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Wood chips for pulp production

Wood content in the bark fraction

1 Scope

This SCAN-test Method describes the procedure for determining the wood content in the bark fraction from a barking drum or from other machines for barking.

The Method is applicable to the determination of the wood losses in the barking process. The total wood loss also includes breakage. The determination of breakage is described in the Appendix.

2 References

SCAN-CM 39	Wood chips for pulp production – Dry matter content
SCAN-CM 40	Wood chips for pulp production – Size distribution
SCAN-CM 41	Wood chips for pulp production – Sampling

3 Definitions

For the purpose of this Method the following definitions apply:

3.1 *Bark fraction* – The mixture of bark, wood, branches etc, which is separated from the pulp wood in a barking drum or in other machines for barking. The expression "bark" refers to the outer bark as well as the inner bark.

For the purpose of this Method, needles and small twigs are regarded as bark whereas the cambium is regarded as wood.

3.2 *Wood content in the bark fraction* – The total wood content in the bark fraction excluding breakage.

3.3 *Wood loss* – The part of the total wood input to the barking operation that is not used for the production of pulp.

3.4 *Breakage* – Piece of wood, from the trunk of a tree, of oven-dry mass exceeding 20 g, present in the bark fraction.

Note – Breakage is normally formed in limited amounts when processing wood, for example in a barking operation. It is part of the wood loss.

4 Principle

The breakage and the fines are removed from the bark fraction sample. The wood in particles > 3 mm is separated manually and its total mass is determined by weighing. The dry wood content is reported as a percentage of the dry sample, excluding breakage and fines.

5 Apparatus

5.1 *Containers*, of aluminium foil, for weighing the wood and the wood-free bark.

5.2 *Chip classifier*, as described in SCAN-CM 40.

5.3 *Drying oven*, capable of being controlled at (105 ± 2) °C, and suitably ventilated.

5.4 *Balance*, accurate and readable to 0,1 g.

6 Sampling and preparation of sample

The sampling procedure is not covered by this Method. Make sure that sampling has been carried out in a manner that ensures representative samples. A suitable sampling procedure for wood chips is described in SCAN-CM 41 and can be used for the bark fraction, as far as it may be applicable.

The test portion for each determination is 4 to 5 litres. If the sample has to be subdivided to obtain test portions of that size, take precautions to avoid any fractionation of the material. A suitable procedure for subdividing a sample is described in SCAN-CM 41.

If the sample contains breakage, the breakage has to be removed from the sample before the determination.

Determine the dry matter content of the bark fraction sample as described in SCAN-CM 39.

The dry matter content of the sample should exceed 50 %. If the sample has a dry matter content below 50 % the separation of the fines fraction will be incomplete. Let the sample dry before screening.

Screen the bark fraction sample in a chip classifier (5.2) as described in SCAN-CM 40 without using the second screen (mean free distance between adjacent rods 8,0 mm). Discard the fines fraction and use the other three fractions for the determination of wood content.

Note – The fines fraction is discarded because the wood particles in the fines fraction are too small to be separated from the bark.

The fact that the fines are left unconsidered in this test introduces an error in the result if the wood content of the fines fraction deviates from the overall wood content. Normally the wood content of the fines is slightly lower than that of the whole sample and the result of the test will be somewhat higher than the true value.

For the purpose of this Method, the error is disregarded.

7 Procedure

Weigh the dry aluminium containers (5.1).

Spread the sample in a thin layer over the top of a large table. Remove all wood particles and collect them in an aluminium container. With the aid of a sharp knife split those pieces in which wood is attached to the bark so that the wood can be removed. Put the remaining wood-free bark into a separate aluminium container.
Remove and report separately all stones, plastic and other objects belonging neither to the wood nor to the bark fraction.

Dry the wood and the wood-free bark separately in containers in a drying oven (5.3) at (105 ± 2) °C. After a period of not less than 16 h and not more than 24 h, remove the containers with wood and bark and weigh them immediately on a balance (5.4).

Note – Weighing the container before it reaches room temperature causes a small weighing error. Another error may arise because the sample is in contact with the surrounding air, and it may gain or lose moisture during the weighing. For the purpose of this Method, these errors are disregarded and any prolonged waiting for the reading to stabilize should be avoided.

8 Calculation and report

Calculate the wood content in the bark fraction from the expression:

$$X = \frac{100a}{a+b} \qquad [1]$$

where

X is the wood content in the bark fraction, as a percentage;
a is the mass of the oven-dried bark-free wood, in grams;
b is the mass of the oven-dried wood-free bark, in grams.

Report the wood content with one decimal.

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

(a) date and place of testing;
(b) the sampling procedure;
(c) identification mark of the sample tested;
(d) the result;
(e) the mass of stones, plastic and other objects not belonging to the wood or to the bark fraction, as a percentage of the dry sample excluding breakage and fines;
(f) any departure from the standard procedure and any other circumstances that may have affected the test results.

9 Precision

The method error has been calculated as:

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

where

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

Two laboratories made duplicate determinations on two different types of bark fractions samples, namely birch wood and spruce wood bark fractions. For some of the duplicates, the laboratories each tested one of them.

The repeatability and the reproducibility, calculated as the method error, are given in *Table 1*.

Table 1. The repeatability and the reproducibility, calculated as the method error (s), within and between laboratories for two different types of bark fraction samples (the samples contained no breakage).

Repeatability for two different laboratories:

Bark fraction sample	Lab A		Lab B	
	Method error within lab	Number of duplicate samples	Method error within lab	Number of duplicate samples
Birch	0,6	13	0,4	20
Spruce	0,6	10	0,3	36

Reproducibility between two laboratories:

Bark fraction sample	Method error between lab	Number of duplicate samples
Birch	1,0	18

Appendix - Determination of breakage

When calculating the total wood loss, wood loss caused by breakage should be included. A suitable procedure to determine the breakage in the bark fraction is to remove all breakage in the out-flow from the barking process during a specified time.

Calculate wood loss caused by breakage from the expression:

$$Y = \frac{100c}{d} \qquad [A.1]$$

where

Y is the wood loss (oven-dried) caused by breakage, as a percentage;

c is the flow of bark-free breakage out of the barking process, in kilograms oven-dried breakage per hour;

d is the flow of wood without bark into the barking process, in kilograms oven-dried wood per hour.

SCAN-test Methods are issued and recommended by KCL, PFI and STFI-Packforsk for the pulp, paper and board industries in Finland, Norway and Sweden.
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