SLOVENSKI STANDARD
SIST-TS CEN/TS 15415:2007

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Trdno alternativno gorivo - Ugotavljanje velikosti delcev s sejalno analizo

Solid recovered fuels - Determination of particle size distribution by screen method

Feste Sekundärbrennstoffe - Bestimmung der Teilchengrößenverteilung mittels Siebanalyse

Combustibles solides de récupération - Détermination de la granulométrie et de sa distribution par méthode par tamisage

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TECHNICAL SPECIFICATION

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CEN/TS 15415

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English Version

Solid recovered fuels - Determination of particle size distribution by screen method

Combustibles solides de récupération - Détermination de la granulométrie et de sa distribution par méthode par tamisage

Feste Sekundärbrennstoffe - Bestimmung der Teilchengrößenverteilung mittels Siebanalyse

This Technical Specification (CEN/TS) was approved by CEN on 25 March 2006 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This document (CEN/TS 15415:2006) has been prepared by Technical Committee CEN/TC 343 “Solid recovered fuels”, the secretariat of which is held by SFS.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This Technical Specification specifies the determination of particle size distribution of solid recovered fuels by a machine or manual sieving method. It applies to particulate agglomerated and non-agglomerated fuels, such as fluff, pellets, briquettes, pulverised solid recovered fuels.

NOTE 1 For fine particles < 1 mm (e.g. sludges), the use of other methods could give more representative results as e.g. an analysis with the laser diffraction method in accordance with ISO 13320-1 [1].

NOTE 2 This Technical Specification is based on CEN/TS 15149-1 [2] but also applicable to particle sizes less than 3,15 mm.

2 Normative references

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

CEN/TS 15357:2006, *Solid recovered fuels — Terminology, definitions and descriptions*

CEN/TS 15414-2, *Solid recovered fuels — Determination of moisture content using the oven dry method — Part 2: Determination of total moisture by a simplified method*

prCEN/TS 15442, *Solid recovered fuels — Sampling — Part 1: Methods for sampling*

prCEN/TS 15443, *Solid recovered fuels — Methods for laboratory sample preparation*

ISO 3310-1 *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 3310-2, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

3 Terms and definitions

For the purpose of this Technical Specification, the terms and definitions given in CEN/TS 15357:2006 apply.

4 Principle

A sample is subjected to sieving through horizontally oscillating sieves, sorting the particles in decreasing size classes either manual or by machine sieving. For particles less than 25 mm, machine sieving is only used, for particles greater than 25 mm, manual or machine sieving is applied.

5 Apparatus

5.1 Sieve

5.1.1 General

The sieve (e.g. the geometry of the apertures, the thickness of the sieve, hole distances) shall be in accordance with ISO 3310-1 and ISO 3310-2. The geometry of the apertures shall be either circular or square and shall be reported.

NOTE For terms regarding sieves and test sieving, see ISO 2395 [3].

For a correct comparison of different sieve analysis, it is necessary to use the same type of sieve with the same geometry of the apertures for each analysis.

The frame of the sieve shall have a height that enables the sieve to contain the sample and allows a free movement of the sample during the sieving process.

5.1.2 Minimum sieve area

An appropriate number of either circular or rectangular certified test sieves is required for the test. For particles greater than 10 mm, an effective sieve area of 0,12 m^2 shall be observed. An effective sieve area of less than 0,12 m^2 and greater than 0,025 m^2 is adequate for materials with a nominal top size of less than 10 mm.

The geometry of the apertures, the thickness of the sieves, the hole distances and the diameter of the holes shall be in accordance with ISO 3310-1 and ISO 3310-2. The frame of the sieves shall have a height that enables the sieves to contain the sample and allows a free movement of the sample during the sieving process.

5.1.3 Number and size of the sieves

The number of sieves and the aperture sizes of the sieves shall be chosen according to the size specification of the sample material.

NOTE 1 For solid recovered fuels > 3,15 mm, it is recommended to use sieves with hole diameters of 3,15 mm, 6,3 mm, 12,5 mm, 25 mm, 50 mm, 100 mm and 125 mm, and for solid recovered fuels < 3,15 mm, it is recommended to use sieves with hole diameters of 200 µm, 400 µm, 800 µm, 1,6 mm and 3,15 mm.

NOTE 2 In order to obtain a complete characterisation of the size range of a sample, the number of sieves should be such that no more than 25 % of the gross sample mass will be retained on any given sieve. On the biggest and the smallest sieves no more than 5 % of the gross sample mass should be retained.

NOTE 3 For further resolution in the size distribution and for avoiding any overloading of one fraction, the addition of sieves in accordance with ISO 565[4] (sieve mesh scale R 20) to the sieve set is also recommended.

5.2 Collecting pan

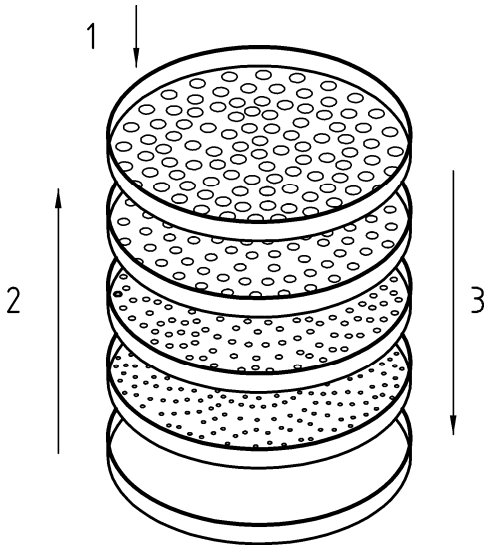
An adequate number of collecting pans is required for weighing the size classes.

5.3 Flat brush

A flat brush is required for cleaning the sieves, especially in case of fine grade solid recovered fuels.

5.4 Mechanical oscillating equipment

If a mechanical device is used, the shaking operation shall be horizontally oscillating (one or two dimensional), using an appropriate stroke-frequency according to the type of material. The principle of a mechanical oscillator is shown in Figure 1.



Key

1 material addition
2 increasing hole diameters
3 material flow direction

Figure 1 — Principle of a mechanical oscillator

5.5 Balance

A balance capable of measuring the mass of the sample to be sieved to the nearest 0,1 g shall be used.

6 Sampling and sample preparation

The sample shall be taken in accordance with prCEN/TS 15442 and prepared in accordance with prCEN/TS 15443.

The minimum mass of the test sample shall be:

- 1 kg for fine grade solid recovered fuels with a nominal top size (d_{95}) less than 25 mm;
- 2 kg for solid recovered fuels with a nominal top size (d_{95}) from 25 mm to 150 mm;
- 5 kg for solid recovered fuels with a nominal top size (d_{95}) greater than 150 mm.

Sieve the sample raw or air-dried. If the moisture content of the sample is greater than 20 %, air-drying is recommended for preventing the particles from sticking together or losing moisture during the sieving process. Air-drying shall be performed in accordance with CEN/TS 15414-2.

Determine the moisture content of the material to be sieved on a separate sub-sample following the procedure given in CEN/TS 15414-2. The moisture content shall be determined and reported concurrently with the particle size distribution determination.

NOTE Air-drying as specified in CEN/TS 15414-2 is performed by bringing the sample into equilibrium with the humidity of the surrounding atmosphere.

7 Procedure

7.1 General

Depending on the size of the sieves, the test sample shall be divided into several sub-samples to avoid overloaded sieves. The sub-samples shall be processed in sequential sieving operations.

NOTE 1 Generally, it is recommended to perform a pre-test, especially if there is no experience with the type of fuel. Particularly, the required minimum sieving time should be determined for each equipment and type of fuel in a pre-test.

NOTE 2 Losing any particles when determining individual mass differences during a pre-test should be avoided.

Continue the sieving operation until the mass changes between two sequential sieves do not exceed a maximum of 0,3 % of the total sample mass per one minute time of sieving operation.

NOTE 3 Attention should be paid to the fact that an excessive sieving time which is significantly longer than the minimum sieving time can cause a modification of the particle size distribution (e.g. abrasion causes a higher portion of the fine fraction).

7.2 Manual sieving

Place the sieve over a collecting pan starting with the sieve with the largest aperture size. Weigh the sample to the nearest 0,1 g. Spread the sample (sub-sample) in an even layer and start sieving. When shaking, apply a vertical as well as horizontal action in order to allow all small particles to pass through the openings until no more material will pass.

Collect the particles passing through the sieve in the collecting pan. Spread the content in the collecting pan in an even layer on the subsequent sieve and repeat the operation. Weigh the retained net material on each sieve and in the collecting pan to the nearest 0,1 g after sieving with the sieve with the smallest aperture size. In the case that a particle sticks in a sieving hole, it shall be removed and added to the fraction which has remained on the sieve (as if it did not pass the hole).

All particles greater than 100 mm (maximum dimension) shall be manually classified into one or more fractions regardless from which sieve or collecting pan they are collected. In this case, the size is defined as maximum length of the particle.

Record the mass of each fraction in a scheme, for an example see Table 1.