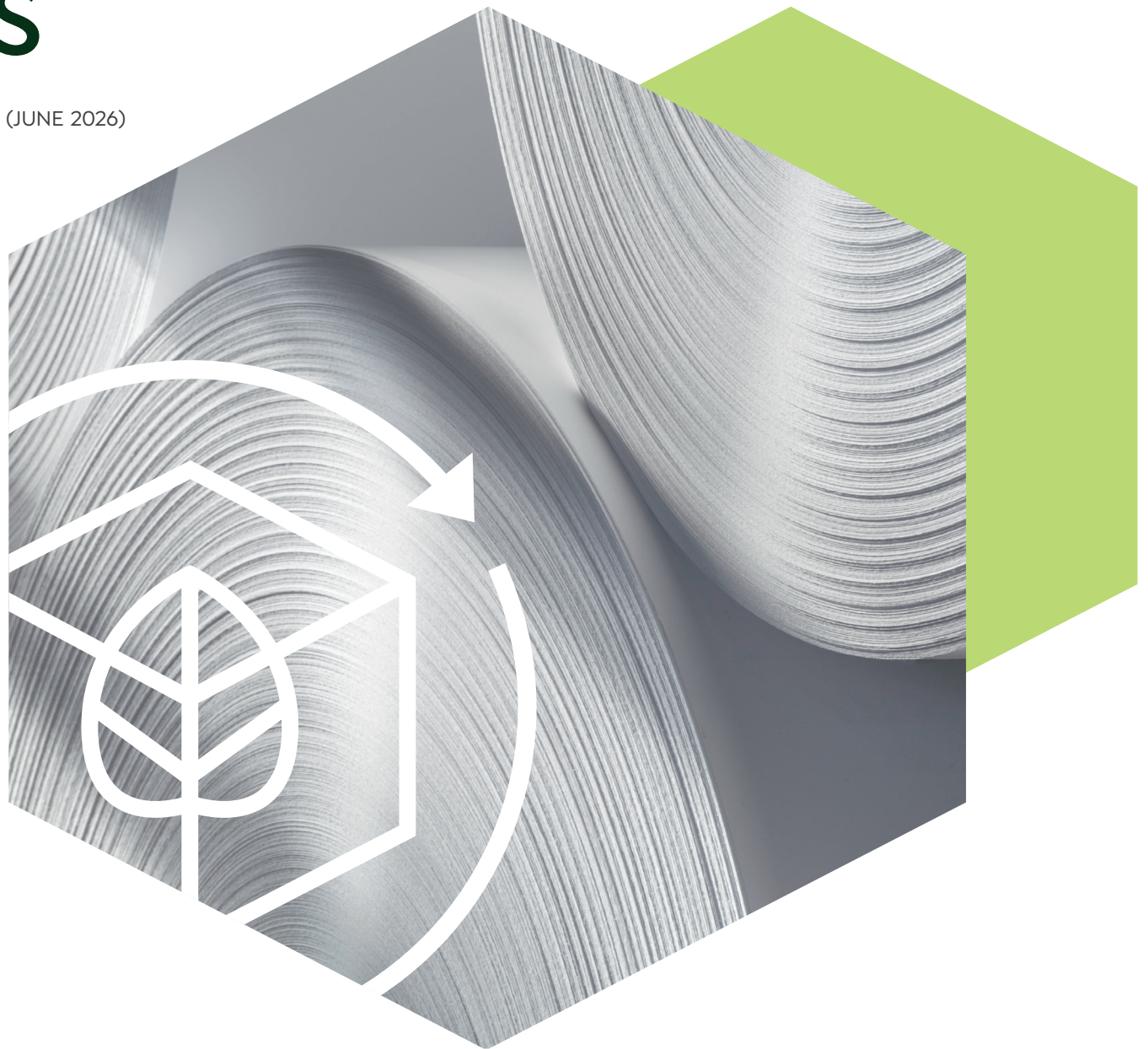
# Recyclability laboratory test method – Part I: Paper mill with conventional recycling process



# 2. ANNEX VISUAL IMPURITIES

VERSION FEBRUARY 2025 - UPDATED EDITION (JUNE 2026)

This Annex is relevant  
for Part I and Part III



# Annex Visual Impurities

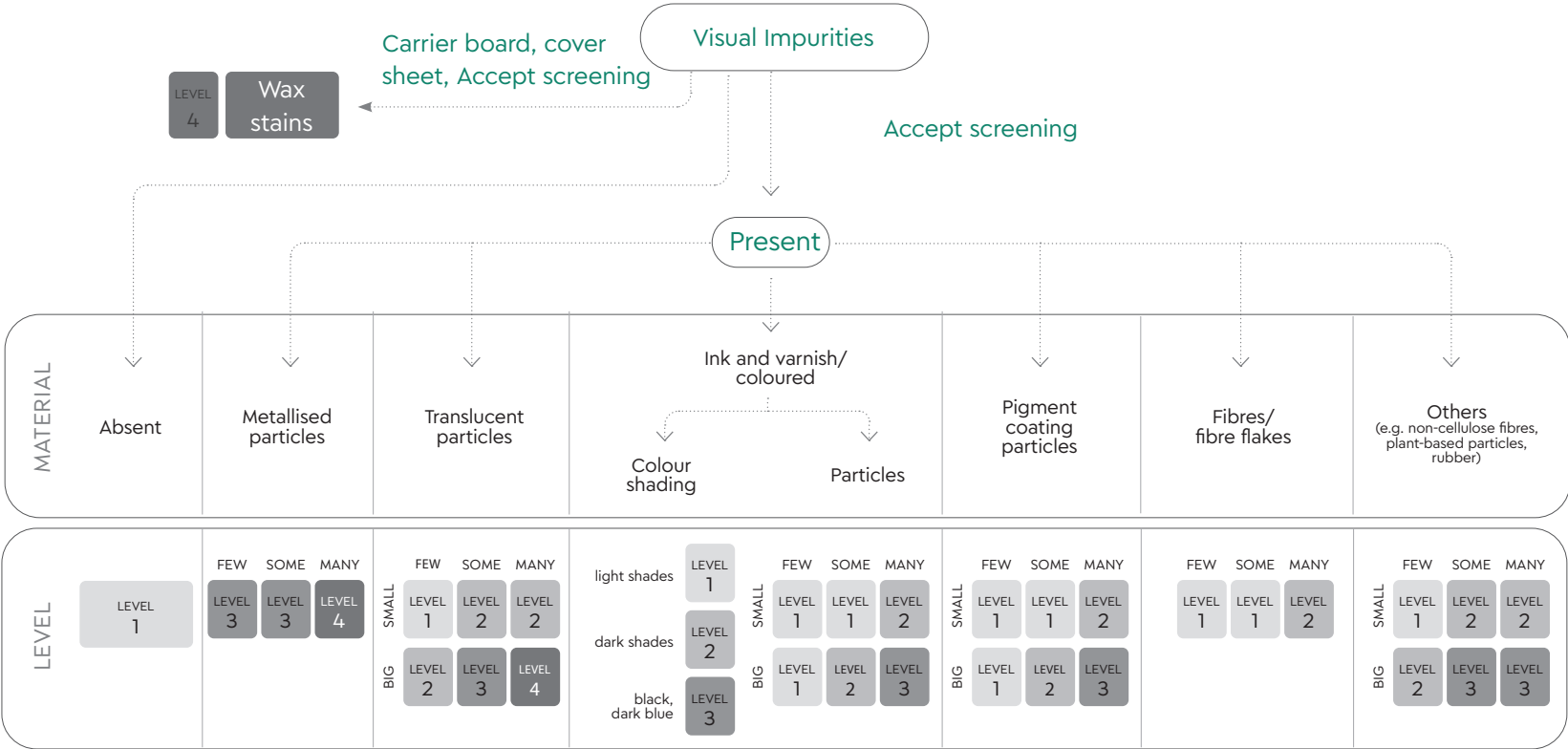
## User guide and purpose

- > The visual impurities decision tree has to be used for assessing the lab sheets formed with the accept of coarse- (AC) and fine screening (AF) in Part I, II and III methods. The assessment of visual impurities should be done visually with and without the aid of a source of transmitted light (e.g. a LED panel).
- > The visual impurities levels given in the decision tree might reflect in minus score points in the recyclability evaluation protocols.



# Visual Impurities Decision Tree

## Version February 2025 - updated edition (June 2026)



NOTE: All applicable columns should be evaluated. Worst case level allocation applies.

|         |                             |         |                                   |
|---------|-----------------------------|---------|-----------------------------------|
| LEVEL 1 | No visual quality issues    | LEVEL 3 | Some visual quality issues        |
| LEVEL 2 | Minor visual quality issues | LEVEL 4 | Significant visual quality issues |

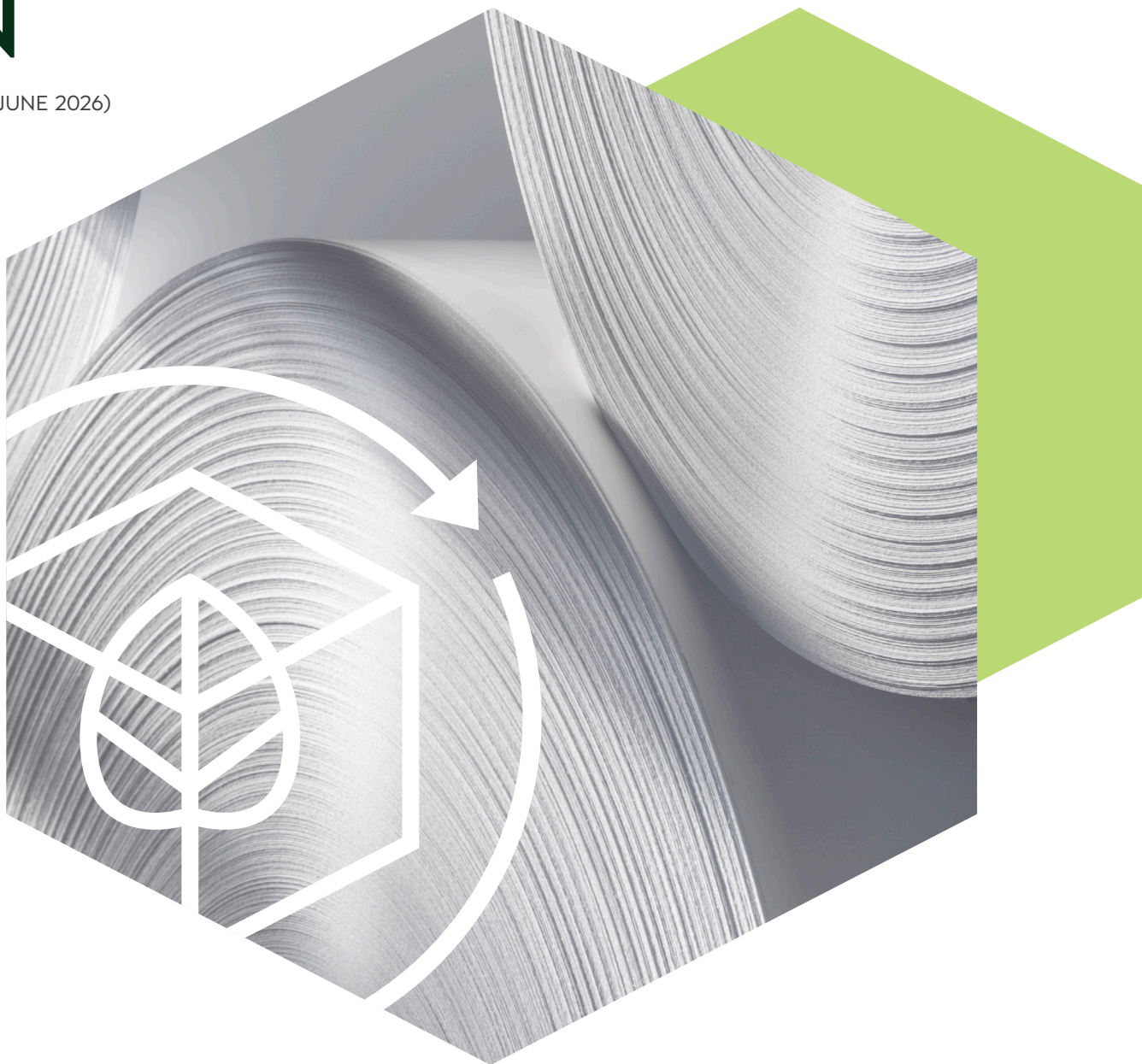
| Visual impurities per handsheet |       |          |                               |
|---------------------------------|-------|----------|-------------------------------|
| Average Amount/<br>Handsheet    | Few   | Some     | Many                          |
|                                 | <10   | 10 - 100 | >100                          |
| Size<br>(1 dimension)           | Small | Big      | Combination                   |
|                                 | ≤1 mm | >1 mm    | Consider the worst case level |

The Visual Impurities decision tree has been corrected in the February 2025 revision of this document.

# 3. ANNEX SHEET ADHESION

VERSION JANUARY 2025 - UPDATED EDITION (JUNE 2026)

This Annex is relevant for Part I,  
Part II and Part III



# Annex sheet adhesion

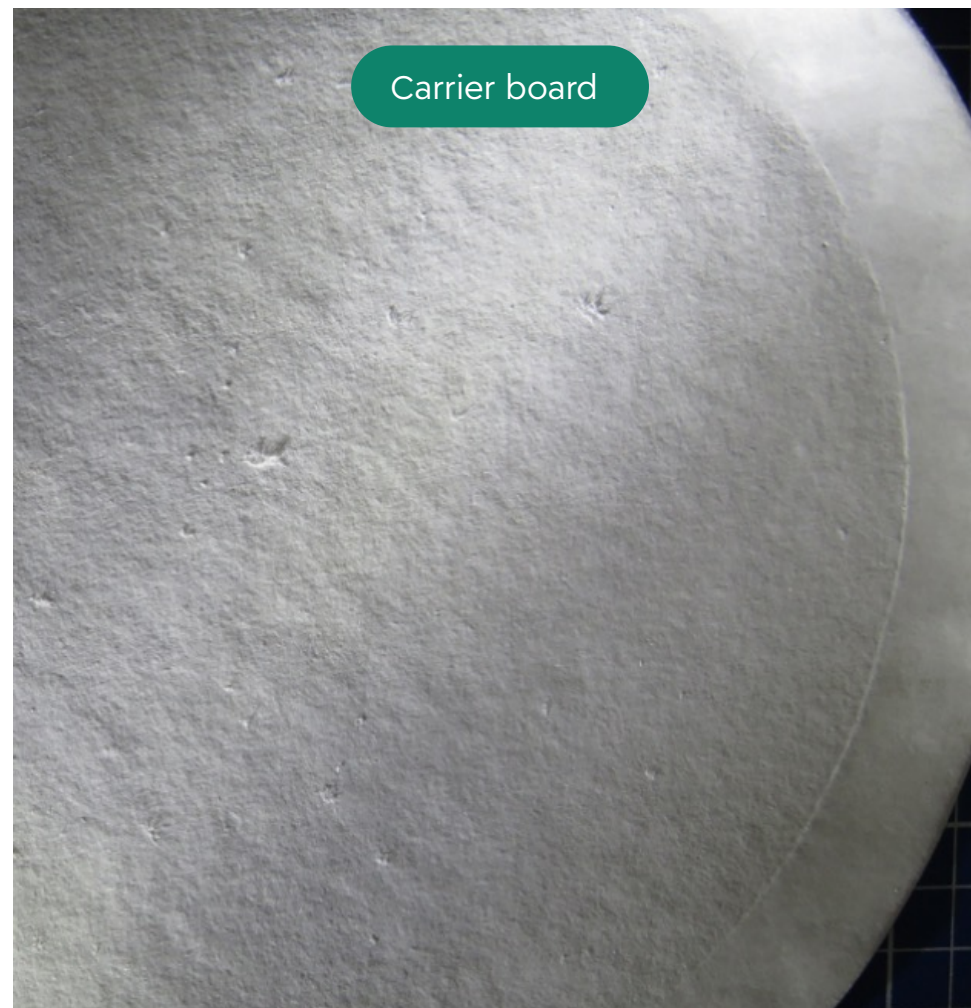
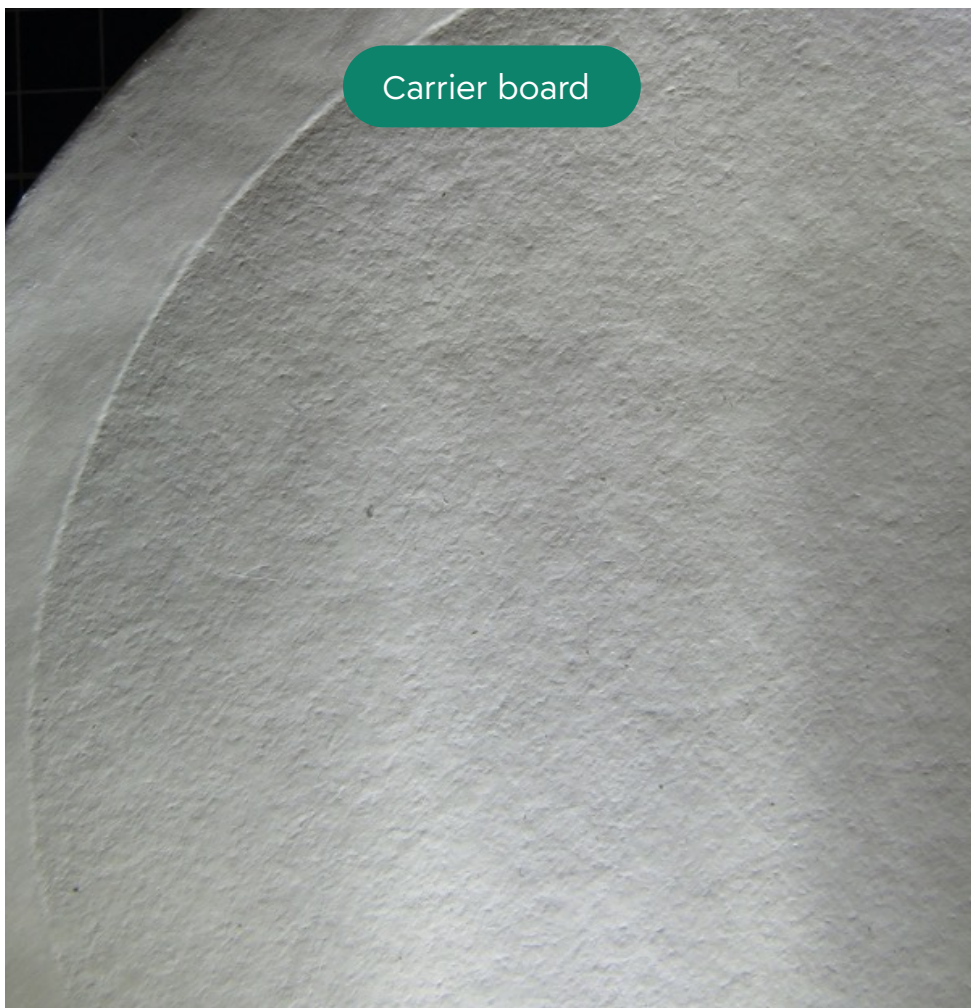
## 1 Performance video of the sheet adhesion test



<https://youtu.be/c3n76YMfnkU>

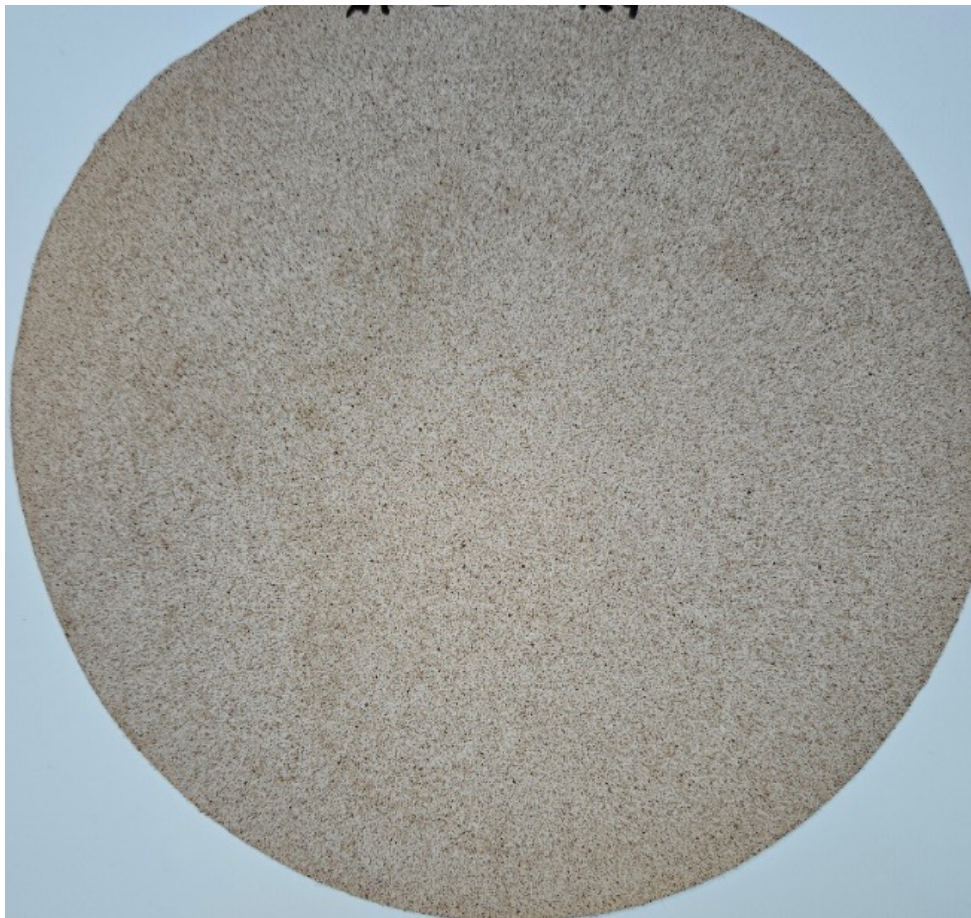
## 2 Reference pictures for the sheet adhesion levels

**Level 1 Tackiness absent:** the handsheet can be separated completely from the carrier board and cover sheet without any damage or breakages. A few single fibre pickups can be present on the carrier board and cover sheet. Visible damage to the handsheets and fragments of paper on the carrier board and cover sheet are not permitted.

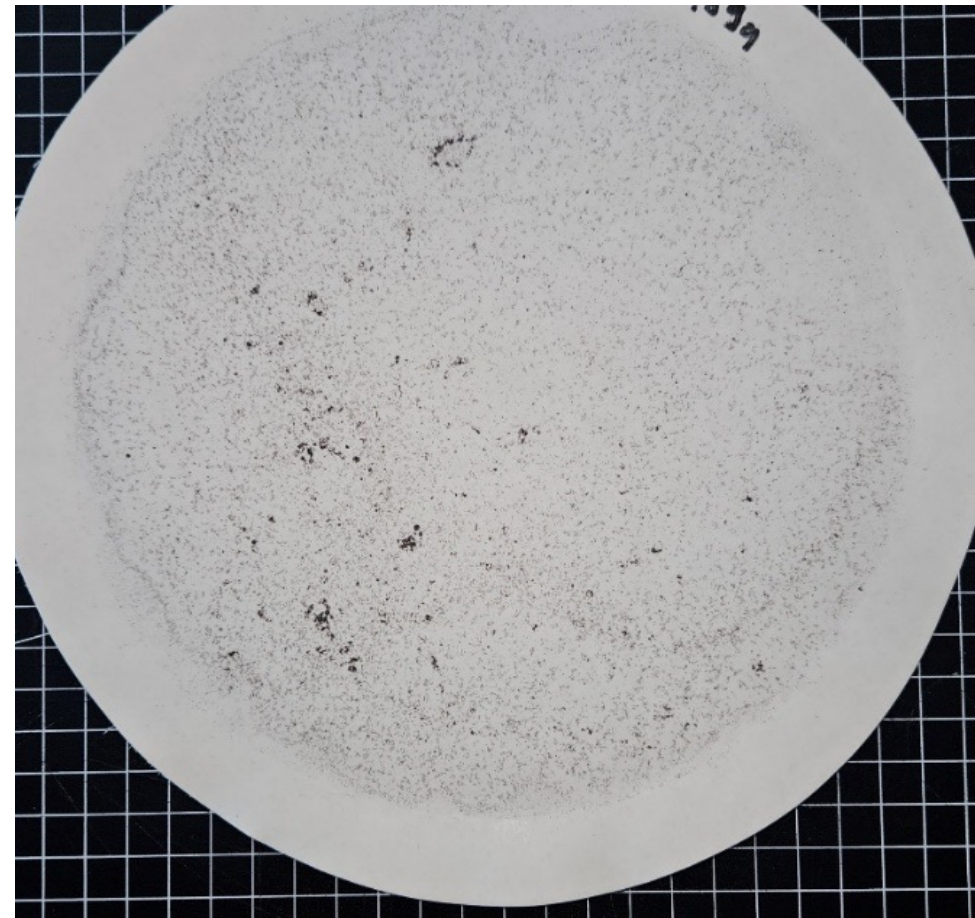




Examples of attached particles, such as ink or varnish, not leading to tackiness and therefore not affecting the sheet adhesion test



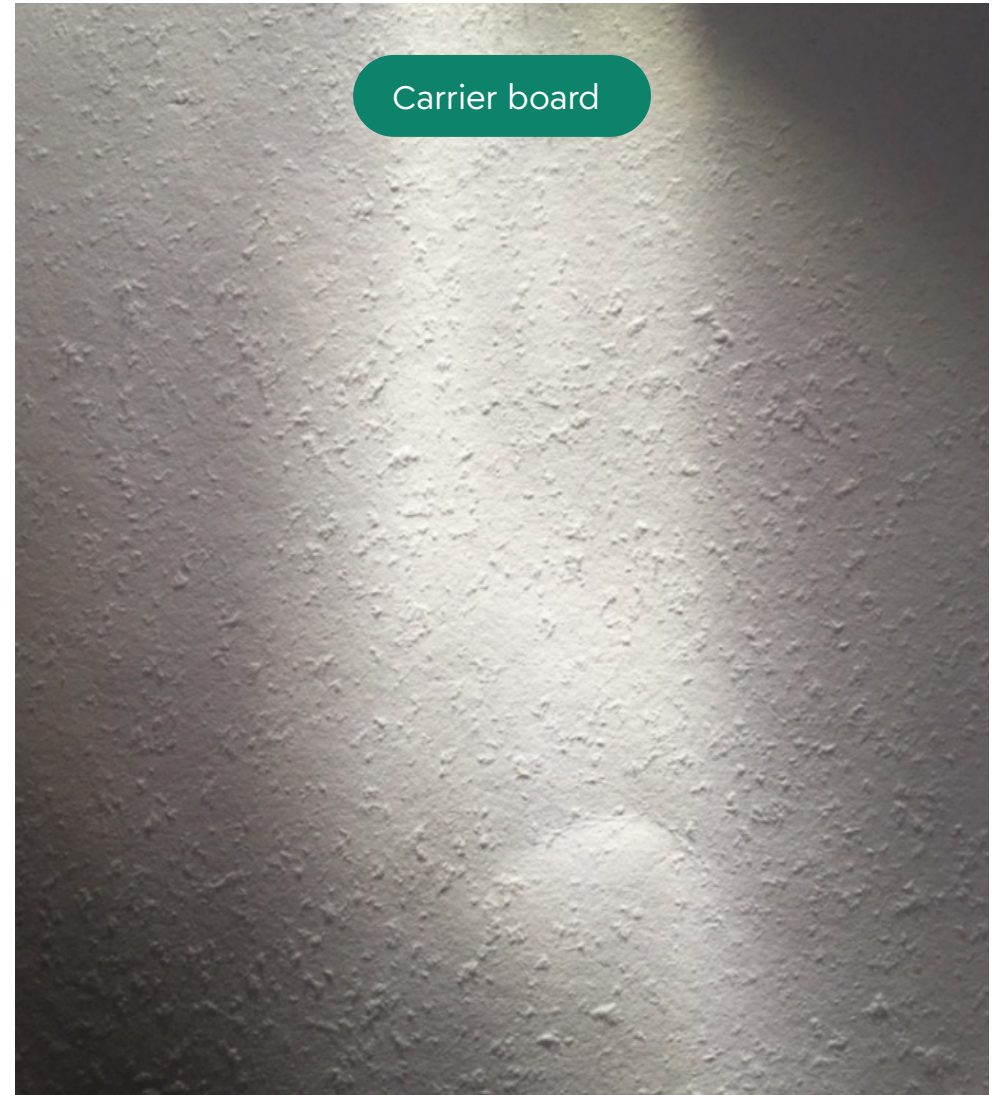
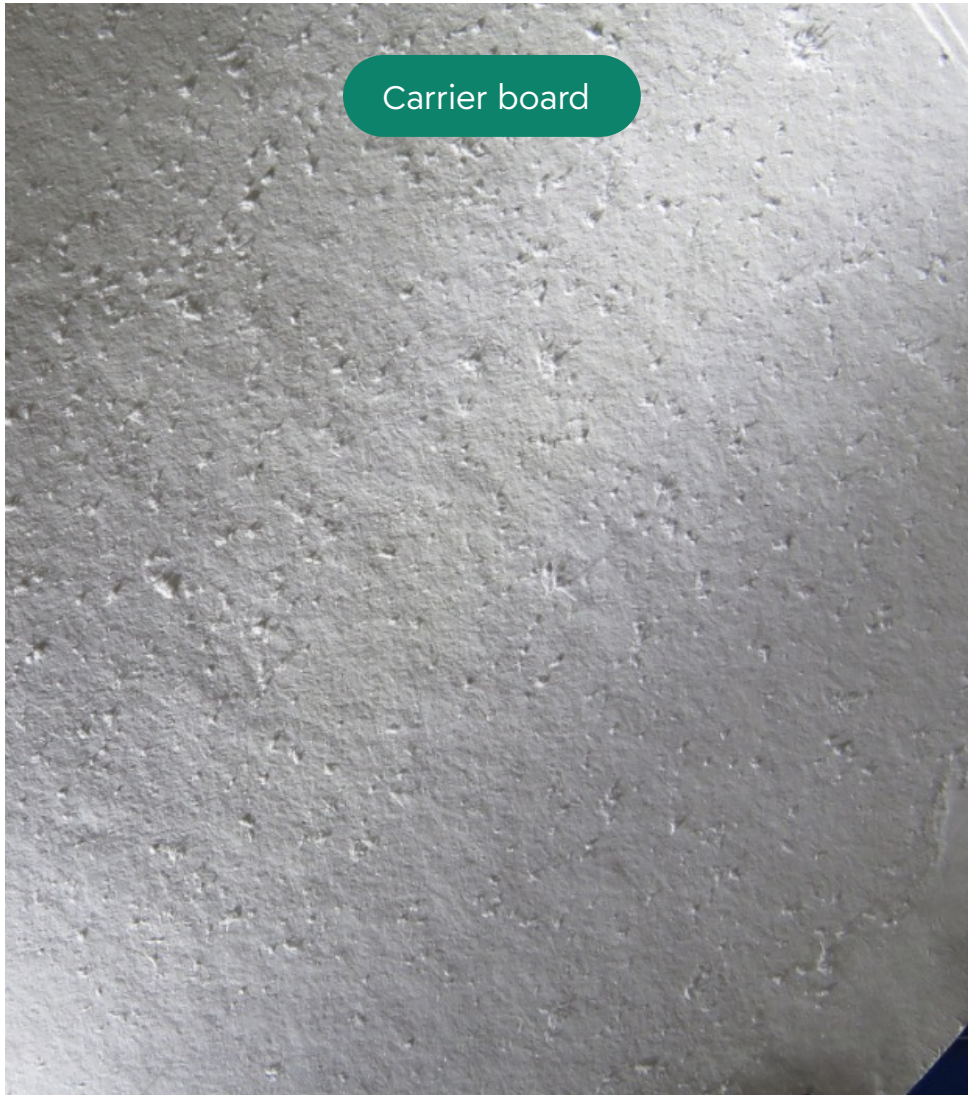
Handsheet on transmitted light with ink and varnish particles.



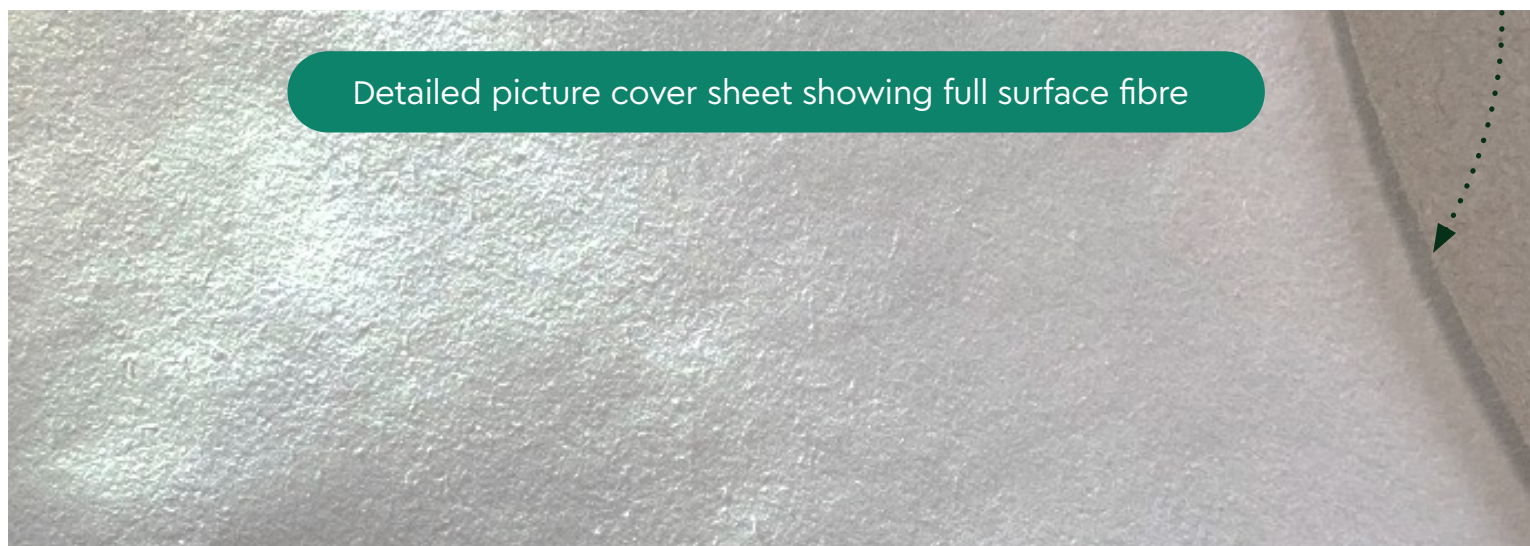
Carrier board from sheet adhesion test without tear-outs. Ink and varnish particles are attached to the carrier board but don't affect the sheet adhesion test rating.



**Level 2 Tackiness partly present:** the handsheet can be separated completely from the carrier board and cover sheet. Fibre tears and particles occur on the carrier board, the cover sheet and the handsheet itself.





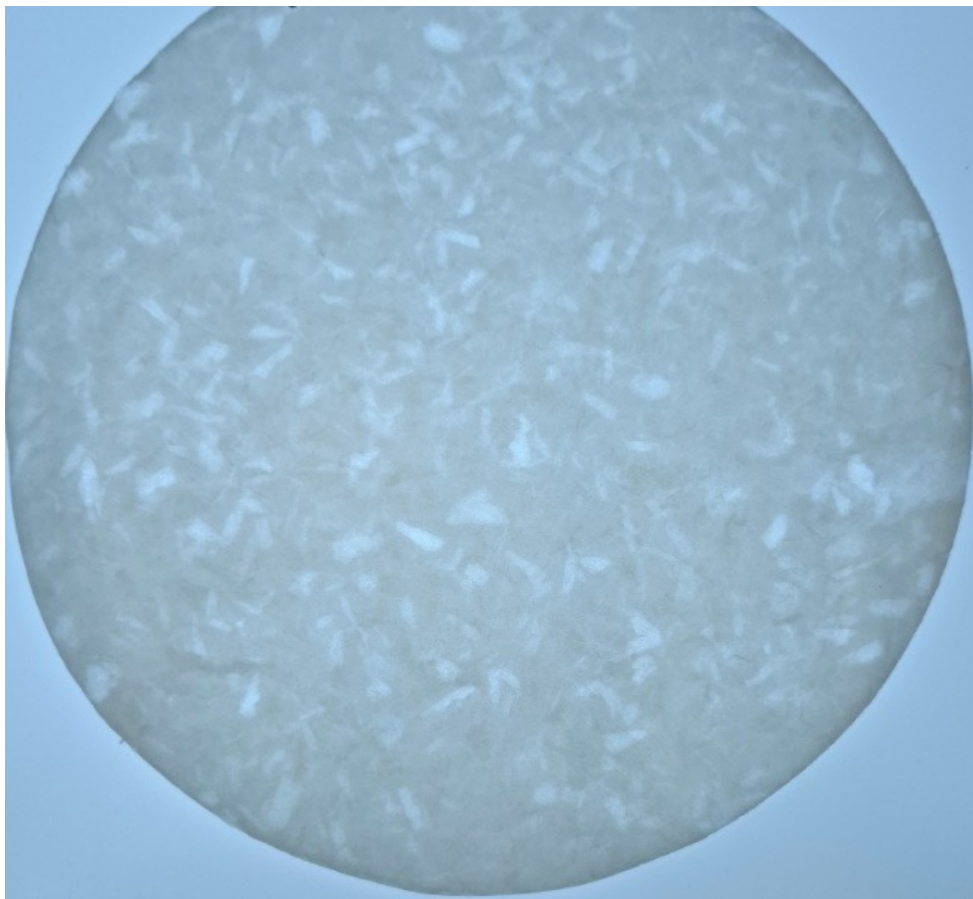


## Further examples of carrier boards with Level 2





## Further examples of carrier boards with Level 2



Handsheet on transmitted light.



Carrier board from sheet adhesion test with tear-outs over a large area (where polymer particles in the handsheet are observed). Still no breaking of the handsheet is observed.

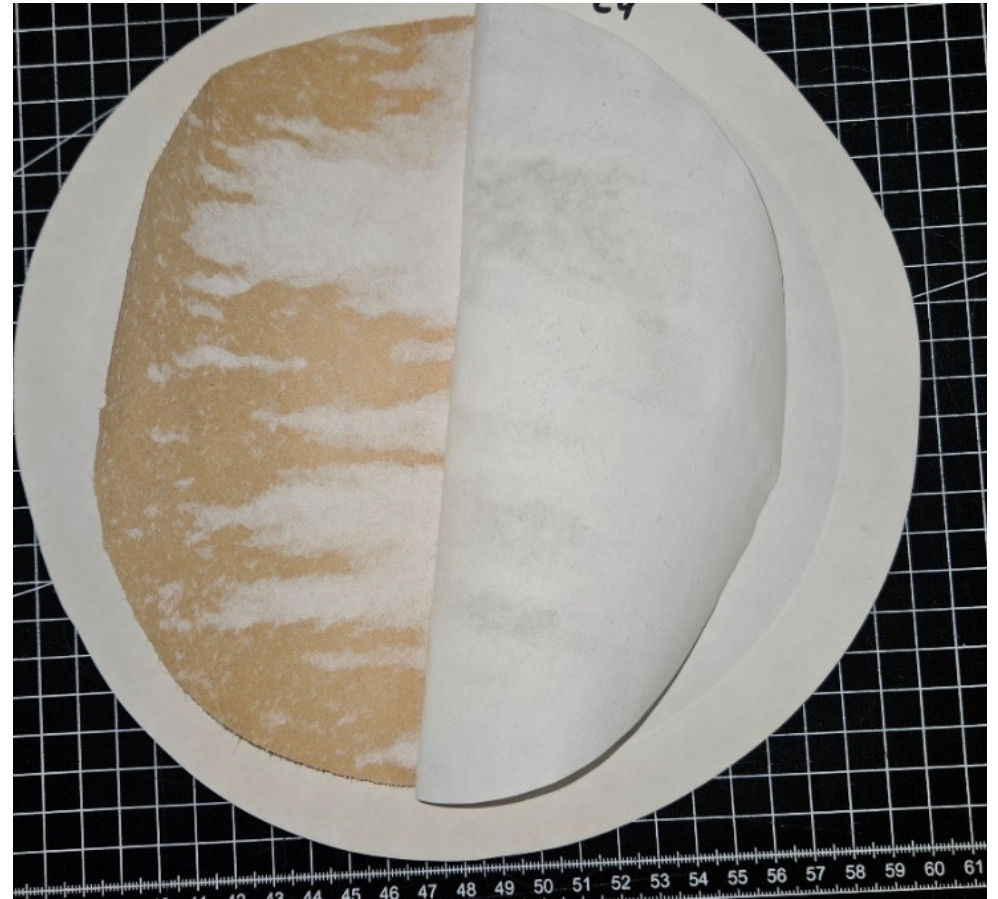
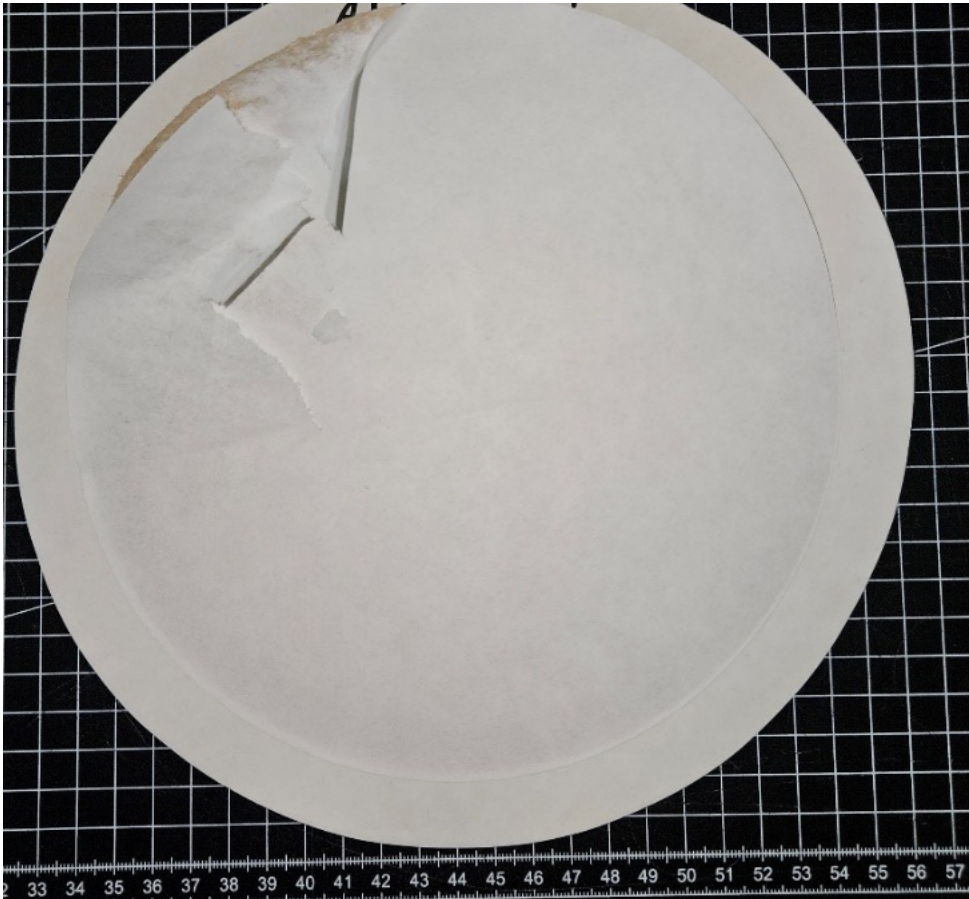
**Level 3 Tackiness present:** the handsheet cannot be separated from its carrier board and the cover sheet without visible damage to the handsheet itself. A breaking of the handsheet or holes ( $> 1\text{mm}$  [in two dimensions]) occur.



The rating must reflect all sheet adhesion tests conducted, and provide an accurate representation of overall performance. A single occurrence of a defect may be disregarded if it is limited to an isolated hole and does not exhibit any fibre tears.



### Further examples of sheet adhesion Level 3



The rating must reflect all sheet adhesion tests conducted, and provide an accurate representation of overall performance. A single occurrence of a defect may be disregarded if it is limited to an isolated hole and does not exhibit any fibre tears.



# 4. ANNEX REJECT CHARACTERISATION

VERSION APRIL 2025 - UPDATED VERSION (JUNE 2026)

This Annex is relevant for Part I,  
Part II and Part III



# Reject characterisation

## User guide and purpose

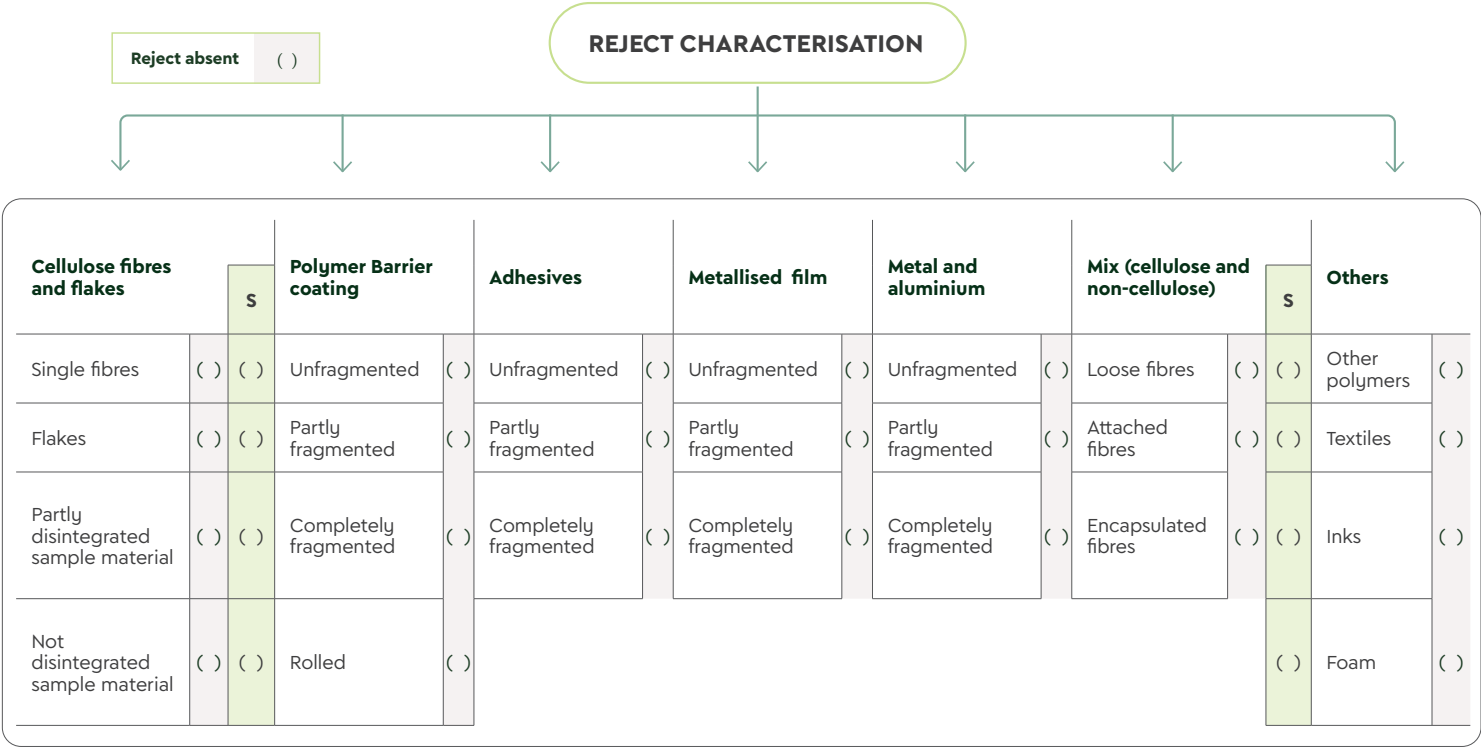
- > The Reject characterisation tree has to be filled for the coarse and fine rejects (separately) in Part I, II and III assessments. This should be done while the rejects are still on the screening plates, before drying, so that the different reject components can be better visualised.
- > The reject characterisation supports decisions on:
  - Part I: Characterisation of coarse and fine reject is needed for assessing “significant amount of fibres” (20 min disintegration option).
  - Part III: Characterisation of the coarse reject is needed for assessing the coarse reject quality CRQ levels.
- > The reject characterisation does not directly impact the calculation of score points in the recyclability evaluation protocol.



**Remark:** It is planned to incorporate more example pictures in future versions of this annex.

# Reject characterisation tree - Version January 2025 - updated version (June 2026)

|                   |                                                                                                              |                                                                                                                                            |                                                                                                 |
|-------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Disintegration    | <b>Not disintegrated material</b><br>Fibrous based pieces with original cut size and /or encapsulated fibres | <b>Partly disintegrated material</b><br>Fibrous based pieces with sharp edges, smaller than original cut size, not broken down into flakes |                                                                                                 |
| Fragmentation     | <b>Unfragmented</b><br>Original cut size pieces                                                              | <b>Partly fragmented</b><br>Medium pieces (size > 1 cm in one dimension), sharp edges                                                      | <b>Completely fragmented</b><br>Granular pieces (size ≤ 1 cm in one dimension), no sharp edges. |
| Amount (optional) | <b>Significant (S)</b><br>Extensive quantity, relevant in Part I and III                                     | Field <b>S</b> is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III)        |                                                                                                 |



Additional comments: \_\_\_\_\_



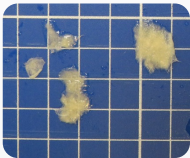
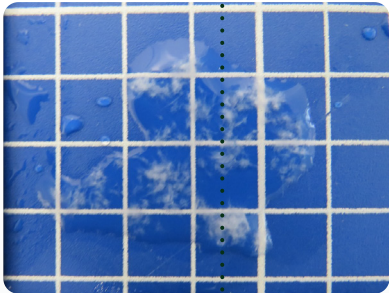
# Reject characterisation examples

|                |                                                                                                                                            |                                                                                                              |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Disintegration | <b>Partly disintegrated material</b><br>Fibrous based pieces with sharp edges, smaller than original cut size, not broken down into flakes | <b>Not disintegrated material</b><br>Fibrous based pieces with original cut size and /or encapsulated fibres |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|

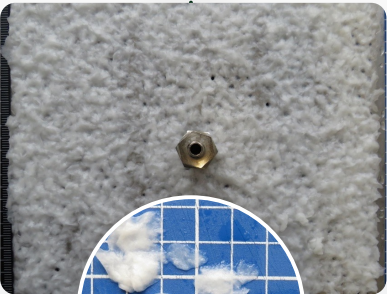
| Cellulose fibres and flakes          |         | S |
|--------------------------------------|---------|---|
| Single fibres                        | ( ) ( ) |   |
| Flakes                               | ( ) ( ) |   |
| Partly disintegrated sample material | ( ) ( ) |   |
| Not disintegrated sample material    | ( ) ( ) |   |

| Amount (optional)                                                                                                                   | Significant (S)<br>Extensive quantity, relevant in Part I and III |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Field <b>S</b> is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III) |                                                                   |

Single fibres



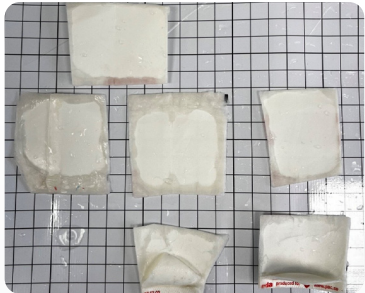
Flakes



Partly disintegrated



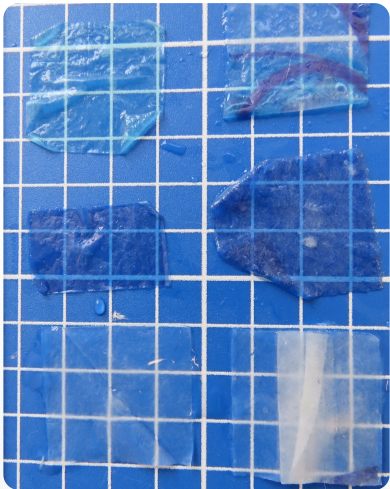
Not disintegrated/  
original size



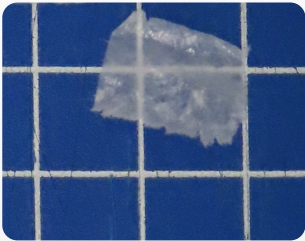
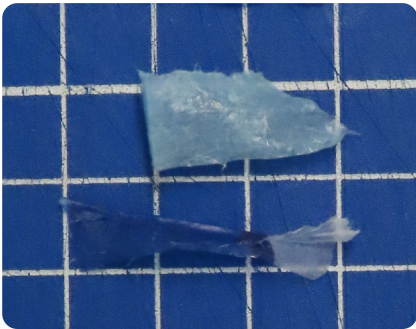
# Reject characterisation examples

| Fragmentation | Unfragmented<br>Original cut size pieces | Partly fragmented<br>Medium pieces (size > 1 cm in one dimension), sharp edges | Completely fragmented<br>Granular pieces (size ≤ 1 cm in one dimension), no sharp edges. |
|---------------|------------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|---------------|------------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|

Unfragmented



Partly fragmented



Completely fragmented



## Polymer Barrier coating

Unfragmented ( )

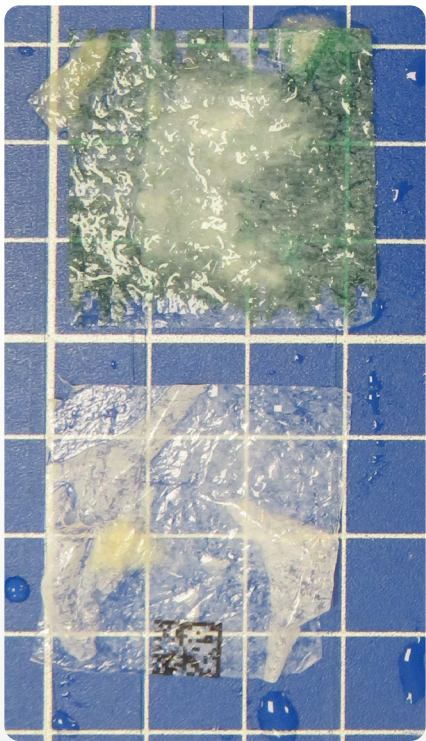
Partly fragmented ( )

Completely fragmented ( )

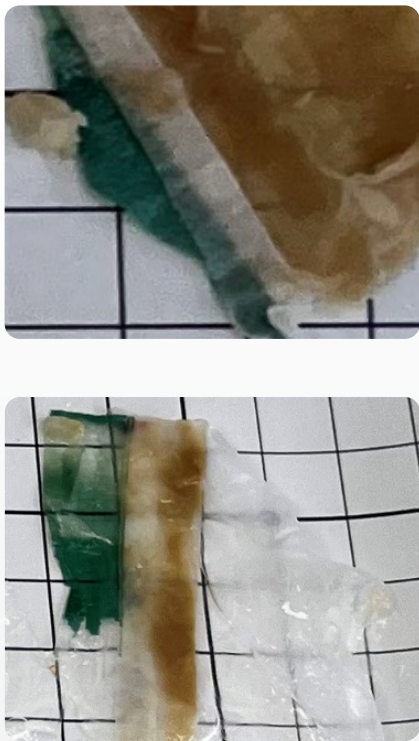
Rolled ( )

# Reject characterisation examples

Loose fibres



Attached fibres



Encapsulated fibres



|                                   |         |   |
|-----------------------------------|---------|---|
| Mix (cellulose and non-cellulose) |         | S |
| Loose fibres                      | ( ) ( ) |   |
| Attached fibres                   | ( ) ( ) |   |
| Encapsulated fibres               | ( ) ( ) |   |

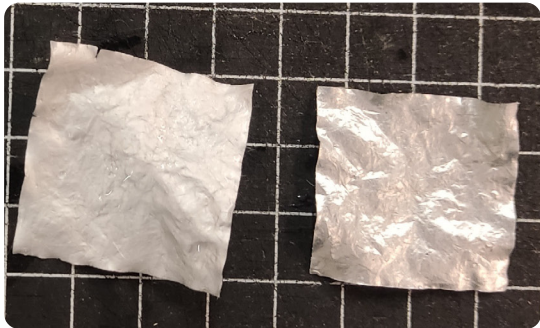
|                                                                                                                                     |                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Amount (optional)                                                                                                                   | Significant (S)<br>Extensive quantity, relevant in Part I and III |
| Field <b>S</b> is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III) |                                                                   |



# Reject characterisation examples

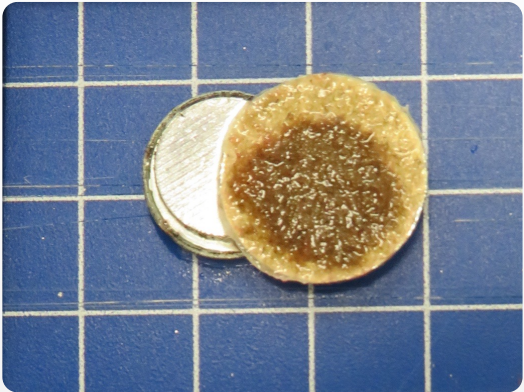
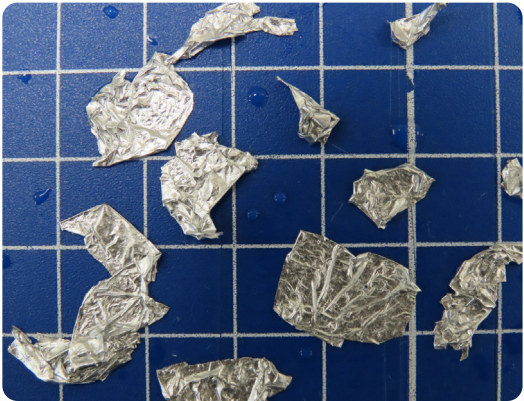
## Metallised film

|                       |     |
|-----------------------|-----|
| Unfragmented          | ( ) |
| Partly fragmented     | ( ) |
| Completely fragmented | ( ) |



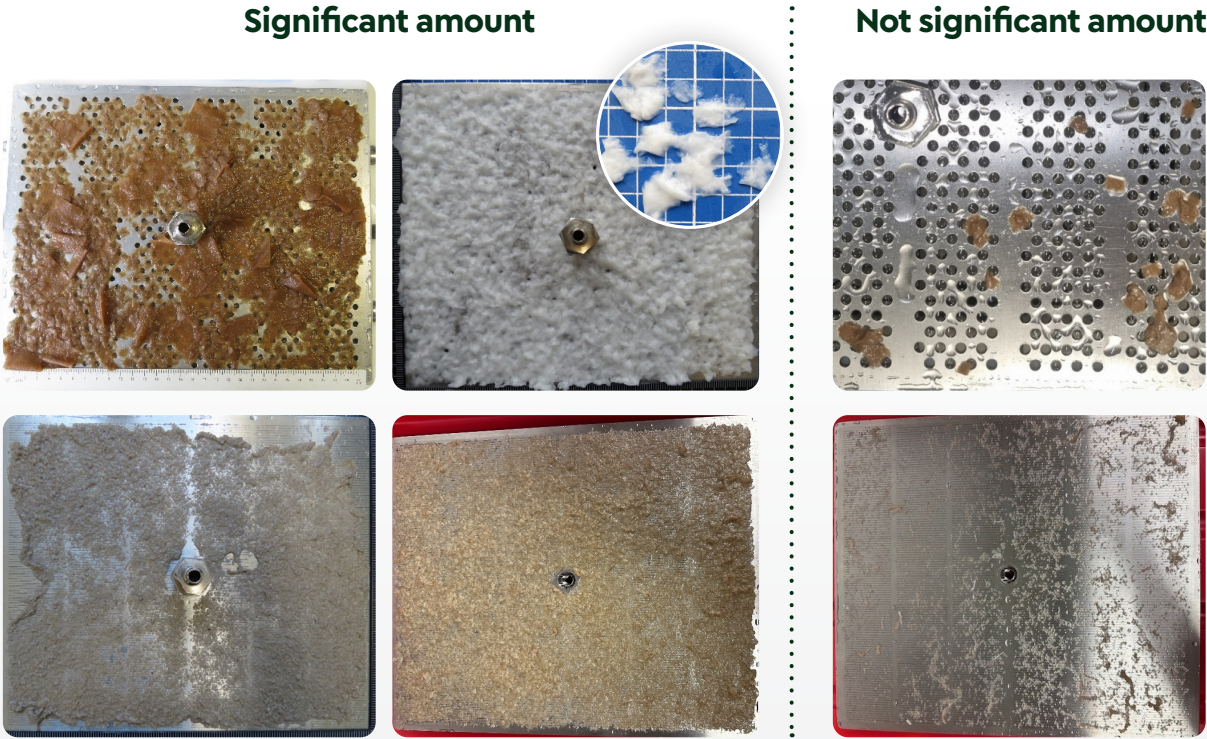
## Metal and aluminium

|                       |     |
|-----------------------|-----|
| Unfragmented          | ( ) |
| Partly fragmented     | ( ) |
| Completely fragmented | ( ) |



# Reject characterisation examples

| Cellulose fibres and flakes          |         | S |
|--------------------------------------|---------|---|
| Single fibres                        | ( ) ( ) |   |
| Flakes                               | ( ) ( ) |   |
| Partly disintegrated sample material | ( ) ( ) |   |
| Not disintegrated sample material    | ( ) ( ) |   |



| Amount (optional)                                                                                                                   | Significant (S)<br>Extensive quantity, relevant in Part I and III |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Field <b>S</b> is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III) |                                                                   |

**Remark:** The 20 min disintegration option in Part I method requires a total screening reject of at least 15 % and a significant amount of fibres in the coarse and/or fine reject.

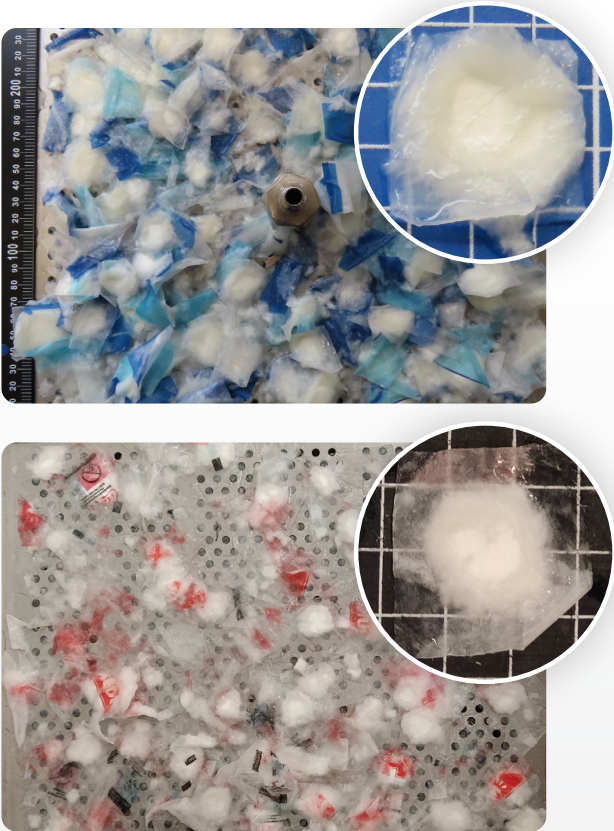


# Reject characterisation examples

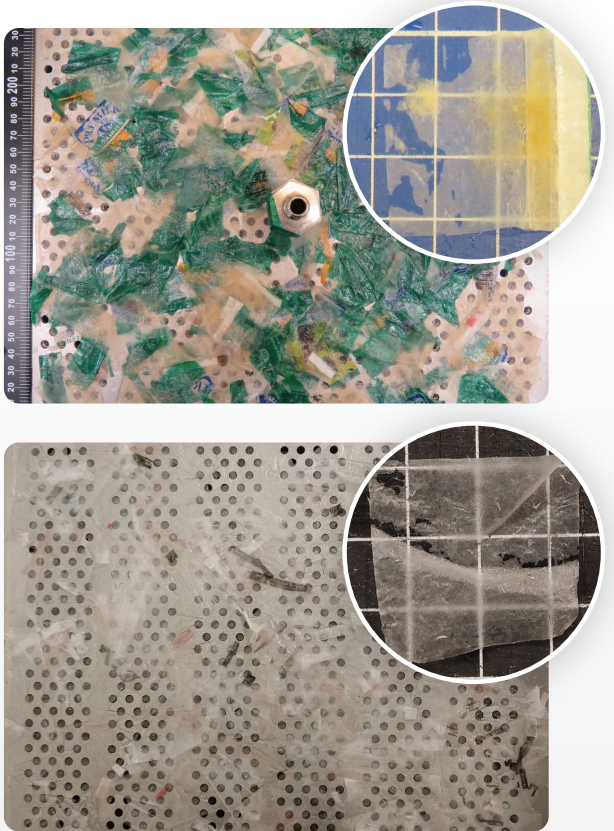
|                                   |     |     |
|-----------------------------------|-----|-----|
| Mix (cellulose and non-cellulose) |     | S   |
| Loose fibres                      | ( ) | ( ) |
| Attached fibres                   | ( ) | ( ) |
| Encapsulated fibres               | ( ) | ( ) |

| Amount (optional)                                                                                                                   | Significant (S)<br>Extensive quantity, relevant in Part I and III |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Field <b>S</b> is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III) |                                                                   |

Significant amount



Not significant amount

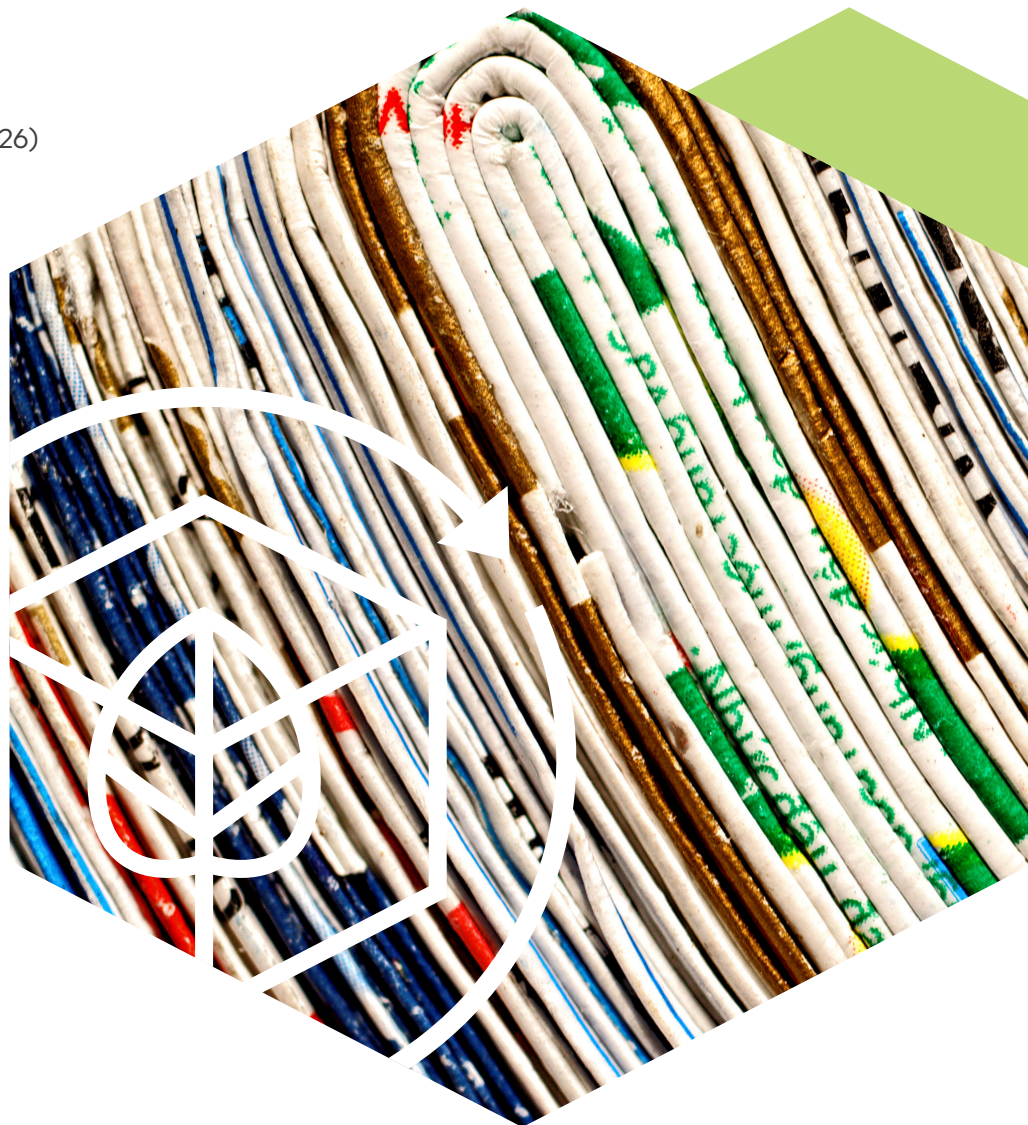


**Remark:** The assessment of significant amount of fibres and flakes in the category mix will be further developed in the future versions of this annex.



# 5. ANNEX 2-SIDE BARRIER COATED SAMPLES

VERSION APRIL 2025 - UPDATED VERSION (JUNE 2026)

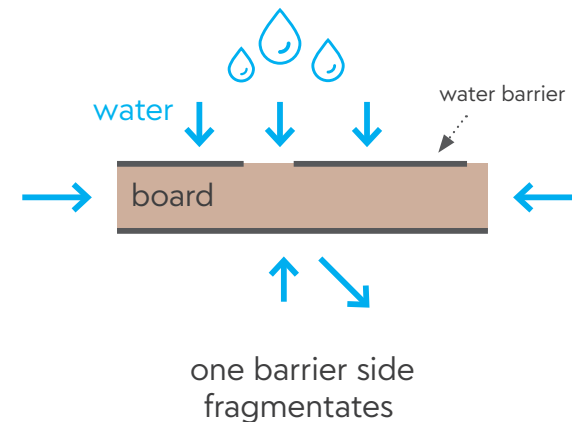
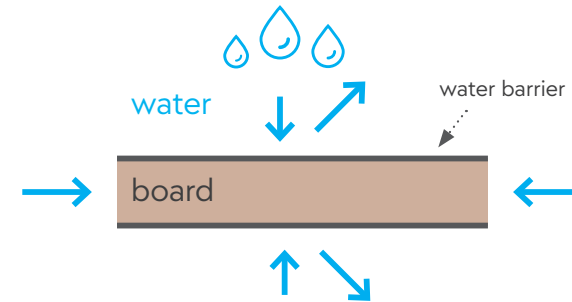


# Evaluation Scorecard Part I

## 2-side barrier coated samples

### General considerations

- > The validity of the test results and recyclability evaluation protocol for technical recyclability in conventional process needs to consider the **fragmentation behaviour** of the barriers (both sides of the paper/board).
- > We can expect **different behaviour between lab and mill if the barriers on both sides do not fragmentise** during repulping, thus the validity of the test should be considered critical for evaluation.
- > In case of **fragmentation of the barrier of at least one side of the board** we will not have a practical issue since this means that water can access the fibres more easily supporting the repulping.



# Evaluation Scorecard Part I

## 2-side barrier-coated samples

### Proposal decision tree

Coarse reject CR > 0%?

NO

**Recyclability evaluation protocol can be applied**

YES

Is the sample 2 side water barrier coated?

How? Check the data sheet or check with water drop penetration, if water penetrates , **NO**

NO

**Recyclability evaluation protocol can be applied**

YES

Does at least on side of the barrier fragment?

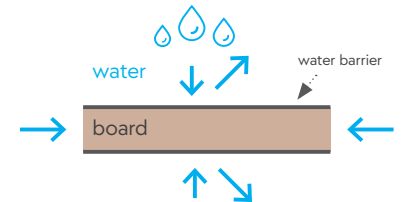
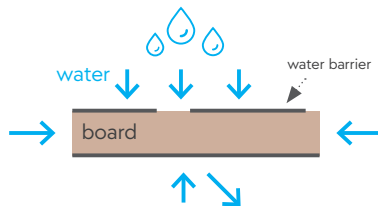
How? Desintegrate 1 min and check fragmentation (reject characterisation)

NO

**Recyclability evaluation protocol cannot be applied**

YES

**Recyclability evaluation protocol can be applied**





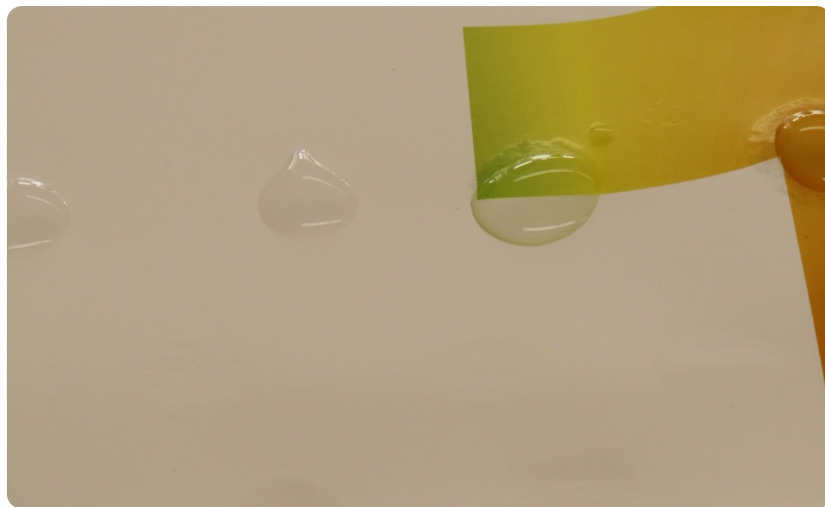
# Evaluation Scorecard Part I

## 2-side barrier-coated samples

### Water drop penetration

Is the sample 2-side water barrier coated?

How? Check the data sheet or check with water drop penetration, if water penetrates



**No barrier coating**



**barrier coating**



**Remark:** A more detailed description will be provided.

# Evaluation Scorecard Part I

## 2-side barrier-coated samples

### Barrier fragmentation

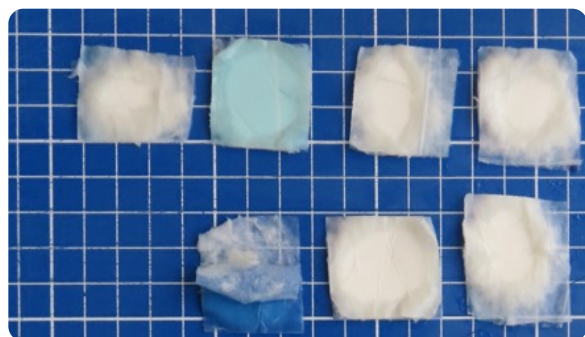
Does at least on side  
of the barrier fragment?

How? Desintegrate 1 min and check fragmentation  
(please see Annex reject characterisation).

2-side barrier coating **without** barrier fragmentation



10-min  
disintegration

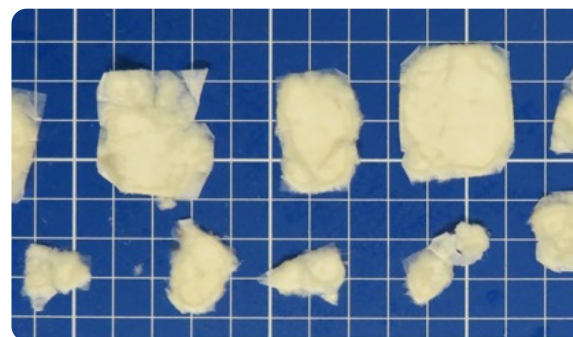


1-min  
disintegration

2-side barrier coating **with** fragmentation



10-min  
disintegration



1-min  
disintegration



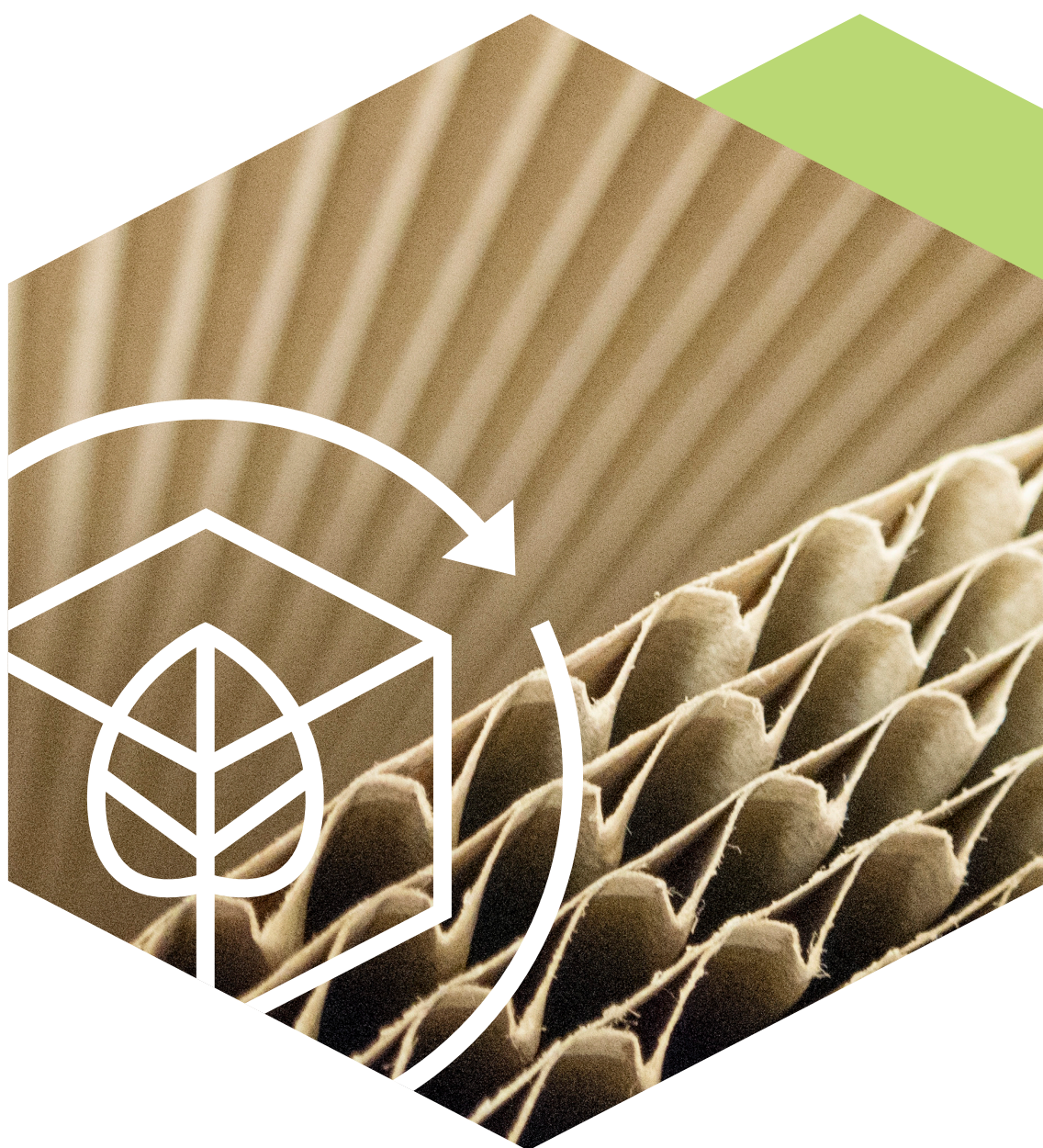
**Remark:** A more detailed description will be provided.



# 6. ANNEX DETAILED WORK DESCRIPTION FOR SAMPLE PREPARATION

VERSION 1, JANUARY 2025 - UPDATED EDITION (JUNE 2026)

This Annex is relevant for Part I,  
Part II and Part III





# Contents

**Contents** ..... 33

**List of figures** ..... 34

**List of abbreviations and symbols** ..... 34

**1 Purpose and scope** ..... 35

**2 Sample preparation** ..... 36

**3 Sample preparation for Part II method** ..... 45

**4 Photo documentation** ..... 47

**5 Further documentation** ..... 47

# List of figures

Figure 1: Example of cutting preparation for cup sample ..... 37

Figure 2: Example of cutting preparation for shopping bag sample ..... 38

Figure 3: Example of cutting preparation for multicomponent sample ..... 39

Figure 4: Cutting of sealed/glued edges ..... 41

Figure 5: Wrapped straw attached to portion pack ..... 41

Figure 6: Preparation of beverage carton sample with sealed closure,  
closures not included in the disintegration step ..... 42

Figure 7: Steps for the preparation of packaging aid products ..... 43

Figure 8: Paper sample positioned on the cutting mat, with detailed cutting map lines ..... 47

# List of abbreviations and symbols

|             |                                          |
|-------------|------------------------------------------|
| <b>OD</b>   | Oven Dry                                 |
| <b>PPWR</b> | Packaging and Packaging Waste Regulation |
| <b>WSA</b>  | Wet Strength Agents                      |

# 1 Purpose and scope

This document describes the necessary laboratory procedures for the preparation of sample material to be analysed according to the following recyclability methods:

- > Paper and Board – Recyclability  
Laboratory Test Method – Part I: Paper mill with conventional recycling process, Version 3
- > Paper and Board – Recyclability  
Laboratory Test Method – Part II: Paper mill with flotation-deinking recycling process, Version 1

- > Paper and Board – Recyclability  
Laboratory Test Method – Part III: Paper mill with specialised recycling process (LPC), Version 1

Please note that certain details and differences must be considered depending on the method applied, such as the amount of sample material needed for disintegration. Also note, that this is a living document, where further work will be implemented in the future, such as more or detailed requirements coming from the EU Packaging and Packaging Waste Regulation (PPWR).



## 2 Sample preparation

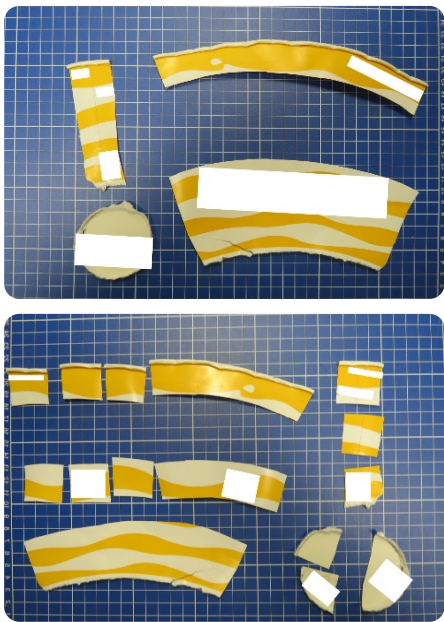
### 2.1 Simple sample preparation for Part I and Part III methods

This topic provides a detailed procedure for preparing simple sample materials, meaning semi-finished products that are flat and do not have different components.

| Step Nr. | Notes                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <b>Material amount</b>           | <ul style="list-style-type: none"> <li>&gt; A minimum amount of 250 g air-dried material is needed to carry out all following measurements.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2        | <b>Dry content determination</b> | <ul style="list-style-type: none"> <li>&gt; Place the sample in the oven at <math>(105 \pm 2)</math> °C until it reaches a constant mass to determine the moisture content according to ISO 638-1. The sample must be cooled for around 30 min. in a desiccator before every weighing.</li> <li>&gt; If the packaging sample is too large to fit in the oven, cut it beforehand placing it in the oven and then in the vacuum desiccator.</li> <li>&gt; If the sample contains dry-removed parts (e.g. metal clips), do not count their weight within the 50 g oven dry (OD) material for disintegration. Instead, include it in the reject amount calculation.</li> </ul> |
| 3        | <b>Cutting the specimen</b>      | <ul style="list-style-type: none"> <li>&gt; If the specimen has the form of a roll, cut it to A4 size.</li> <li>&gt; Put the A4 format sample into a cutting machine or punch and cut/punch it to <math>(3 \times 3 \pm 0.5)</math> cm.</li> <li>&gt; If cutting the sample in <math>(3 \times 3 \pm 0.5)</math> cm pieces is not possible because parts of the sample are already smaller than that (e.g.: the edges of a cup), do it as close as possible to specification (with as little deviation as possible), and note it accordingly in the spreadsheet.</li> <li>&gt; At least 65 g air dry sample must be cut / punched.</li> </ul>                              |
| 4        | <b>Ageing</b>                    | <ul style="list-style-type: none"> <li>&gt; If the sample contains wet strength agents (WSA) and was produced less than 30 days ago, store it for the time needed to complete this ageing and then proceed with the test.</li> <li>&gt; Another option is to perform accelerated ageing by placing the sample in the oven at <math>(60 \pm 1)</math> °C for 72 hours.</li> <li>&gt; In case of samples without WSA, make sure the sample is at least 15 days old from the date of production, and therefore no ageing is necessary.</li> </ul>                                                                                                                             |
| 5        | <b>Documentation in Excel</b>    | <ul style="list-style-type: none"> <li>&gt; Enter the dry content of the sample in the Excel spreadsheet.</li> <li>&gt; Calculate the sample weight equivalent to 50 g OD.</li> <li>&gt; Enter the experiment date and processor abbreviation in the Excel spreadsheet.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         |

## 2.2 Complex sample preparation for Part I and Part III methods

### 2.2.1 Example 1: paper cup

| Step Nr. | Notes/Pictures                                                                                                                                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <b>Dry content determination</b>                                                                                                                                               | <ul style="list-style-type: none"> <li>&gt; Place the sample, or at least each different part of the sample (sealing, gluing, paper, etc.) in the oven at <math>(105 \pm 2)^{\circ}\text{C}</math> to determine the moisture content according to ISO 638-1.</li> <li>&gt; If the packaging sample is too large to fit in the oven, cut it beforehand placing it in the oven and then in the vacuum desiccator.</li> <li>&gt; If the sample contains dry-removed parts (e.g. metal clips or rigid plastic) that can harm the disintegrator, it is allowed to separate them before the disintegration step (dry removal). For that, do not count their weight within the 50 g OD material for disintegration, but instead, include them in the coarse reject calculation.</li> <li>&gt; The use of electronic equipment instead of the oven method mentioned in the standard needs to be reported. Some rejects can behave differently when electronic devices are used in the dry content determination.</li> </ul> |
| 2        | <b>Cutting the specimen</b>  <p>Figure 1. Example of cutting preparation for cup sample</p> | <ul style="list-style-type: none"> <li>&gt; Cut the cup along the side gluing all the way to the bottom.</li> <li>&gt; Remove the bottom section by hand.</li> <li>&gt; Cut off the side gluing seam.</li> <li>&gt; Cut off the rolled edge.</li> <li>&gt; Weigh all parts individually and enter their weights in the Excel spreadsheet.</li> <li>&gt; Weigh out sample portions corresponding to 50 g OD and cut it to <math>(3 \times 3 \pm 0.5)</math> cm pieces.</li> <li>&gt; If there is a sample where this is not possible because pieces are smaller than <math>(3 \times 3 \pm 0.5)</math>, perform the sample preparation with as little deviation as possible, and note it accordingly in the spreadsheet.</li> </ul>                                                                                                                                                                                                                                                                                  |
| 3        | <b>Documentation in Excel</b>                                                                                                                                                  | <ul style="list-style-type: none"> <li>&gt; Enter the dry content in Excel spreadsheet.</li> <li>&gt; Enter the weight of each sample components in Excel spreadsheet.</li> <li>&gt; Enter the date and abbreviation of the processor in the Excel spreadsheet.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## 2.2.2 Example 2: Shopping bag

| Step Nr. | Notes/Pictures                                                                                                                                                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <b>Dry content determination</b>                                                                                                                                                       | > Perform it as in topic 2.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2        | <b>Cutting the specimen</b>  <p>Figure 2. Example of cutting preparation for shopping bag sample</p> | <ul style="list-style-type: none"> <li>&gt; Cut the bag along the side gluing all the way to the bottom.</li> <li>&gt; Cut off the bottom.</li> <li>&gt; Cut off the side gluing seam.</li> <li>&gt; Cut off the handle including adhesives.</li> <li>&gt; Metal parts that are not shredded are marked as dry removed.</li> <li>&gt; Weigh all parts individually and enter their weights in the Excel spreadsheet.</li> <li>&gt; Weigh out sample portions corresponding to 50 g OD and cut it into <math>(3 \times 3 \pm 0.5)</math> cm pieces.</li> <li>&gt; If this preparation is not possible because the sample pieces are smaller than <math>(3 \times 3 \pm 0.5)</math> cm, perform it as close as possible to specification (with as little deviation as possible), and note it accordingly in the spreadsheet.</li> </ul> |
| 3        | <b>Documentation in Excel</b>                                                                                                                                                          | > Perform it as in topic 2.2.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



### 2.2.3 Example 3: Multicomponent packaging

| Step Nr. | Notes/Pictures                                                                                                                                                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | If a sample contains several different components, such as polymer and metal components or a user instruction booklet, special care is needed for the sample preparation and testing. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1        | <b>Dry content determination</b>                                                                                                                                                      | > Perform it as in topic 2.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 2        | <b>Cutting the specimen</b>  <p>© 2023 CTP</p>                                                      | <ul style="list-style-type: none"> <li>&gt; Cut the folding box along the side gluing all the way to the bottom.</li> <li>&gt; Cut off the bottom.</li> <li>&gt; Cut off the side gluing seam.</li> <li>&gt; Cut off the plastic hanger and mark as dry removed.</li> <li>&gt; Cut off the metal part and mark as dry removed.</li> <li>&gt; Cut off the polymer window including adhesives.</li> <li>&gt; Weigh out the user instructions booklet and establish whether it will be included in the test or not. This should be discussed with the customer beforehand.</li> <li>&gt; Weigh all parts individually and enter their weights in the Excel spreadsheet.</li> <li>&gt; Weigh out sample portions corresponding to 50 g OD and cut into <math>(3 \times 3 \pm 0.5)</math> cm pieces.</li> <li>&gt; If this preparation is not possible because the sample pieces are smaller than <math>(3 \times 3 \pm 0.5)</math> cm, do it as close as possible to specification (with as little deviation as possible), and note it accordingly in the spreadsheet.</li> <li>&gt; The dry removed non-paper components will normally be added to the coarse reject. Only components significantly smaller than 5 mm will be added to the fine reject.</li> <li>&gt; Ensure that the right calculations are used for the total reject with dry-removed components factored in.</li> <li>&gt; Integrated components should only be dry removed when they could cause harm to the disintegration device or heavily influence its behaviour (e.g. big ridged plastic parts or metal).</li> <li>&gt; When the sample is then tested, observe whether the different components plausibly appear during testing.</li> </ul> |

**Figure 3.** Example of cutting preparation for multicomponent sample

## Overview of the components

| Component                                | Procedure                                                                                                                                                                                                                 | Explanation                                                                                                                                                                                                                                             |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bottom gluing                            | <ul style="list-style-type: none"> <li>&gt; Determine mass share and dry matter content</li> <li>&gt; Include in the disintegration</li> </ul>                                                                            | <ul style="list-style-type: none"> <li>&gt; Paper part of the sample which can be disintegrated</li> </ul>                                                                                                                                              |
| Side gluing                              | <ul style="list-style-type: none"> <li>&gt; Determine mass share and dry matter content</li> <li>&gt; Include in the disintegration</li> </ul>                                                                            | <ul style="list-style-type: none"> <li>&gt; Paper part of the sample which can be disintegrated</li> </ul>                                                                                                                                              |
| Remaining folding box                    | <ul style="list-style-type: none"> <li>&gt; Determine mass share and dry matter content</li> <li>&gt; Include in the disintegration</li> </ul>                                                                            | <ul style="list-style-type: none"> <li>&gt; Paper part of the sample which can be disintegrated</li> </ul>                                                                                                                                              |
| Plastic hanger (two green pieces)        | <ul style="list-style-type: none"> <li>&gt; Determine mass share and the size of the component</li> <li>&gt; Include in the disintegration</li> </ul>                                                                     | <ul style="list-style-type: none"> <li>&gt; Non-paper component of the sample, which can be included into the disintegration as there is no harm expected for the disintegration device</li> </ul>                                                      |
| Second plastic part                      | <ul style="list-style-type: none"> <li>&gt; Determine mass share and the size of the component</li> <li>&gt; If the component is significant smaller than 5 mm it will be added to the coarse reject</li> </ul>           | <ul style="list-style-type: none"> <li>&gt; Dry-removed non-paper component of the sample with no adhesive application</li> </ul>                                                                                                                       |
| Metal closure                            | <ul style="list-style-type: none"> <li>&gt; Determine mass share and the size of the component</li> <li>&gt; If the component is significant smaller than 5 mm it will be added to the coarse reject</li> </ul>           | <ul style="list-style-type: none"> <li>&gt; Dry-removed non-paper component of the sample with no adhesive application</li> </ul>                                                                                                                       |
| Polymer window with adhesive application | <ul style="list-style-type: none"> <li>&gt; Determine mass share of the component</li> </ul>                                                                                                                              | <ul style="list-style-type: none"> <li>&gt; Non-paper component of the sample with adhesive application has to be included in the disintegration</li> <li>&gt; The possible tacky influence of the adhesive application needs to be observed</li> </ul> |
| User instruction                         | <ul style="list-style-type: none"> <li>&gt; Determine mass share of the component</li> <li>&gt; Discuss with the customer the purpose of testing and explain different disposal options for graphic components</li> </ul> | <ul style="list-style-type: none"> <li>&gt; As this is a separatable component, the recommendation is to not include it in the disintegration, because it would be disposed with graphic products</li> </ul>                                            |

|   |                        |                                 |
|---|------------------------|---------------------------------|
| 3 | Documentation in Excel | > Perform it as in topic 2.2.1. |
|---|------------------------|---------------------------------|

## 2.2.4 Example 4: Beverage cartons (Focus of the Part III method)

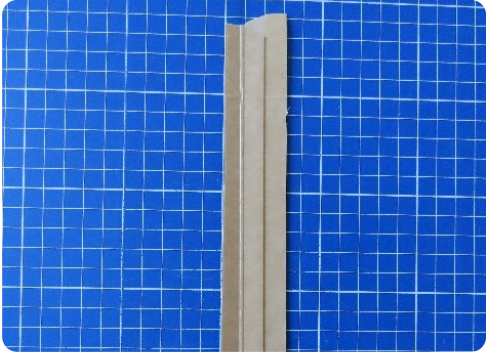
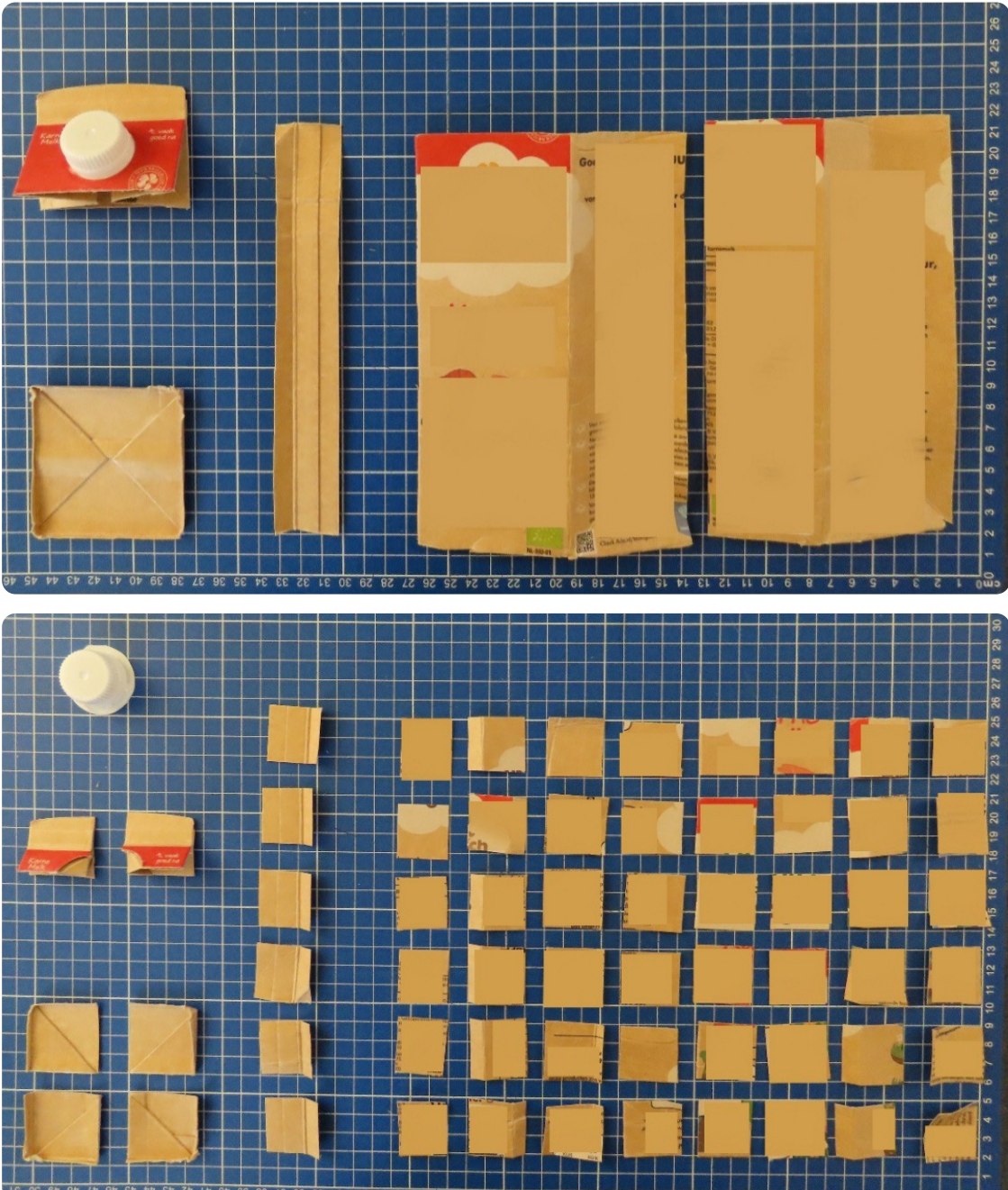
| Step Nr. | Notes/Pictures                                                                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <b>Dry content determination</b>                                                                                                           | > Perform it as in topic 2.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 2        | <b>Cutting the specimen</b><br>Sealed or glued pieces<br> | > Be careful with the cutting size of the sealed or glued pieces of the packaging sample. The two parts tend to separate during the disintegration, and when they are smaller than (3 x 3 cm ± 0.5) cm, they might give a false impression of fragmentation in the reject characterisation. Smaller parts can also go through the screening steps. Hence, the whole glue seam component should be ideally cut in a way that the single parts measure at least 2.5 x 2.5 cm. If this is not possible, keep in mind that smaller pieces might appear in the results.<br>During sample preparation, do not detach glued pieces that would not otherwise be detached by the consumer (e.g. the lateral glue in the picture). |
| 3        | <b>Documentation in Excel</b>                                                                                                              | > Perform it as in topic 2.2.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4        | <b>Plastic closures</b>                                                                                                                    | > If plastic closures can damage the disintegrator, they can be dry removed from the sample before the disintegration, but in this case their weight should be added to the coarse reject.<br>> Sample parts removed before the disintegration should be documented with photos in the test report.<br>Disclaimer: Further deviations and examples on how to handle different components are planned. For example, the handling of the glue used in attached closures.                                                                                                                                                                                                                                                   |
| 5        | <b>Straws and plastic wrappings</b><br>                 | > Sample components that are usually not separated by the end-consumer before disposal, such as a wrapped paper straw from a portion pack, should be tested together.<br>> Use the PPWR as a guide for taking decisions in this regard.<br>> The customer can also be consulted on this matter.                                                                                                                                                                                                                                                                                                                                                                                                                          |

Figure 5. Wrapped straw attached to portion pack



| Step<br>Nr. | Notes/Pictures                                                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6           | <b>Photo documentation</b>                                                          | <p>&gt; Take photographs of how the beverage carton sample was cut using a sense of scale like a cutting mat. If possible, place the cut pieces in a way that gives an impression of how the total beverage carton looked before cutting. Also take pictures of parts that were for some reason not included in the test (e.g. narrow edges). This gives important insights for the reject characterisation (pieces with round or pointy corners, different dimensions, etc.).</p> |
| 7           |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**Figure 6.** Preparation of beverage carton sample with sealed closure, closures not included in the disintegration step

## 2.2.5 Packaging aid sample preparation

| Step Nr. | Notes/Pictures             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <b>General information</b> | <p>&gt; The following packaging aid products should be analysed:</p> <ul style="list-style-type: none"> <li>- Paper-based adhesive tape</li> <li>- Labels</li> <li>- RFID-tags</li> <li>- Others</li> </ul> <p>Disclaimer: More examples and pictures will be added in a later version of these guidelines.</p> <p>&gt; They are typically used for the following applications:</p> <ul style="list-style-type: none"> <li>- E-commerce shipping</li> <li>- Closing of a folding box</li> <li>- Security label</li> <li>- Others</li> </ul> <p>Disclaimer: In a later version more application examples could be collected.</p> <p>&gt; The typical base material for packaging aid products are:</p> <ul style="list-style-type: none"> <li>- Testliner for corrugated board</li> <li>- Pigment coated or non-pigment coated carton board</li> <li>- Paper for flexible packaging</li> <li>- Others</li> </ul> <p>&gt; Volume or mass of packaging aid products should be established from the 'typical mass share' identified from collected market data.</p> <p>&gt; It is suggested to have a mass ratio of 5 % packaging aid to 95 % base substrate.</p> |
| 2        | <b>Preparation steps</b>   | <p>&gt; Apply adhesive tape or other packaging aid on the selected base material (defined mass share) with constant pressure/compacting, e.g. using a final roll or couching roll.</p> <p>&gt; With regards to the age and the dry matter content of the individual components, weigh out sample portions corresponding to 50 g OD and cut it into <math>(3 \times 3 \pm 0.5)</math> cm pieces.</p> <p>&gt; If this preparation is not possible because the sample or components of the sample are than <math>(3 \times 3 \pm 0.5)</math> cm, do it as close as possible to specification (with as little deviation as possible), and note it accordingly in the spreadsheet.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

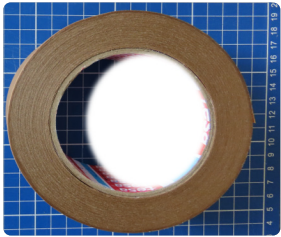
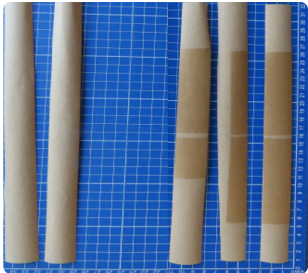
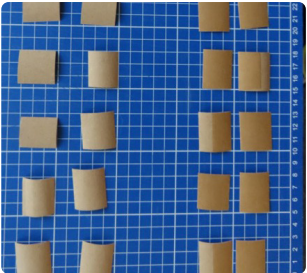
| Step Nr. | Notes/Pictures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Description                     |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 3        | <div>1. Initial sample<br/>Adhesive tape</div>  <div>2. Adhesive tape applied<br/>to test liner with defined mass share</div>    <div>3. Sample material cut into 3 x 3 cm</div>   <p>© 2024 PTS</p> |                                 |
| 4        | Documentation in Excel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | > Perform it as in topic 2.2.1. |

Figure 7. Steps for the preparation of packaging aid products



## 3 Sample preparation for Part II method

### 3.1 Sample preparation and dilution water and chemical preparation

This topic describes the necessary procedures for the Part II sample preparation. In the event of a complex sample, please see chapter 2.2. for the appropriate preparation and adjust the procedure to the specific needs of Part II, as described below.

| Step Nr. | Notes                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <b>Required sample amount</b>              | <ul style="list-style-type: none"><li>&gt; For the disintegration of Batch 1 and 2, around 1500 g in total of the sample material is needed.</li><li>For Batch 1 the amount of chemicals needed depends on the ash and the dry matter content of the sample material. The amount of chemicals corresponds to the sample needed, calculated in the Laboratory Excel Spreadsheet.</li><li>The amount of chemicals needed for Batch 2, depends on the pH value obtained in Batch 1.</li></ul>                                                                                                                                                                                                |
| 2        | <b>Ageing</b>                              | <ul style="list-style-type: none"><li>&gt; The sample material needed for Batch 1 is not subject to accelerated ageing. But if the sample contains WSA and was produced less than 30 days prior to testing, store it for the time needed to complete the ageing process 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.</li><li>&gt; For Batch 2, place the samples in a drying oven for accelerated ageing at <math>(60 \pm 3) ^\circ\text{C}</math> for 72 h. Individual stacks should not contain more than 100 g per A4 equivalent.</li></ul>            |
| 3        | <b>Determination of dry matter content</b> | <ul style="list-style-type: none"><li>&gt; Place a representative amount of the sample in the oven at <math>(105 \pm 2) ^\circ\text{C}</math> until it reaches a constant mass value to determine the moisture content according to ISO 638-2. The sample must be cooled for around 10 min. in a desiccator before weighing.</li><li>&gt; If the sample is too large to fit in the oven, cut it before placing in the oven and then to the vacuum desiccator.</li><li>&gt; If the sample contains dry-removable parts (e.g. metal clips), do not count their weight within the required sample amount for disintegration. Instead, include it in the reject amount calculation.</li></ul> |
| 4        | <b>Determination of ash content</b>        | <ul style="list-style-type: none"><li>&gt; Muffle furnace according to ISO 1762.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Step Nr. | Notes                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5        | <b>Cutting the specimen</b>          | <ul style="list-style-type: none"> <li>&gt; Cut the samples into pieces of about <math>(3 \times 3 \pm 0.5)</math> cm.</li> <li>&gt; If there is a sample where this is not possible, then perform the preparation with as little deviation as possible, and note it accordingly in the spreadsheet.</li> <li>&gt; At least 600 g air dry sample has to be cut/punched.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 6        | <b>Documentation in Excel</b>        | <ul style="list-style-type: none"> <li>&gt; Enter the dry content of the sample in the Excel spreadsheet.</li> <li>&gt; After adding the dry matter and ash content of the sample to the Excel Lab Result sheet, the sample weight equivalent to 200 g oven-dry fibres is calculated automatically.</li> <li>&gt; Enter the experiment date and processor abbreviation in the Excel spreadsheet.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 7        | <b>Preparation of dilution water</b> | <ul style="list-style-type: none"> <li>&gt; During the laboratory process only use deionised water adjusted to a calcium hardness of 3.21 mmol/l, equivalent to 128 mg <math>\text{Ca}^{2+}</math>/l.</li> <li>&gt; To obtain the requested water hardness, add 472 mg/l calcium chloride dihydrate (<math>\text{CaCl}_2 \cdot 2 \text{H}_2\text{O}</math>) to deionised water. This is equivalent to 128 mg <math>\text{Ca}^{2+}</math>/l.</li> <li>&gt; The dilution water should be stored in a temperature-controlled water bath to maintain a constant temperature <math>(45 \pm 2) ^\circ\text{C}</math>.</li> <li>&gt; It is also possible to heat part of the dilution water to a considerably higher temperature by means of a water heater, and successively adding cold dilution water until the desired temperature has been reached.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 8        | <b>Preparation of chemicals</b>      | <ul style="list-style-type: none"> <li>&gt; It is advisable to prepare the chemicals by mass as volume is affected by temperature. The standard deinking recipe is as follows: <ul style="list-style-type: none"> <li>Sodium hydroxide 0.6 % (100 %)</li> <li>Sodium silicate 1.8 % (1,3–1,4 g/cm<sup>3</sup>)</li> <li>Hydrogen peroxide 0.7 % (related to a <math>\text{H}_2\text{O}_2</math> concentration of 100 %)</li> <li>Oleic acid 0.8 % (extra pure)</li> </ul> </li> <li>&gt; Prepare a total amount of 2000 g of deinking solution which will be sufficient for several tests.</li> <li>&gt; Dissolve 6 g of sodium hydroxide in approximately 600 g of deionised water, heat slowly to approximately 60 °C, and proceed by adding 8 g of oleic acid.</li> <li>&gt; Mix until the solution is clear, then add 18 g of sodium silicate, and fill up with deionised water to 2000 g.</li> <li>&gt; The formation of soap reduces the alkalinity (0.114 % sodium hydroxide is needed to neutralise the oleic acid).</li> <li>&gt; In addition, prepare 100 g of hydrogen peroxide solution for each test, using deionised cold water.</li> <li>&gt; The required amount of deinking solution and of hydrogen peroxide is dependent on the sample amount used for pulping and shall be calculated individually.</li> <li>&gt; Do not use a deinking solution which is older than one week.</li> </ul> |

## 4 Photo documentation

| Step Nr. | Notes                                                                                                                                                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        |  <p><b>Figure 8.</b> Paper sample positioned on the cutting mat, with detailed cutting map lines</p> | <ul style="list-style-type: none"> <li>&gt; Photograph the front and back side, and all individual parts/ components of the specimen on the cutting mat (if available) so that the scale of the mat can be seen.</li> <li>&gt; If possible, place the specimen so that it lies against a mat line. Additionally a ruler can be placed near to the sample.</li> <li>&gt; The photo should be made as straight as possible (use the cutting mat or ruler as an aid).</li> <li>&gt; Photographs of specific sample portions are recommended for complex specimens.</li> </ul> |

## 5 Further documentation

Please use corresponding laboratory report template for further documentation.

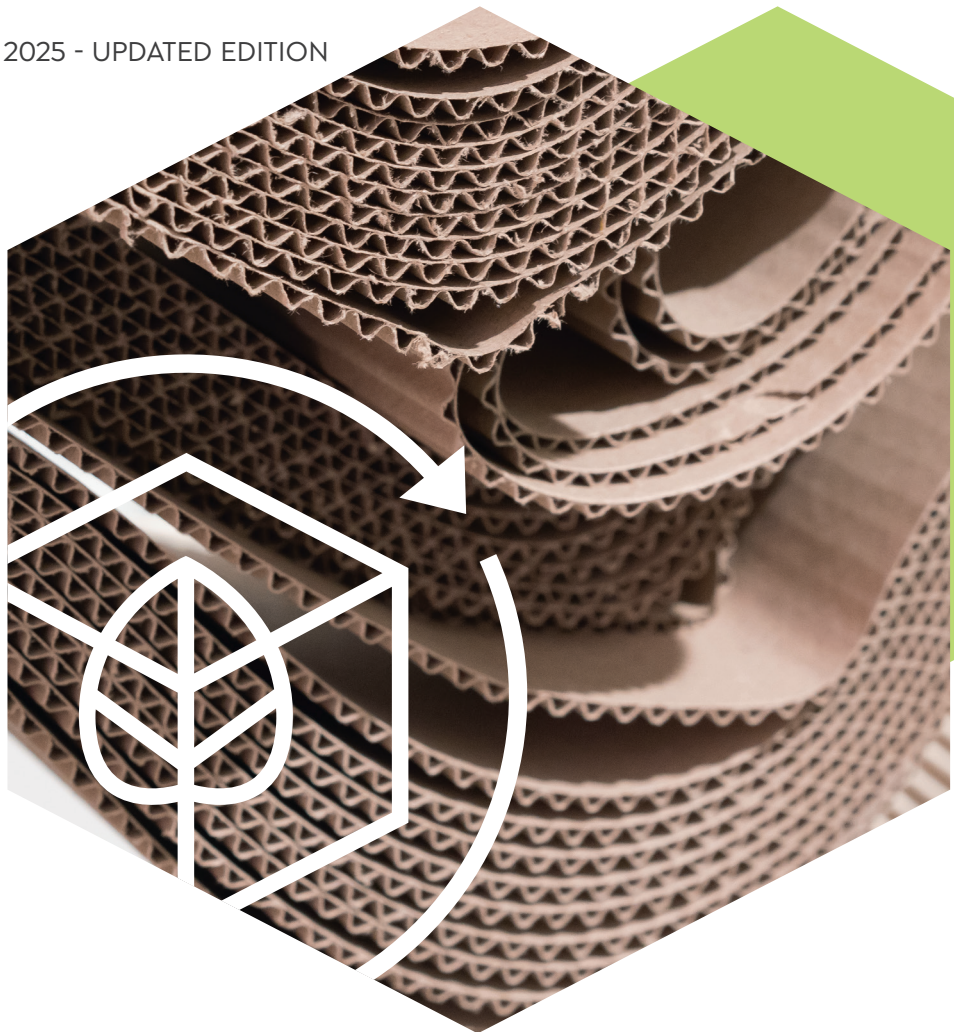
## List of changes

| Rev.          | Valid from     | Author           | Change(s)                                                         |
|---------------|----------------|------------------|-------------------------------------------------------------------|
| 01/2023-03-27 | March 2023     | Marie Geißler    | First version of the detailed work description                    |
| 01/2023-09-18 | September 2023 | Marie Geißler    | Adding multicomponent sample                                      |
| 01/2024-10-30 | October 2024   | Vanessa Wortmann | Preparation of beverage carton samples added                      |
| 01/2025-01-01 | January 2025   | Marie Geißler    | Adding Part II needs into document, restructuring of the document |



# 7. ANNEX DETAILED WORK DESCRIPTION: RECYCLABILITY LABORATORY TEST METHOD – PART I: PAPER MILL WITH CONVENTIONAL RECYCLING PROCESS

VERSION 9.1, APRIL 2025 - UPDATED EDITION  
(JUNE 2026)



# Contents

|                                                 |    |
|-------------------------------------------------|----|
| <b>Contents</b>                                 | 49 |
| <b>List of figures</b>                          | 50 |
| <b>List of abbreviations and symbols</b>        | 51 |
| <b>1 Purpose and scope</b>                      | 52 |
| <b>2 Sample preparation</b>                     | 52 |
| <b>3 Disintegration</b>                         | 53 |
| <b>4 Filtrate analysis</b>                      | 54 |
| <b>5 Screening</b>                              | 58 |
| <b>6 Macrostickies determination (optional)</b> | 70 |
| <b>7 Evaluation</b>                             | 72 |
| <b>8 Documentation</b>                          | 72 |

# List of figures

|                                                                                                          |    |
|----------------------------------------------------------------------------------------------------------|----|
| Figure 1: Paper sample diluted with tap water .....                                                      | 53 |
| Figure 2: Disintegrated sample in the standard disintegrator .....                                       | 53 |
| Figure 3: Total stock in a beaker .....                                                                  | 54 |
| Figure 4: filtration using Büchner filter .....                                                          | 54 |
| Figure 5: Filtrate presenting foam .....                                                                 | 54 |
| Figure 6. Filtrate presenting colouration .....                                                          | 54 |
| Figure 7: Evaporation residue (white stain) left on the aluminium tray .....                             | 55 |
| Figure 8: Cuvette used in the COD measurement .....                                                      | 56 |
| Figure 9: Cuvette in the heating block .....                                                             | 56 |
| Figure 10: Cuvette cooling on the cuvette rack .....                                                     | 56 |
| Figure 11: Cuvette on the photometer .....                                                               | 57 |
| Figure 12: Reject characterisation tree Version 2025 .....                                               | 58 |
| Figure 13: Coarse (above) and fine (below) rejects on the screening plates .....                         | 58 |
| Figure 14: Washing step .....                                                                            | 59 |
| Figure 15: Perforated plate (5 mm hole) UNI 11743 .....                                                  | 60 |
| Figure 16: Coarse screening in the Somerville fractionator .....                                         | 60 |
| Figure 17: Coarse reject after the water draining .....                                                  | 60 |
| Figure 18: Coarse reject after the coarse screening .....                                                | 61 |
| Figure 19: Detailed picture of reject components .....                                                   | 61 |
| Figure 20: Büchner funnel used for the residue filtration .....                                          | 61 |
| Figure 21: Filter papers cooling in desiccator .....                                                     | 61 |
| Figure 22: Coarse reject dried in the aluminium tray .....                                               | 61 |
| Figure 23: Sheet former and the couch roller .....                                                       | 63 |
| Figure 24: Lab sheet AC .....                                                                            | 63 |
| Figure 25: Drying oven used for the sheet adhesion test. ....                                            | 64 |
| Figure 26: Lab sheet with carrier board and cover sheet placed between metal plates in the oven ....     | 64 |
| Figure 27: Handsheets analysed in the sheet adhesion test AC with incident light .....                   | 65 |
| Figure 28: Lab sheets AC on the LED panel with transmitted light .....                                   | 65 |
| Figure 29: Slotted plate (150 µm slots) .....                                                            | 66 |
| Figure 30: Fine screening in the Somerville fractionator .....                                           | 66 |
| Figure 31: Fine reject after water draining .....                                                        | 66 |
| Figure 32: Fine reject on the 150 µm plate .....                                                         | 67 |
| Figure 33: Fine reject in detail .....                                                                   | 67 |
| Figure 34: Lab sheet AF .....                                                                            | 68 |
| Figure 35. Hand sheets analysed in the sheet adhesion test with incident light .....                     | 69 |
| Figure 36: Individual pictures of the cover sheet, lab sheet and carrier board with incident light ..... | 69 |
| Figure 37: Lab sheets AF on the LED panel with transmitted light .....                                   | 69 |
| Figure 38: Macrostickies screening reject on the 150 µm plate .....                                      | 70 |
| Figure 39: Reject dewatering on the filter paper. ....                                                   | 70 |
| Figure 40: Example of a prepared macrostickies specimen .....                                            | 71 |

# List of abbreviations and symbols

|            |                              |
|------------|------------------------------|
| <b>AC</b>  | Accept from coarse screening |
| <b>AF</b>  | Accept from fine screening   |
| <b>COD</b> | Chemical oxygen demand       |
| <b>OD</b>  | Oven dry                     |
| <b>ER</b>  | Evaporation residue          |
| <b>RC</b>  | Reject characterisation      |
| <b>RK</b>  | Rapid Köthen                 |
| <b>WSA</b> | Wet strength agents          |



# 1 Purpose and scope

This work instruction specifies the procedure for the:

**Determination of the technical recyclability according to the Paper and Board Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process.**

This document aims to address difficulties and/or issues with clarity in the method implementation.

## 2 Sample preparation

The sample preparation should be carried out as described in the detailed work description for the sample preparation Rev. 01/2025-01-01.

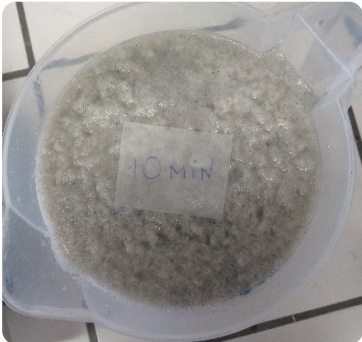
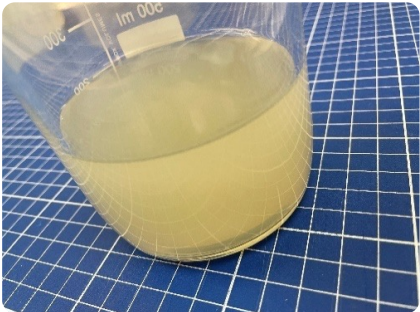
### 3 Disintegration

| Step Nr.                                        | Notes/Pictures                                                                                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard disintegrator following the ISO 5263-1 |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 1                                               | <b>Disintegrator check</b>                                                                                                     | <ul style="list-style-type: none"> <li>&gt; Check the disintegrator regularly to ensure the following conditions: <ul style="list-style-type: none"> <li>- The rotor shaft must run smoothly and be always positioned centrally in the vessel</li> <li>- The rotor must run at a specified speed</li> <li>- The rotor blades must be correctly adjusted (this can be checked with the help of a gauge)</li> <li>- The rotor blades must have specified dimensions (see Annex Standard 5263-1) and cannot be damaged</li> </ul> </li> <li>&gt; If the device is used properly, the other dimensions of the impact device should not change. However, they must be checked at regular intervals.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2                                               | <b>Dilution</b><br> <p>© 2022 PTS</p>        | <ul style="list-style-type: none"> <li>&gt; Weigh 50 g over dry (OD) pulp based on the dry content.</li> <li>&gt; Note down the real sample amount weighed in; considering that they may be a little less or more than the sample amount equivalent to 50 g OD may be used due to 3 x 3 cm pieces.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 3                                               | <b>Disintegration</b><br> <p>© 2022 PTS</p> | <ul style="list-style-type: none"> <li>&gt; Transfer the sample to the standard disintegrator container.</li> <li>&gt; Dilute the sample in the disintegrator using tap water at <math>(40 \pm 1)^\circ\text{C}</math> and with a mildly alkaline pH (7-8) until reaching a stock consistency of 2.5%.</li> <li>&gt; The dilution water is important for the determination of the evaporation residue. If possible, already take an extra 200 g of the water and save it for the determination of the evaporation residue.</li> <li>&gt; The diluted sample should be disintegrated immediately after the dilution to avoid soaking. Do not take longer than 30 s to do this.</li> <li>&gt; Set the revolution counter to 30,000, which is equivalent to about 10 min. of disintegration time.</li> <li>&gt; After completion of the disintegration process, transfer the sample to a beaker, without adding any water to it.</li> <li>&gt; Homogenise it in the beaker using a spoon or ladle and take the sample amount needed for the filtration analysis, approximately 300 g.</li> <li>&gt; Only after that, a spray bottle with tap water can be used to recover the sample attached to the disintegrator in the beaker with the rest of the sample.</li> <li>&gt; If there are undisintegrated pieces attached to the walls of the disintegrator vessel, they should not be introduced in the screening step. Instead, they need to be photographed and weighed separately with their dry weight added to the coarse reject amount.</li> </ul> |

**Figure 1.** Paper sample diluted with tap water

**Figure 2.** Disintegrated sample in the standard disintegrator

## 4 Filtrate analysis

| Step Nr. | Notes/Pictures                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <b>Sampling</b>  <p>© 2022 PTS</p> <p>Figure 3. Total stock in a beaker</p>                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>&gt; Perform the filtration immediately after the disintegration step.</li> <li>&gt; Homogenise the total stock in the beaker using a spoon or ladle.</li> <li>&gt; Weigh out around 300 g of the total stock using the analytical balance.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2        | <b>Filtration</b>  <p>© 2024 PTS</p> <p>Figure 4. Filtration using Buchner filter</p>  <p>© 2024 PTS</p> <p>Figure 5. Filtrate presenting foam</p>  <p>© 2024 PTS</p> <p>Figure 6. Filtrate presenting colouration</p> | <ul style="list-style-type: none"> <li>&gt; Use the suction flask and the Büchner funnel exclusively for water analysis tests.</li> <li>&gt; Place a filter paper (150 mm grade 388, basis weight 84 g/m<sup>2</sup>, filtration speed 10 s/10 ml, deposition range 12-15 µm) onto the Büchner funnel (150 mm).</li> <li>&gt; Attach the vacuum hose and turn the vacuum pump on.</li> <li>&gt; Filter 100 g of the total stock through the Büchner funnel, if possible, without wetting the filter paper. To prevent the sample from reaching the flask without passing through the filter, first pour a few drops of the sample to set the filter on the funnel and then proceed with the rest.</li> <li>&gt; Use the filtrate to rinse the suction flask and discard it.</li> <li>&gt; Separate the filter cake from the filter paper and return it to the total stock in the beaker.</li> <li>&gt; Place another filter paper (150 mm grade 388, basis weight 84 g/m<sup>2</sup>, filtration speed 10 s/10 ml, deposition range 12-15 µm) onto the Büchner funnel (150 mm).</li> <li>&gt; Filter another 200 g of the total stock via a Büchner funnel. To produce a filter cake as homogeneous as possible, first pour the sample over the filter and then turn the pump on.</li> <li>&gt; Retrieve the filtrate from the suction flask and filter it via the Büchner funnel again using the same paper filter. Pour the loop sample very carefully to do not cause big holes on the filter cake.</li> <li>&gt; Pour the filtrate into a clean glass bottle and label it.</li> <li>&gt; Photograph the paper filter with the filter cake in transmitted light.</li> <li>&gt; Photograph the filtrate using a suitable background, especially if it presents some colouration.</li> <li>&gt; Return the filter cake to the pulp stock as described above.</li> <li>&gt; After use, wash the funnel and the flask with deionised water.</li> </ul> |

# Evaporation residue

| Step Nr. | Notes/Pictures                                                                                                                                                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <p><b>Evaporation residue</b></p>  <p><b>Figure 7.</b> Evaporation residue (white stain) left on the aluminium tray</p> <p>© 2022 PTS</p> | <ul style="list-style-type: none"> <li>&gt; You can decide to prepare the evaporation residue test right after the filtration or at the end of the whole test. The second option is preferable because the disintegrated sample does not have to stand longer before the screening steps. If the second option is taken, leave the filtrate in the bottle at room temperature.</li> <li>&gt; Pour a known amount (e.g. 70 g) of filtrate on a previously weighed aluminium tray.</li> <li>&gt; The size of aluminium tray must be compatible with the amount of liquid poured on it and the size of the oven.</li> <li>&gt; Note down the mass of the empty aluminium tray “m1” and the mass of the filtrate that was taken in “m2”.</li> <li>&gt; Repeat the procedure to have a double determination of the evaporation residue.</li> <li>&gt; Place the trays with the filtrate and the water in the drying oven at (105 ± 2) °C to remove the solvent.</li> <li>&gt; Determine the residue in line with DIN 38409-1:1987-01.</li> <li>&gt; When there is apparently no more solvent in the tray, take it out of the oven for the first time.</li> <li>&gt; In order to control the residue mass, cool the tray in the desiccator for around 30 min. before weighing it.</li> <li>&gt; Repeat the process until the residue reaches a constant mass value ‘m3’, and note it down.</li> <li>&gt; As the packaging sample is disintegrated with tap water, it is necessary to consider its influence on the evaporation residue.</li> <li>&gt; Measure the evaporation residue of the tap water performing the procedures described above. The water does not need to be filtrated.</li> <li>&gt; Enter the all values in the Excel spreadsheet.</li> </ul> |
| 2        | <p><b>Calculation</b></p>                                                                                                                                                                                                  | <p>&gt; The evaporation residue (ER) of the sample is calculated as follows:</p> $ER_{filtrate} (g \text{ residue} / g \text{ filtrate}) = \frac{m3 (g) - m1 (g)}{m2 (g)}$ $ER_{sample} (g \text{ residue} / g \text{ filtrate}) = ER_{filtrate} (g / g) - ER_{tap \text{ water}} (g / g)$ <p>m1 = mass of the empty aluminium tray<br/> m2 = mass of the filtrate that was taken in<br/> m3 = mass of tray after drying the filtrate</p> <p>The evaporation residue can be calculated in relation to the used stock suspension. As approximately 50 g of sample was disintegrated in 2 L of water, the packaging mass is 25 g pulp /L. Thus, the evaporation residue in percentage can be calculated as follows:</p> $\frac{ER_{sample} (\frac{g}{g})}{Packaging \text{ mass } (\frac{g}{L})} \times 1000 (\frac{g}{L}) \times 100\% = ER_{sample} (\%)$ <p>The results must be given to one decimal place.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |



## Chemical oxygen demand (optional)

| Step Nr. | Notes/Pictures                                                                                                                                                                                                                                                                                                                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <p><b>Cuvette test</b></p>  <p>© 2022 PTS</p> <p><b>Figure 8.</b> Cuvette used in the COD measurement</p>                                                                                                                                                          | <ul style="list-style-type: none"> <li>&gt; An optional process is to prepare a chemical oxygen demand (COD) test right after the filtration or at the end of the whole test (if COD is conducted it is preferable to do it at the end of the test because the disintegrated sample does not have to stay long before the screening steps. Taking the second option, it is advised to leave the filtrate in the bottom at room temperature.</li> <li>&gt; If direct measurement is not possible, store the filtrate in a glass bottle in the refrigerator at approximately 4 °C for maximum 24 h.</li> <li>&gt; Record in the Excel spreadsheet and in the test report if the filtrate was stored in the refrigerator and the duration.</li> <li>&gt; Select the COD cuvette with the expected measuring range for the tests according to ISO 15705.</li> <li>&gt; Perform a double determination of the COD (2 cuvettes).</li> <li>&gt; Attention: the following instructions for the determination of COD might change depending on the cuvette test selected! Follow the instructions given in the test packaging.</li> <li>&gt; Write the sample number on the cuvette lid (the barcode must remain legible and the glass must be clean for measurement).</li> <li>&gt; Invert the cuvette to homogenise the solution.</li> <li>&gt; Shake the glass bottle containing the filtrate.</li> <li>&gt; Measure 2 ml filtrate using a pipette. Depending on the cuvette test range, a different volume of the filtrate is required (for details, see the instructions on the packaging).</li> <li>&gt; Add the filtrate to the cuvette carefully (run along the edge).</li> <li>&gt; Close the cuvette securely.</li> <li>&gt; If the cuvette solution immediately presents a green coloration, as in Figure 8, discard the sample and either use a higher measuring range or use filtrate diluted with deionised water.</li> <li>&gt; Invert the cuvette containing the preparation.</li> </ul> |
| 2        | <p><b>Boiling</b></p>  <p>© 2022 PTS</p> <p><b>Figure 9.</b> Cuvette in the heating block</p>  <p>© 2022 PTS</p> <p><b>Figure 10.</b> Cuvette cooling on the cuvette rack</p> | <ul style="list-style-type: none"> <li>&gt; Place the cuvettes in the heating block.</li> <li>&gt; Set the heating block to work for 2 h at 148 °C.</li> <li>&gt; Remove the hot cuvette from the heating block.</li> <li>&gt; Carefully invert the cuvette while it is still warm.</li> <li>&gt; Cool the cuvette to room temperature on the cuvette rack.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Step Nr. | Notes/Pictures                                                                                                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3        | <b>Photometry measurement</b>  <p>Figure 11. Cuvette on the photometer</p> | <ul style="list-style-type: none"> <li>&gt; Start the photometer.</li> <li>&gt; Do not stir (up) the sediment in the cuvette any more.</li> <li>&gt; The outside of the cuvette must be clean; wipe it clean if necessary.</li> <li>&gt; Place the cuvette in a photometer and perform the measurement (absorbance at 600 nm).</li> <li>&gt; Enter the results in the Excel spreadsheet.</li> <li>&gt; Repeat the same procedure using tap water instead of filtrate.</li> <li>&gt; If the COD of the tap water is higher than 15 mgO<sub>2</sub>/L, it is recommended to measure it every time a sample is going to be tested.</li> <li>&gt; If the COD of the tap water is lower than 15 mgO<sub>2</sub>/L, it is recommended to measure it every 3 months.</li> </ul>                                                                                |
| 4        | <b>Calculation</b>                                                                                                                                          | <ul style="list-style-type: none"> <li>&gt; The COD of the sample is calculated as follows: <math display="block">  \begin{aligned}  COD_{sample} \left( \frac{mg \ O^2}{L} \right) &amp;= COD_{filtrate} \left( \frac{mg \ O^2}{L} \right) \\  &amp;- COD_{tap \ water} \left( \frac{mg \ O^2}{L} \right)  \end{aligned}  </math> </li> <li>&gt; The COD value must be calculated in relation to the used stock suspension. As approximately 50 g of sample was disintegrated in 2 L of water, the packaging mass is 25 g pulp/L. Thus, the COD is calculated as follows: <math display="block">  \begin{aligned}  COD \ (g \ O^2 / kg \ Packaging) &amp;= \frac{COD \ \left( \frac{mg \ O^2}{L} \right)}{Packaging \ mass \ \left( \frac{g}{L} \right)}  \end{aligned}  </math> </li> </ul> <p>The results must be given with two decimal places.</p> |

## Biological oxygen demand (optional)

Detailed description will be added in the next version of this document.

# 5 Screening

## Reject characterisation

**Step Nr.** **Notes/Pictures**

**Description**

This chapter explains how the reject characterisation should be performed after the coarse- and fine-screening steps and according to the reject characterisation tree. The screening steps are described next.

1

|                          |                                                                                                             |                                                                                                                                            |                                                                                                 |
|--------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>Disintegration</b>    | <b>Not disintegrated material</b><br>Fibrous based pieces with original cut size and/or encapsulated fibres | <b>Partly disintegrated material</b><br>Fibrous based pieces with sharp edges, smaller than original cut size, not broken down into flakes |                                                                                                 |
| <b>Fragmentation</b>     | <b>Unfragmented</b><br>Original cut size pieces                                                             | <b>Partly fragmented</b><br>Medium pieces (size > 1 cm in one dimension), sharp edges                                                      | <b>Completely fragmented</b><br>Granular pieces (size ≤ 1 cm in one dimension), no sharp edges. |
| <b>Amount (optional)</b> | <b>Significant (S)</b><br>Extensive quantity, relevant in Part I and III                                    | Field <b>S</b> is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III)        |                                                                                                 |

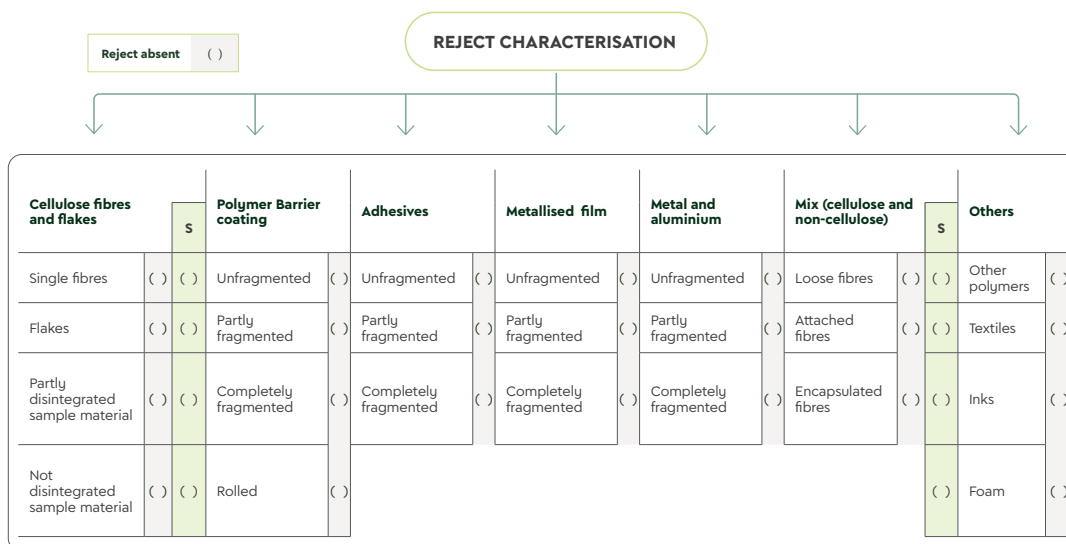


Figure 12. Reject characterisation tree Version 2025

2

### Instructions to fill the reject characterisation tree

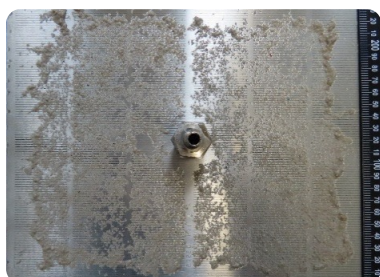


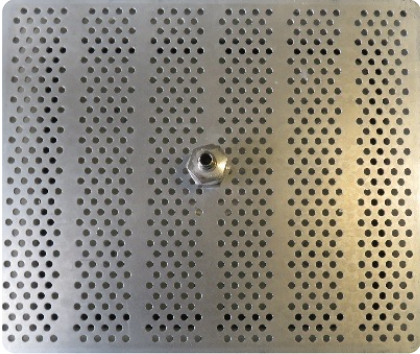
Figure 13. Coarse (above) and fine (below) rejects on the screening plates

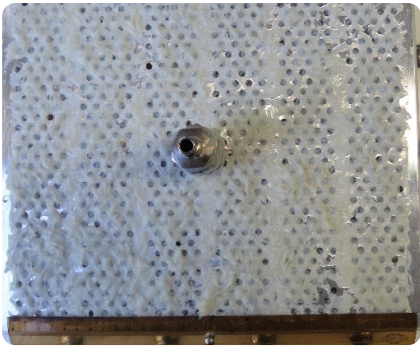
- > The reject characterisation should be carried out after coarse and fine reject screening. Please do it while the rejects are still on the screening plate, so the different reject components can be better visualised.
- > Fill the reject characterisation tree for the coarse and fine reject separately. There is space for that in the Excel spreadsheet.
- > Check the definitions of degree of disintegration (partly and not disintegrated) and of degree of fragmentation (completely, partly and unfragmented) on the top right of the tree. If not clear, check the example pictures in the Annex Reject Characterisation.
- > If there is no reject left on the plate, tick the box 'reject absent'.
- > If there are rejects left on the plate, check to which category they belong and its degree of fragmentation or disintegration (if cellulose fibres and flakes). Tick the orange boxes according to what has been observed, and tick as many boxes as needed.
- > The category mix (cellulose and non-cellulose) should only be selected if there are fibres and/or flakes combined with polymer barrier, metallised films, metal/aluminium, and/or others. Visual examples can be found in the Annex Reject Characterisation.

| Step<br>Nr. | Notes/Pictures                                                                                                                                                                                                                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2           | <p><b>Instructions to fill the reject characterisation tree</b></p>  <p><b>Figure 14.</b> Washing step</p> | <ul style="list-style-type: none"> <li>&gt; To differentiate loose and attached fibres and flakes, insert 1-2 reject pieces into a beaker with tap water. Then, manually stir the reject pieces in the water to release as much entangled fibres and flakes as possible. Do not physically delaminate structures or rub the reject pieces. Check if the reject pieces still contain fibres and flakes attached to them, or if they were washed out.</li> <li>&gt; If a large amount of fibres and flakes were washed out in the washing step, try to recover them using a pre-weighted filter paper and include their weight in the reject determination.</li> <li>&gt; Exclusively for categories 'cellulose fibres and flakes' and 'mix', there is an extra optional checklist (column in grey) for significant amounts of fibres and flakes.</li> <li>&gt; The overall impression of the test should be considered. For example, if there is only a single polymer piece with significant fibres attached to it, the S field should not be selected, because it does not represent the overall impression of the test.</li> <li>&gt; The S field is relevant for the 20 min. disintegration option in PART I.</li> <li>&gt; If there is additional information about the reject characterisation that was not covered by the tree (e.g. a type of reject that is not represented in the tree) write it down in the 'additional comments' section.</li> </ul> |



## Determination of the 5 mm hole residue (coarse reject)

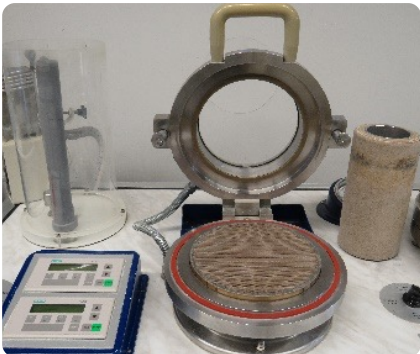
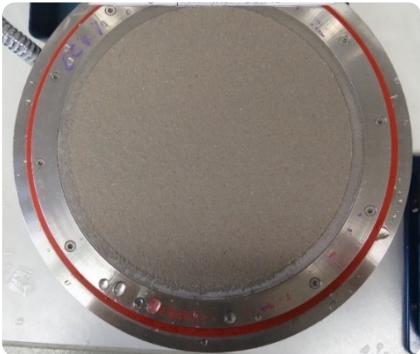
| Step Nr. | Notes/Pictures                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <b>Somerville check</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>&gt; Check the Somerville Fractionator regularly to ensure the following conditions: <ul style="list-style-type: none"> <li>- The space below the screening plates should be clean, some adhesives and fibres can be stuck on it and be carried over to the next sample</li> <li>- The plates should be clean, especially the fine-screening plate, where fibres tend to get attached</li> <li>- The spray nozzle should follow the TAPPI T 275 sp-12 specifications</li> <li>- The slots of the fine-screening plate cannot be obstructed by the structure of the screen box</li> <li>- The water flow should be 8.6 l/min and might be affected by the type of screening plate used</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 2        | <b>Sampling</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>&gt; Use the total amount of the sample suspension for the coarse screening (including the filter cake recovered from the filtration analysis).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 3        | <b>Sampling Procedure</b><br> <p>Figure 15. Perforated plate (5 mm hole) UNI 11743</p>  <p>Figure 16. Coarse screening in the Somerville fractionator</p>  <p>Figure 17. Coarse reject after the water draining</p> | <ul style="list-style-type: none"> <li>&gt; Place the 5 mm perforated plate into the Somerville fractionator.</li> <li>&gt; Attach the instrument screen box tightly.</li> <li>&gt; Attach the instrument hose onto the plate nozzle.</li> <li>&gt; Place the glass protection cover over the screen box.</li> <li>&gt; Ensure that the weir is positioned in the bottom of the weir box.</li> <li>&gt; Start the water flow and wait until the water level in the screening box is approximately 2.5 cm to start pouring the sample onto the screening plate.</li> <li>&gt; When the sample starts to overflow through the weir, start counting the screening time using a timer.</li> <li>&gt; During the screening process, the sorted suspension (AC) is collected in a barrel.</li> <li>&gt; After 5 min. turn off the motor and the water supply.</li> <li>&gt; Pull the weir out the weir box, so the water can be drained.</li> <li>&gt; Open the unit when the water has completely drained off.</li> <li>&gt; Carefully open the screening box.</li> <li>&gt; Transfer the materials stuck below the screening plate and in the weir box of the Somerville into the barrel, where the 'accept material' is collected.</li> </ul> |

| Step Nr. | Notes/Pictures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4        | <p><b>Photo documentation</b></p>  <p><b>Figure 18.</b> Coarse reject after the coarse screening</p>  <p><b>Figure 19.</b> Detailed picture of reject components</p>                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>&gt; Photograph the residue on the perforated plate using a ruler for scale.</li> <li>&gt; Photograph the perforated plate again, zooming in on the reject.</li> <li>&gt; If applicable, separate the different components in the coarse reject and photograph them on a dark background using a scale indicator.</li> <li>&gt; Stretch the reject components to show their size clearly in the picture. This is important to evaluate the reject fragmentation.</li> <li>&gt; If applicable, show in the picture fibres attached to non-paper components.</li> <li>&gt; Characterise the rejects according to the reject characterisation tree explained in chapter 5.1.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 5        | <p><b>Measurement of the coarse reject</b></p>  <p><b>Figure 20.</b> Büchner funnel used for the residue filtration</p>  <p><b>Figure 21.</b> Filter papers cooling in desiccator</p>  <p><b>Figure 22.</b> Coarse reject dried in the aluminium tray</p> | <ul style="list-style-type: none"> <li>&gt; Carefully transfer the residue to a vessel using a dough scraper or squeeze bottle. Be sure that all fragments trapped on the plate are also recovered.</li> <li>&gt; Place a weighed filter paper (125 mm grade 388, basis weight 84 g/m<sup>2</sup>, filtration speed 10s/10ml, and deposition range 12-15 µm) on the Büchner filter and pour the residue over it.</li> <li>&gt; If the reject does not fit on the filter paper described above (125 mm), place it in a previously calibrated aluminium tray or filter paper (240 mm grade 1289, basis weight 84 g/m<sup>2</sup>, filtration speed 20 s/10ml, deposition range 8-12 µm) using the Rapid Köthen sheet former.</li> <li>&gt; Place the filter paper or the aluminium tray in the oven at (105 ± 2) °C, until the mass becomes constant.</li> <li>&gt; Allow the filter paper to cool in a desiccator.</li> <li>&gt; Weigh the paper filter on the analytical balance.</li> <li>&gt; Transfer the results to the Excel spreadsheet, and calculate the coarse reject (dry-weight) in respect to the starting sample.</li> <li>&gt; Round the coarse reject to the first decimal place.</li> </ul> |

## Determination of the consistency after the coarse screening

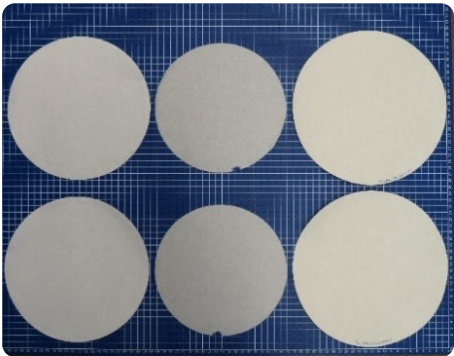
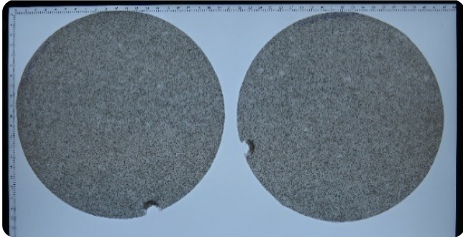
| Step Nr. | Notes/Pictures                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| 1        | <b>Determination of the consistency</b> | <ul style="list-style-type: none"> <li>&gt; The determination of the stock consistency is carried out according to ISO 4119 as follows (stock consistency between 0.05 % and 0.3 %).</li> <li>&gt; Carefully homogenise the screened stock collected in the AC barrel.</li> <li>&gt; Place the sampling vessel on the analytical balance and set it to zero before weighing.</li> <li>&gt; Transfer approximately 1000 g of the suspension into the vessel.</li> <li>&gt; Weigh the mass of the sample taken (m1).</li> <li>&gt; Place a pre-weighted filter paper (125 mm grade 388, basis weight 84 g/m<sup>2</sup>, filtration speed 10 s/10ml, deposition range 12-15 µm) on the Büchner funnel (diameter 125 mm) and moisten it with water using a spray bottle.</li> <li>&gt; Make sure that all pores in the Buechner funnel are covered by the filter paper.</li> <li>&gt; Apply negative pressure by means of a vacuum pump.</li> <li>&gt; Place the sample over the paper filter into the Büchner funnel.</li> <li>&gt; Rinse the sample vessel with water and pour the liquid through the funnel taking care not to not lose any sample residue.</li> <li>&gt; Wait until there is no more water in suspension in the Büchner funnel.</li> <li>&gt; Remove the filter paper containing the pulp cake from the funnel.</li> <li>&gt; Return any material remaining on the funnel wand to the paper filter.</li> <li>&gt; Place the filter paper between two cover sheets and dry it in the dryer of the sheet former for 7 min. at (93 ± 4) °C.</li> <li>&gt; Turn the filter paper around and dry it again for 7 min at (93 ± 4) °C.</li> <li>&gt; Transfer the filter paper to a desiccator to cool it down.</li> <li>&gt; Determine the dry mass of the filter cake on the analytical balance and document the result as m3.</li> <li>&gt; Observations of the consistency should be used to determine the sample amount needed for the fine screening.</li> <li>&gt; After the whole Part I method is concluded, the paper filter used for determining the consistency should be dried in the oven at 105 °C overnight.</li> <li>&gt; On the following day, the paper filter should be first laid into the desiccator for at least 10 min. before being weighed.</li> <li>&gt; Correct the stock consistency against the day before using the paper filter weight measured after the oven drying.</li> <li>&gt; If the stock consistency has changed after the oven drying process, the input for the fine screening should also be corrected. This can be done automatically in the Excel spreadsheet.</li> </ul> |
| 2        | <b>Calculation of the consistency</b>   | $c (\%) = \frac{m_3 (g) - m_2 (g)}{m_1 (g)} \times 100$ <p> m1 = mass of sample before drying<br/> m2 = mass of filter paper without sample<br/> m3 = mass of sample with filter paper after drying </p> <p>The results must be given with two decimal places.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

# Sheet formation after coarse screening, including quality assessment

| Step Nr. | Notes/Pictures                                                                                                                                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <p><b>Sheet formation (AC)</b></p>  <p>Figure 23. Sheet former and the couch roller</p> | <ul style="list-style-type: none"> <li>&gt; Homogenise the total amount of the sample carefully before sampling.</li> <li>&gt; Take approximately 2000 g of pulp from the barrel, in which the 'accept material' was collected during the screening to form the first lab sheet.</li> <li>&gt; The target weight for the lab sheet is <math>(60 \pm 2) \text{ g/m}^2</math> (approximately 1.8 g); if it is not reached with 2000 g, adjust the amount of pulp required for sheet formation.</li> <li>&gt; The lab sheet formation should be carried out in the Rapid Köthen according to ISO 5269-2 (AC1). For that, follow the steps: <ul style="list-style-type: none"> <li>- Pump approx. 4 l of water into the sheet former column.</li> <li>- Pour the sample into the sheet former column until the mark of 7 l.</li> <li>- If it is necessary to pour more sample into the sheet former, drop the column before adding the rest; it is important to have a maximum volume of 7 l in the sheet former before the bubbling step.</li> <li>- Bubble the sample for 5-10 s; if it is necessary to pour more sample into the sheet former, drop the column before adding the rest; it is still important that the maximum volume in the sheet former is 7 l.</li> <li>- Let the sample settle for 5-10 s.</li> <li>- When the water has completely passed through the sieve, aspirate the water for 10-15 s, or until there is no more water in the column.</li> <li>- Open the sheet former column and photograph the sheet.</li> <li>- Place a carrier board over the formed sheet and roll a couch roller over it (one time lengthwise and one time crosswise).</li> <li>- Remove the screen frame from the sheet former and knock the laboratory sheet out of it.</li> </ul> </li> <li>&gt; Form three more lab sheets following the steps above.</li> <li>&gt; The second sheet (AC2) is only for visualisation (optional).</li> <li>&gt; The other two sheets (AC3 and AC4) are used to perform the sheet adhesion test and to evaluate the optical inhomogeneities.</li> </ul> |
| 2        | <p><b>Photo documentation</b></p>  <p>Figure 24. Lab sheet AC</p>                     | <ul style="list-style-type: none"> <li>&gt; Photograph each lab sheet.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

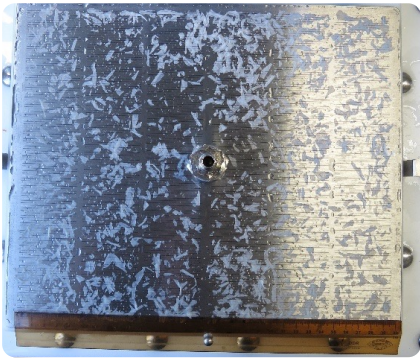


| Step Nr. | Notes/Pictures                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3        | <p><b>Sheet adhesion test</b></p>  <p><b>Figure 25.</b> Drying oven used for the sheet adhesion test.3</p>  <p><b>Figure 26.</b> Lab sheet with carrier board and cover sheet placed between metal plates in the oven</p> | <ul style="list-style-type: none"> <li>&gt; Place the lab sheet between a carrier board (bottom side) and a cover sheet (top side) and dry it in the dryer of the sheet former for 7 min. at <math>(93 \pm 4) ^\circ\text{C}</math>.</li> <li>&gt; Place the lab sheet with carrier board and cover sheet flat between two preheated metal plates (pressure of 1.18 kPa or 3.7 kg) into the drying oven and dry it at <math>(130 \pm 2) ^\circ\text{C}</math> for 2 min.</li> <li>&gt; Place the lab sheet with carrier board and cover sheet in the desiccator for 10 min. to cool down (time is measured using a stopwatch).</li> <li>&gt; After taking it out of the desiccator, perform both sheet adhesion tests immediately by separating the carrier board first and then the cover sheet in a 'fluent motion' from the lab sheet. The separation of the carrier board and cover sheet should not take longer than 1-3 s each.</li> <li>&gt; Weigh the lab sheet on the analytical balance.</li> <li>&gt; Observe the carrier boards, handsheets and cover sheets using 'incident light' and check for the presence of fibre pickups, paper fragments, and damage on them.</li> <li>&gt; For more information on the evaluation of the sheet adhesion check the Annex Sheet Adhesion Test.</li> <li>&gt; Record the observations in the laboratory Excel spreadsheet.</li> </ul> |
| 4        | <p><b>Visual impurities</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>&gt; Use the handsheets from the sheet adhesion test to assess the visual impurities according to the Annex Visual Impurities.</li> <li>&gt; Check for visual impurities on the handsheets visually with and without the aid of a source of transmitted light.</li> <li>&gt; The handsheets can be placed on a LED panel for the visualisation in transmitted light.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 5        | <p><b>Labelling</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>&gt; Label all sheets with their number and sample number.</li> <li>&gt; The cover sheet and the carrier board must be labelled in the same way as the lab sheets.</li> <li>&gt; Regarding the carrier board, the side that was in touch with the lab sheet must be labelled.</li> <li>&gt; Regarding the cover sheet, the side that was not in touch with the lab sheet must be labelled.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Step<br>Nr. | Notes/Pictures                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6           | <p><b>Photo documentation</b></p>  <p><b>Figure 27.</b> Handsheets analysed in the sheet adhesion test AC with incident light</p>  <p><b>Figure 28.</b> Lab sheets AC on the LED panel with transmitted light</p> | <ul style="list-style-type: none"> <li>&gt; Photograph the sheets on the cutting map, using the auxiliary lines to align the photo.</li> <li>&gt; Place the carrier board at the right-hand side and at the lowest line.</li> <li>&gt; Place the lab sheet in the middle and two lines above the carrier board.</li> <li>&gt; Place the cover sheet along the left-hand side and one line above the carrier board.</li> <li>&gt; Photograph the lab sheets on the LED panel, showing the measurement scale.</li> </ul> |

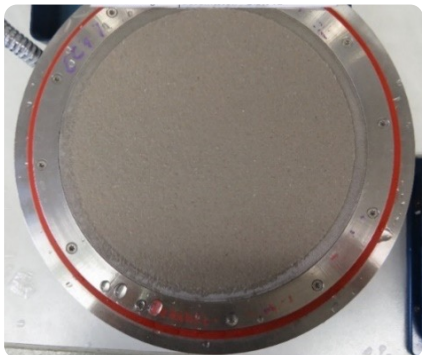
## Determination of the 150 µm slot residue (fine reject)

| Step Nr.                                             | Notes/Pictures                                                                                                                                                                                                                                                                                                                                                                                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Somerville fractionator according to TAPPI T275 sp18 |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 1                                                    | <b>Sampling</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>&gt; Homogenise the total amount of the sample carefully before sampling.</li> <li>&gt; Take 20 g OD from the AC barrel for the fine screening.</li> <li>&gt; Please note, even a high volume must be filled in a relatively short time, a thickening of the 'accept' after coarse screening is not allowed according to the method.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2                                                    | <b>Screening procedure</b><br> <p>Figure 29. Slotted plate (150 µm slots)</p>  <p>Figure 30. Fine screening in the Somerville fractionator</p>  <p>Figure 31. Fine reject after water draining</p> | <ul style="list-style-type: none"> <li>&gt; Place the 150 µm slotted plate into the Somerville fractionator.</li> <li>&gt; Set the Somerville as described in chapter 5.2.</li> <li>&gt; Start the water flow and wait until the water level in the screening box is approximately 2.5 cm to start pouring the sample onto the screening plate. When the overflow through the weir starts, start the 20 min. screening time using a stopwatch.</li> <li>&gt; The pouring time should be as short as possible and not be longer than 4 min.</li> <li>&gt; Record the time needed to pour the sample, especially in case more time was needed.</li> <li>&gt; If possible, collect all the accept material (AF) in a barrel and use with a thickener to reduce the water volume and perform the sheet adhesion test and the assessment of visual impurities.</li> <li>&gt; If no thickener is available collect at least the first 50 l of AF in a barrel and proceed with the sheet adhesion test and the assessment of visual impurities.</li> <li>&gt; If thickener is used during the fine-screening step, make sure no unforeseen washing effect of the fibre suspension is happening and there is no false positive reduction/washing of adhesive impurities.</li> <li>&gt; After 20 min. turn off the motor and then the water supply.</li> <li>&gt; Pull the weir out of the weir box, so the water can be drained.</li> <li>&gt; Open the unit when the water has completely drained off.</li> <li>&gt; Carefully open the screening box and perform the photo documentation stage.</li> <li>&gt; Transfer the fibres stuck in the screening box and beyond the screen of the Somerville into the barrel, where the sorted material is collected.</li> </ul> |

| Step Nr. | Notes/Pictures                                                                                                                                                                                                                                                                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3        | <p><b>Photo documentation</b></p>  <p>Figure 32. Fine reject on the 150 µm plate</p>  <p>Figure 33. Fine reject in detail</p> | <ul style="list-style-type: none"> <li>&gt; Photograph the fine-screening residue on the slotted plate using a scale indicator.</li> <li>&gt; Take detailed pictures of the residues, if necessary.</li> <li>&gt; Characterise the rejects according to the reject characterisation tree explained in chapter 5.1.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 4        | <p><b>Measurement of fine reject</b></p>                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>&gt; Carefully transfer the residue into a vessel using a dough scraper or squeeze bottle. Be sure that all fragments trapped on plate are also recovered.</li> <li>&gt; Place a weighed filter paper (125 mm grade 388, basis weight 84 g/m<sup>2</sup>, filtration rate 10 s/10ml filtration range 12-15 µm) on the Büchner filter and pour the residue over it.</li> <li>&gt; If the reject does not fit on the filter paper (125 mm), place it in a previously calibrated aluminium tray or filter paper (240 mm) using the Rapid Köthen sheet former.</li> <li>&gt; Place the filter paper or the aluminium tray in the oven at (105 ± 2) °C, until the mass becomes constant.</li> <li>&gt; Weigh the paper filter on the analytical balance.</li> <li>&gt; Transfer the results to the Excel spreadsheet.</li> </ul> |



## Sheet formation after fine screening, including quality assessment

| Step Nr. | Notes/Pictures                                                                                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | <b>Sheet formation</b>                                                                                                                      | <ul style="list-style-type: none"> <li>&gt; Homogenise the total amount of the sample carefully before sampling.</li> <li>&gt; Take approximately 9000 g of pulp from the AF barrel.</li> <li>&gt; Form a sample sheet using the sheet former as in chapter 5.4.</li> <li>&gt; The target weight is <math>(60 \pm 2)</math> g/m<sup>2</sup>; if it is not reached, adjust the amount of pulp required for sheet formation.</li> </ul> |
| 2        | <b>Photo documentation</b>  <p>Figure 34. Lab sheet AF</p> | <ul style="list-style-type: none"> <li>&gt; Photograph each lab sheet.</li> </ul>                                                                                                                                                                                                                                                                                                                                                     |
| 3        | <b>Sheet adhesion test</b>                                                                                                                  | <ul style="list-style-type: none"> <li>&gt; Perform it as in chapter 5.4.</li> </ul>                                                                                                                                                                                                                                                                                                                                                  |
| 4        | <b>Visual impurities</b>                                                                                                                    | <ul style="list-style-type: none"> <li>&gt; Perform it as in chapter 5.4.</li> </ul>                                                                                                                                                                                                                                                                                                                                                  |
| 5        | <b>Labelling</b>                                                                                                                            | <ul style="list-style-type: none"> <li>&gt; Perform it as in chapter 5.4.</li> </ul>                                                                                                                                                                                                                                                                                                                                                  |

Step  
Nr.

Notes/Pictures

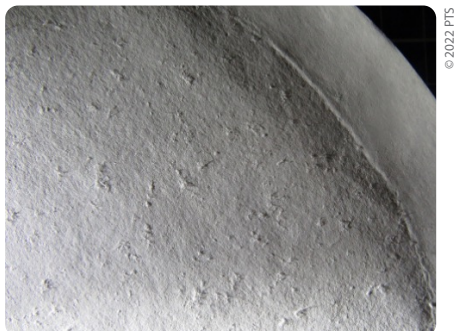
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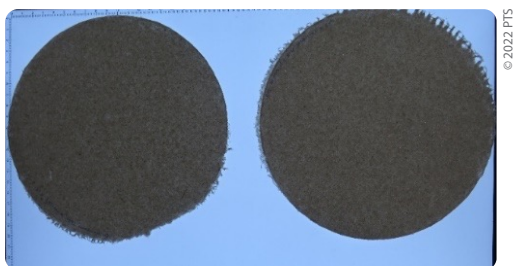
**Photo documentation**



**Figure 35.** Hand sheets analysed in the sheet adhesion test with incident light



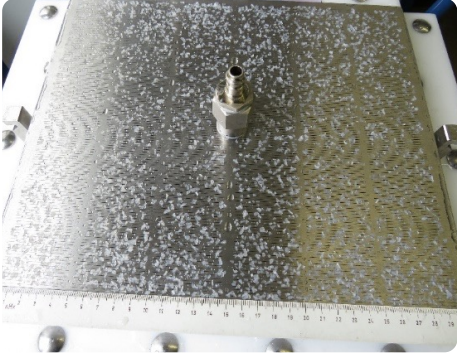
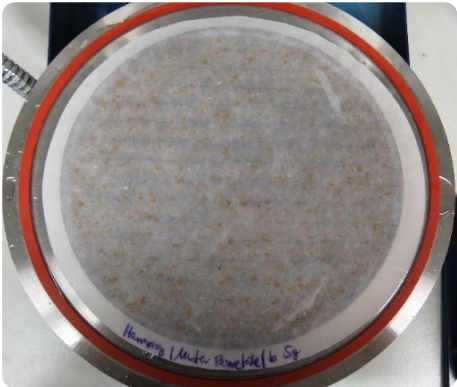
**Figure 36.** Individual pictures of the cover sheet, lab sheet and carrier board with incident light

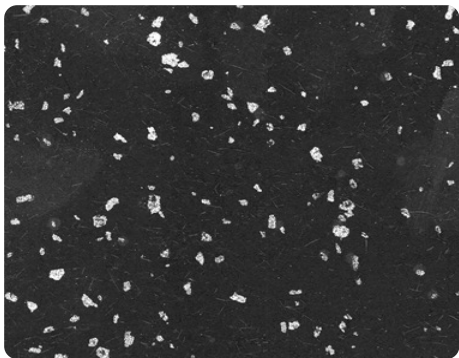


**Figure 37.** Lab sheets AF on the LED panel with transmitted light

- > Photograph the sheets on the cutting map, using the auxiliary lines to align the photo, as in chapter 5.4.
- > Photograph each sheet individually with a source of incident light.
- > Photograph the lab sheets on the LED panel, showing the measurement scale.

## 6 Macrostickies determination (optional)

| Step Nr.                                       | Notes/Pictures                                                                                                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Somerville fractionator according to ISO 15360 |                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1                                              | <b>Sampling</b>                                                                                                                                 | <ul style="list-style-type: none"> <li>&gt; Homogenise the 'accept' from the coarse screening carefully before sampling.</li> <li>&gt; Take 5 g OD from the AC barrel for the macrostickies determination.</li> <li>&gt; Perform a double determination.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2                                              | <b>Macrostickies screening</b>                                                                                                                  | <ul style="list-style-type: none"> <li>&gt; Place the 150 µm slotted plate into the Somerville fractionator.</li> <li>&gt; Set the Somerville as described in chapter 5.2.</li> <li>&gt; When the overflow through the weir starts, start the 10 min. screening time using a stopwatch.</li> <li>&gt; Turn off the motor and the water supply after the screening time.</li> <li>&gt; Open the unit carefully when the water has completely drained off.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 3                                              | <b>Photo documentation</b><br> <p>© 2022 PTS</p>              | <ul style="list-style-type: none"> <li>&gt; Photograph the residue on the slotted plate using a scale indicator.</li> <li>&gt; Take a detail picture if necessary.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 4                                              | <b>Reject dewatering of the reject</b><br> <p>© 2022 PTS</p> | <ul style="list-style-type: none"> <li>&gt; Carefully transfer the residue into a beaker using a dough scraper or squeeze bottle.</li> <li>&gt; Label the filter sheet (grade 1289 diameter 240 mm) using a pencil, noting the sample name, oven-dry quantity and slot width.</li> <li>&gt; Place the labelled filter sheet on Rapid Köthen sheet former, moisten it with a squeeze bottle, smooth it by hand and close the sheet former.</li> <li>&gt; Aspirate the water from the 'reject' in the Rapid Köthen sheet former.</li> <li>&gt; Start the sheet former on the manual mode.</li> <li>&gt; Pump water into it to approximately 2 l.</li> <li>&gt; Add the sample and bubble it for approx. 8 s.</li> <li>&gt; Switch to reject dewatering when the water has completely passed through the sieve, and aspirate it dry for approx. 10-15 s, or until there is no more water in the column.</li> <li>&gt; Rinse off adhering particles in the sheet former column using a squeeze bottle.</li> <li>&gt; If the stickies quantity on the filter paper is too high (they overlap each other), they should be divided onto several filter papers.</li> <li>&gt; A reduction of screening amount or an extension of screening time is not foreseen.</li> <li>&gt; To split the macrostickies onto several filter papers, divide them into 2 or more equal parts and place them on 2 or more filters. If possible, do not divide them into more than 5 equal parts, so that there, is at least a residue corresponding to 1 g of accepted stock on each filter. However, if an overlap of the particles is still detected after distribution on five filters, a further distribution of the macrostickies should be carried out as long as no overlap is detected. In this case, the second macrostickies screening (5 g OD) can be skipped.</li> </ul> |

| Step Nr. | Notes/Pictures                                                                                                                                                                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4        | <b>Reject dewatering of the reject</b>                                                                                                                                                               | <ul style="list-style-type: none"> <li>&gt; To carry out the division, once the residue has been collected in a beaker, bring to a known volume and, under constant stirring, divide into two or more equal parts in different beakers. With these, make a corresponding number of filter sheet samples.</li> <li>&gt; Measure the macrostickies on all the filter sheet samples.</li> <li>&gt; Calculate the average of the individual results to refer the measured data to the all first 5 g of accepted stock initially collected.</li> <li>&gt; Repeat this process by taking another 5 g from the accepted stock of coarse screening.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 5        | <b>Specimen preparation</b>                                                                                                                                                                          | <ul style="list-style-type: none"> <li>&gt; Carefully remove the filter from the sheet former, place it with the underside on a carrier board and cover it with silicon paper (siliconised side in contact with the stickies).</li> <li>&gt; Dry it in the dryer of the sheet former for 10 min. at <math>(93 \pm 4) ^\circ\text{C}</math>.</li> <li>&gt; Pour the black ink (e.g. Pelikan No. 4001) onto a plate.</li> <li>&gt; Dip the filter sheet completely into the ink; the entire filter surface must be covered in ink.</li> <li>&gt; Place the filter sheet over a piece of kitchen paper or blotting paper to absorb the ink excess.</li> <li>&gt; Place the dyed filter sheet with the underside on one carrier board and cover it with silicon paper.</li> <li>&gt; Dry the sample in the dryer of the sheet former for 10 min. at <math>(93 \pm 4) ^\circ\text{C}</math>.</li> <li>&gt; Pulverise the sticky side of the filter sheet with a large quantity corundum powder evenly.</li> <li>&gt; Make sure the filter is covered completely with a closed layer of powder.</li> <li>&gt; Place the filter sheet with the underside on one used carrier board and cover it with another silicon paper (and optionally also with carrier board).</li> <li>&gt; Dry the sample between two preheated metal plates (6 kg, 28 cm diameter) for 10 min. in a drying oven at <math>(105 \pm 2) ^\circ\text{C}</math>. (Store the metal plates permanently in the oven at <math>(105 \pm 2) ^\circ\text{C}</math>).</li> <li>&gt; Gently remove the excess of corundum powder using a soft cosmetic brush.</li> </ul> |
| 6        | <b>Visual inspection</b>  <p>© 2022 PTS</p> <p><b>Figure 40.</b> Example of a prepared macrostickies specimen</p> | <ul style="list-style-type: none"> <li>&gt; Visually check the filter sheets to avoid the stickies overlapping.</li> <li>&gt; Remove any hydrophobic contamination (e.g. plastic pieces) by hand or using tweezers or colour them black using a permanent marker.</li> <li>&gt; The surface of filter sheets should not contain bends or waves.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 7        | <b>Distribution of stickies in several filter papers</b>                                                                                                                                             | <ul style="list-style-type: none"> <li>&gt; In case the stickies are overlapping on the filter paper, they should be distributed across many filter papers.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 8        | <b>Image analysis using image analysis system e.g. PTS-DOMAS Multispec (see separate description)</b>                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



## 7 Evaluation

| Step Nr. | Notes/Pictures                                                 | Description |
|----------|----------------------------------------------------------------|-------------|
| 1        | The evaluation scheme for this method is published separately. |             |

## 8 Documentation

Please see excel spreadsheet (Annex lab template).

## List of changes

| Rev.          | Valid from    | Author           | Change(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------|---------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01/2021-09-01 | November 2021 | Marie Geißler    | First version of the detailed work description                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 02/2021-12-01 | December 2021 | Marie Geißler    | (Version used in the 3x3 validation) <ul style="list-style-type: none"> <li>- Determination of the dry matter content only in the oven according to ISO 287</li> <li>- Drying of the rejects also only in the oven</li> <li>- Defining the exact procedure for the Somerville screening (2.5 cm water level before filling in the sample which is exact 20 g OD)</li> <li>- Cancelling of the macrostickies assessment, because it was not relevant for the 3x3 tests</li> </ul> |
| 03/2022-03-14 | March 2022    | Vanessa Wortmann | <ul style="list-style-type: none"> <li>- Detailed definition for the procedure of the DCS (chapter 5)</li> <li>- Description of the procedure for the sheet adhesion tests</li> <li>- Including macrostickies as a parameter again for the completeness of the document (excluding procedure for image analysis)</li> </ul>                                                                                                                                                      |
| 04/2022-03-14 | March 2022    | Vanessa Wortmann | <ul style="list-style-type: none"> <li>- Update on the procedure for drying the coarse reject and fine reject first in the dryer of the sheet former and then in the oven</li> <li>- Update on the procedure for drying the consistency filter paper two times in the dryer of the sheet former</li> </ul>                                                                                                                                                                       |
| 05/2022-03-23 | March 2022    | Vanessa Wortmann | <ul style="list-style-type: none"> <li>- Filter paper with 125 mm was added to the materials list</li> <li>- The standard DIN 12331:1988-10 was replaced for the most updated version DIN EN ISO 3819:2016 – 05</li> </ul>                                                                                                                                                                                                                                                       |
| 06/2022-05-23 | May 2022      | Vanessa Wortmann | <ul style="list-style-type: none"> <li>- Ageing in the sample preparation</li> <li>- Aluminium tray as an alternative to the filter paper in the coarse reject drying</li> <li>- Photo documentation of the coarse reject on a dark background</li> </ul>                                                                                                                                                                                                                        |

| Rev.          | Valid from     | Author                            | Change(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------|----------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 07/2022-06-21 | June 2022      | Vanessa Wortmann<br>Marie Geißler | <p>Update of the detailed description according to the CEPI revision 2022:</p> <ul style="list-style-type: none"> <li>- Artificial ageing of samples containing WSA: 60 °C for 3 days</li> <li>- Natural ageing of sample without WSA: 15 days</li> <li>- pH of tap water used in the disintegration: mildly alkaline (7-8)</li> <li>- Pouring time in the fine screening: max. 4 min.</li> <li>- Collection of the whole accept fraction from the fine screening (AF) and use of a thickener in ideal conditions</li> <li>- Collection of at least 50 l of AF if a thickener is not available</li> <li>- Filtration proceeded only two times, one for rinsing the suction flask and another to determine the dissolved in colloidal substances</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 08/2022-09-27 | September 2022 | Vanessa Wortmann                  | <ul style="list-style-type: none"> <li>- Amount of material needed to complete all measurements was included</li> <li>- Suppliers of lab equipment erased</li> <li>- Self-protection equipment erased</li> <li>- List of test equipment and materials more detailed</li> <li>- Use of two carrier boards in the analysis of macrostickies erased</li> <li>- PTS logo updated</li> <li>- Changes from the feedback of the Consultative Group Summer 2022</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 09/2024-10-30 | October 2024   | Vanessa Wortmann<br>Marie Geißler | <ul style="list-style-type: none"> <li>- ISO reference for the Büchner funnel erased</li> <li>- The consistency during the disintegration must be 2.5%; the amount of water added to reach this consistency can vary depending of the sample</li> <li>- In the sheet formation after the coarse screening the suggested sample amount of 2000 g is meant for forming one single handsheet</li> <li>- In the sheet formation after the fine screening the suggested sample amount of 9000 g is meant for forming one single handsheet</li> <li>- Steps for the sheet formation updated according to the standard ISO 5269-2</li> <li>- ER calculations simplified</li> <li>- Second filtrate bottle was not supposed to exist and was erased</li> <li>- First 100 g filtrate used for cleansing the bottle should be discarded</li> <li>- The sample should be disintegrated immediately after dilution to avoid soaking</li> <li>- Separate dilution water for the determination of the evaporation residue</li> <li>- Do not add water to the disintegration sample before taking the sample amount needed for the filtrate analysis</li> <li>- Sample amount to determine the consistency updated to 1000 g instead of 500 g</li> <li>- Picture of the filter cake in transmitted light after the loop filtration</li> <li>- Note added that the COD instructions might change depending on the selected cuvette test</li> <li>- The cuvette taken from the heating box must be inverted while it is still warm</li> <li>- Figure 1 updated</li> <li>- Somerville check added</li> <li>- Method name corrected</li> <li>- Purpose of DWD edited</li> </ul> |
| 09/2025-01-01 | December 2024  | Marie Geißler<br>Vanessa Wortmann | <ul style="list-style-type: none"> <li>- Implementation of CEPI laboratory group feedback</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 09/2025-01-01 | January 2025   | Marie Geißler                     | <ul style="list-style-type: none"> <li>- Implementation of WS1 feedback</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## ABOUT 4EVERGREEN

[4evergreen](#) is a cross-industry alliance perfecting the circularity of paper-based packaging to contribute to a climate-neutral and sustainable society. Our goal is to raise the overall recycling rate of paper-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 paper-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.



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