SLOVENSKI STANDARD
SIST-TS CEN/TS 15406:2007

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Trdno alternativno gorivo - Metode za ugotavljanje premostitvenih lastnosti razsutega materiala

Solid recovered fuels - Methods for the determination of bridging properties of bulk material

Feste Sekundärbrennstoffe - Verfahren zur Bestimmung der Neigung zur Brückenbildung von Schüttgut

Combustibles solides de récupération - Méthodes pour la détermination des propriétés de formation de voute dans les matériaux en vrac

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75.160.10	Trda goriva	Solid fuels

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TECHNICAL SPECIFICATION

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English Version

Solid recovered fuels - Methods for the determination of bridging properties of bulk material

Combustibles solides de récupération - Méthodes pour la détermination des propriétés de formation de voûte dans les matériaux en vrac

Feste Sekundärbrennstoffe - Verfahren zur Bestimmung der Neigung zur Brückenbildung von Schüttgut

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.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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Foreword

This document (CEN/TS 15406:2006) 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.

Introduction

This Technical Specification describes the determination of bridging properties of solid recovered fuels (SRF), which is conveyable in a continuous material flow. Bridging or arching is a complex parameter describing the situation when particles form a stable bridge over an opening that can be several times the length of the single particles. Bridging is dependent on several influencing factors, e.g. the conveying or transport system, particle size and shape, moisture content, bulk density, bed depth.

The behaviour of SRF in bins, hoppers, feeders, and other handling equipment depends on bridging properties [1]. Knowing these properties, already in phase of product development, is essential for avoiding flow problems.

Bridging properties are also important for quality control. By checking the relative bridging properties of a given bulk solid before it is placed into a system, unsatisfactory batches can be rejected or recycled, thereby preventing costly handling problems downstream.

Bridging is not an absolute value and therefore there is a need for standardising the conditions for the determination of bridging tendency in order to gain comparative measuring results.

Bridging of solid recovered fuels is subject to variation due to several impacts such as filling layer, particle shape, and storage time in silos. Measured bridging values can therefore deviate from real conditions in silos and conveyer systems.

1 Scope

This Technical Specification specifies a method for the determination of bridging properties of solid recovered fuels using standard measuring equipment. The method is applicable to all particulate recovered fuels that either have been reduced in size (such as cut tyres, plastics, cardboards) or physically in a particulate form (such as pellets, granules or fluff obtained from waste materials or dry sewage sludge).

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*

prCEN/TS 15442, *Solid recovered fuels — Methods for sampling*

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

CEN/TS 15414-1, *Solid recovered fuels — Determination of moisture content using the oven dry method — Part 1: Determination of total moisture by a reference method*

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*

CEN/TS 15415, *Solid recovered fuels — Determination of particle size distribution by screen method*

3 Terms and definitions

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

4 Determination of bridging properties for non coalescing materials

4.1 Principle

A sample is subjected to bridging by placing it over an expandable slot opening in an equipment of standardised dimensions. By increasing the slot opening, the building of a bridge is facilitated which ultimately will collapse and represent the bridging value of the tested fuel.

4.2 Apparatus

4.2.1 Bridging apparatus, consisting of a container with an effective area of $[(1{,}1 \pm 0{,}01) \times (2{,}0 \pm 0{,}01)]$ m and a minimum height of $(0{,}75 \pm 0{,}01)$ m. The sides of the container shall be manufactured of oriented strand board (OSB) plates.

The bottom of the container shall be made of two solid rubber mats with the following dimensions:

— width: $(1{,}1 \pm 0{,}01)$ m

— length: $(1{,}1 \pm 0{,}01)$ m

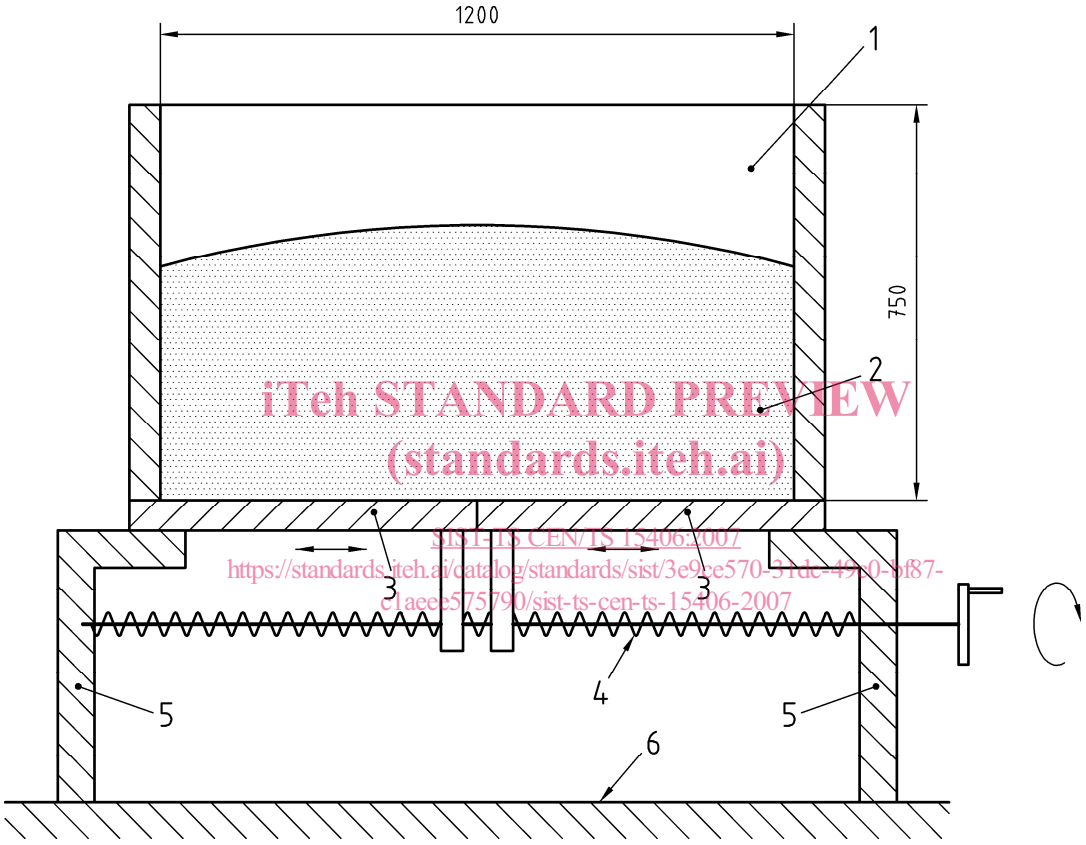
— thickness: $(0{,}01 \pm 0{,}001)$ m

One end of each rubber mat shall be fixed to the lower edges of the OSB end plates of the container. The opposite end of each plate mat shall be fixed to separate steel coils situated below the bottom of the container. The coils shall have an external diameter of (0,32 ± 0,001) m. The centre of the coils shall be placed in a distance of (0,43 ± 0,05) m below the horizontal plane of the container underside. By rolling the coils, a slot opening is formed in the bottom of the container from the middle and outward (see Figure 1).

To facilitate the handling, the container may be equipped with legs.

NOTE Under the pressure of a silo the bridging behaviour can deviate from measurements carried out under standard conditions, in particular for SRF with low bulk density.

Dimensions in millimetres



Key

1	container	4	coils
2	SRF	5	leg
3	sliding plate	6	concrete floor

Figure 1 — Operation principle of the bridging apparatus

4.2.2 Metric steel rule, with a scale gradation of 0,001 m, for measuring the distance between the coils after the bridge is collapsed.

4.2.3 Shovel, to homogenise the sample.

4.3 Sampling and sample preparation

The sample shall be taken and prepared in accordance with prCEN/TS 15442 and prCEN/TS 15443. The minimum volume of the test portion shall be 1,1 m^3 loose volume.

Determine the particle size distribution of the material on a separate sub-sample following the procedures given in prCEN/TS 15443 and CEN/TS 15415. The particle size shall be reported together with the result of the bridging test.

Determine the moisture content of the material on a separate sub-sample following the procedure given in prCEN/TS 15443 and CEN/TS 15414-1 or CEN/TS 15414-2. The moisture content shall be reported together with the result of the bridging test and at least the minimum sample size in accordance with prCEN/TS 15442.

4.4 Procedure

Place the bridging apparatus (4.2.1) horizontally on a clean, solid concrete floor.

A distance shall be existent between the floor to the underside of the apparatus to allow a free fall of the sample material.

Make sure that the container of the bridging apparatus is dry and empty and load the sample into the container of the bridging apparatus (4.2.1). Level out the upper surface of the sample so that a layer of 0,5 m thickness is evenly spread in the container.

The loading of the container with the sample may be performed, for example, using a wheel loader.

Roll the rubber mats slowly onto the coils, thus generating a slot opening under the sample. As soon as the bridge collapses, stop the opening process and measure the shortest distance between the surface of the coils with the metric steel rule (4.2.2) to the nearest 1 mm.

After the measurement is fully performed, open the bottom of the sample container and allow the container to empty completely thus unifying the remaining sample in the container with the samples that fall out of the container as a result of the test.

Homogenise the sample using the shovel (4.2.3) by redistributing fuel from the rim to the top of the heap and reload the container and repeat 10 times the procedure.

4.5 Calculation

Calculate the relative bridging property as the arithmetic mean of the 10 repetitions.

5 Determination of bridging properties for coalescing materials

5.1 Principle

For coalescing materials, the minimum shear that causes the collapse of a consolidated sample is assumed as an index of bridging properties [2].

5.2 Apparatus

5.2.1 Shear tester, mainly consisting of a test chamber and a cover plate (see Figure 2).