

TEST METHOD

MC 501:2017

Analysis of the recyclability level
of cellulose-based materials
and products

A+

ABSTRACT

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Introduction

The Aticelca 501:2017 method allows determining the level of recyclability of cellulose-based materials and products on a laboratory scale, simulating some of the main phases of industrial papermaking based on paper for recycling to produce new paper and board.

Aticelca method was first developed to offer companies a tool to help determine whether a paper and board packaging could be defined as recyclable, integrating the provisions of the EN 13430 standard and annexes (CR 13688), and their updates. However, the Aticelca 501:2017 method applies not only to packaging but also to all cellulose-based materials and products.

In addition, the method aims to encourage eco-design and provide a quantitative reference on the recyclability level to guide the development of paper and board products that take account of recyclability needs.

Lastly, the method can be a useful tool to support, through specific laboratory tests, the communication of companies aimed at declaring, voluntarily, the recyclability of their paper and board products. This communication can be made either using one's own way or using the wording and icon developed by Aticelca.

The main definitions contained in the method

Paper and board for recycling: as defined in the EN 643 standard, natural fibre based paper and board suitable for recycling and consisting of:

- paper and board in any shape
- products made predominately from paper and board, which may include other constituents that cannot be removed by dry sorting, such as coatings and laminates, spiral bindings, etc.

Material made predominately from cellulose: Paper and board (like for example rolls and sheets of paper for printing or paper for converting, corrugated cardboard sheets for the production of packaging, tissue paper reels for the production of tissue paper, etc.) that need further transformations to become finished objects. Other non-cellulose constituents can be included not above a 50% weight.

Products made predominately from cellulose: Finished objects (such as packaging, moulds, articles for domestic use, etc.) mainly made of (over 50% in weight) material made predominately from cellulose.

Recyclability: Paper and board, and the products made with them, are considered as being recyclable in a paper mill if the cellulose fibres of which they are made of lead to the effective and efficient production, from a technological and economic point of view using the most widely used current papermaking technologies, of a new sheet of paper or board of quality that suites the needs of the market.

Provided laboratory tests

The laboratory test takes place based on the block diagram shown in Annex 1 and briefly described hereunder.

1. Sampling and sample preparation

Sampling is performed by selecting a certain quantity of material preserving the essential features and proportions between the different components (for example labels, sealing, welding points with hot-melt glues, metallisation, paints, etc.).

The sample is sectioned into pieces so that it can then be managed with laboratory equipment and the dry material content is determined.

From this moment all the tests are carried out at least twice and the result is determined with the average of the single measurements.

2. Determination of the dry matter content

The sample is subjected to an oven test at 105°C to eliminate the moisture present and determine the dry matter content to which the subsequent measurements will refer.

3. Pulping and pulp dilution

Pulping of the material is then carried out in a laboratory pulper to obtain a pulp sample to be analysed. Pulping takes place under conditions and a timing that simulate the process that commonly takes place in low density industrial pulpers. The pulp sample is then diluted for subsequent tests.

4. Coarse reject measurement and preparation of the first accepted fraction

The coarse reject is determined through the mechanical separation process of the various components in the diluted pulp. The solid fraction that does not go through the 5 mm holes is the coarse reject. This fraction is then dried in an oven and weighed. Instead the pulp that goes through the perforated plates is the first accepted fraction on which the subsequent tests are carried out.

5. Measurement of the flakes

The flakes are determined by the mechanical separation of the different components of the first accepted fraction using slots with a width of 0.15 mm or holes with a diameter of 0.7 mm.

The solid fraction retained by the plate represents the flakes. This fraction is then dried in an oven and weighed.

6. Measurement of the adhesive particles (macrostickies)

The adhesive particles (macrostickies) are determined by the mechanical separation of the

different components of the first accepted fraction using slots with a width of 0.10 mm, the subsequent specimen preparation and the use of an image analysis system able to distinguish the adhesive particles with an equivalent diameter included between 0.1 to 2.0 mm. The overall surface covered by adhesive particles is then measured.

7. Preparation of the second accepted pulp and formation of laboratory handsheet

The accepted fraction coming from the analysis of the adhesive particles is homogenised, the fibre consistency is determined, and 60 g/m² laboratory handsheets are formed.

8. Adhesion test

The adhesion test is carried out by checking that the handsheet does not adhere to the surface of two metal plates between which it is pressed and subjected to a temperature of 130°C. Adhesiveness is deemed as absent if the handsheet can be separated from the support and the cover in its entirety without any damage and breakage. Traces of fibres on the support and/or on the cover are permitted. Instead fragments of paper on the support and/or on the cover are not permitted.

9. Evaluation of optical inhomogeneities

Optical inhomogeneities is evaluated by observing the handsheet on both sides and assigning a judgement by comparison with the references indicated in the method. The result is reported on a scale from 1 to 3 in which level 1 indicates a weak or absent optical inhomogeneities (on a white or brown colour base), level 2 a indicates a medium inhomogeneities and level 3 indicates a high one. Intense and homogeneously coloured handsheets belong to Level 2 even if they have weak or absent optical inhomogeneities.

How the method evaluates the results

The method includes four levels of recyclability (level A+, A, B, C), in addition to the evaluation of non-recyclability with paper, depending on the results of the various tests carried out.

The judgement is based on the following table:

Evaluation criteria	Recyclable with paper				Non recyclable with paper
	Level A+	Level A	Level B	Level C	Non recyclable with paper
Coarse reject (%)	< 1.5	1.5 - 10.0	10.1 - 20.0	20.1 - 40.0	> 40.0
Macrostickies area ø < 2000 µm. (mm²/ kg)	< 2.500	2.500 - 10.000	10.001 - 20.000	20.001 - 50.000	> 50.000
Fibre flakes (%)*	< 5.0	5.0 - 15.0	15.1 - 40.0	> 40.0	-
Adhesiveness	absent	absent	absent	absent	present
Optical inhomogeneities	level 1	level 2	level 3	level 3	-

* in the case of a clearly identifiable prevalence of non-cellulose-based flakes, the fibre flakes result is not assigned and the value is added to the coarse reject value (calculated on the initial product's weight).

The parameter with the worst value characterises the class to which the sample belongs.

If the sample is classified as “non recyclable with paper”, this material or product is not suitable for a separate waste collection with paper. Without prejudice to the fact that it can be used in other industrial processes or sent for energy recovery.

The test report produced by the laboratory

The method also defines the contents of the test report. In particular, the test report produced by the laboratory must contain:

- The description of the material or product. Indicate if there is a visible presence of adhesives, sealing, printing, metallisation, coupled materials, accessory components or other specific features useful to identify the sample. In the case of a product, indicate if it has been subjected to the use for which it was designed;
- Any photographic documentation of the material or product, if it is not possible to describe it precisely as in the previous point;
- The table of results expressed according to the criteria set down respectively in the above points 9, 10, 11 and 12;

- d. General evaluation of product's recyclability (level A+, A, B, C) or of non-recyclability;
- e. Date of the test;
- f. Reference to the Aticelca site where an extract of the method is shown with the table containing the evaluation criteria for recyclability and the indications on the use of the results;

The test report may also include, if desired, the following information:

- a. An indication of the adhesive particles (macrostickies) content expressed as a total area (including those greater than 2.0 mm of equivalent diameter), expressed as mm² of the macrostickies' area per kilogram of the sample as it is, based on the ISO 15360-2 method. The measurement is carried out on the same specimens used to measure the adhesive particles with a diameter smaller than 2,000 µm, as indicated at point 6;
- b. The indication of the ash content determined based on the ISO 1762 method. The measurement is carried out on the material or product sample. Repeat the same operation with a second sample, at least;
- c. Any specific comments.

Special test conditions, method variants and whatever is not explicitly contemplated by this method must be indicated on the test report.

How to use the results and the voluntary declaration of the client on recyclability

The Aticelca 501:2017 method is a useful tool to certify the level of recyclability intended as the ability to process the material or product efficiently and efficaciously from a technological and economic point of view, to recover the cellulose fibres it contains using the most widely used current papermaking technologies for the processing of recycled paper obtained from differentiated waste collection.

The method does not include compliance with any current legal requirements of the country where the product is used.

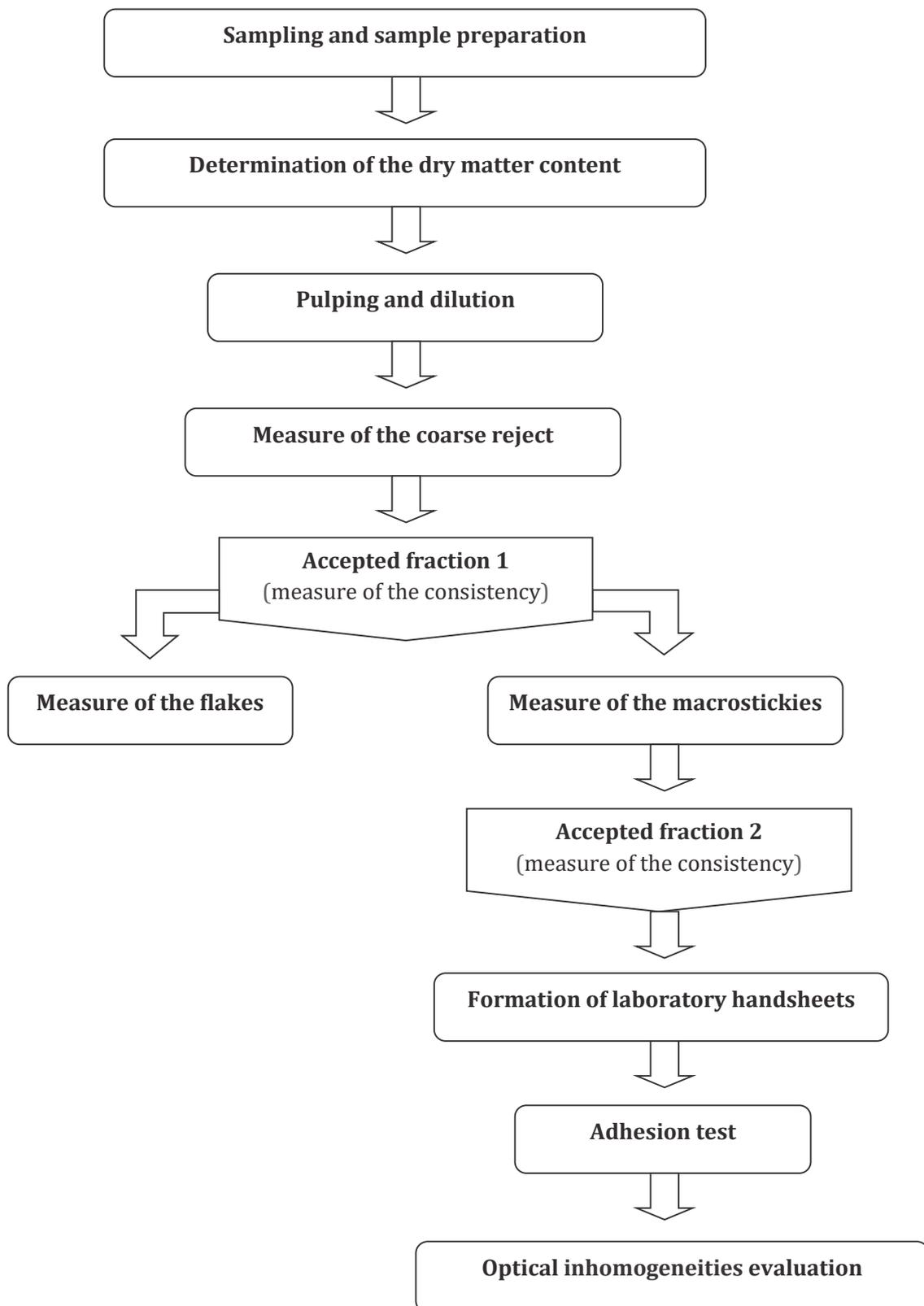
The result refers to the sample as received and analysed by the laboratory and described in the Test Report. Therefore, recyclability because of subsequent processing or following uses of the material or product other to those to which the sample was subjected before the analysis, is excluded from the evaluation.

Based on the test outcome, the client may:

- a. Use the results to direct the development of the material or product within the Eco-design and Circular Economics perspective;
- b. Use the results as one of the elements useful to prove a compliance with the EN 13430 standard and annexes (CR 13688);

- c. Use the results to draw up a voluntary self-declaration, with its own icons and wording to communicate the recyclability of the material or product;
- d. Use the results to draw up one's own voluntary self-declaration, using the icon and/or wording "RECYCLABLE WITH PAPER - Aticelca® 501", to communicate the level of recyclability of the material or product. For further information on using the icon and/or wording please visit www.aticelca.it.

Annex 1: Block diagram for the various phases of this method.



**THE ITALIAN
TECHNICAL
ASSOCIATION FOR
CELLULOSE AND
PAPER**

**Bastioni di Porta Volta, 7
20121 Milan
Italy**

**tel. +39 02 62911308
fax +39 02 29003396
segreteria@aticelca.it
www.aticelca.it**