Tahked biokütused. Puistetiheduse määramine

Solid biofuels - Determination of bulk density

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NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 15103:2010 sisaldab Euroopa standardi EN 15103:2009 ingliskeelset teksti.	This Estonian standard EVS-EN 15103:2010 consists of the English text of the European standard EN 15103:2009.
Standard on kinnitatud Eesti Standardikeskuse 28.02.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 28.02.2010 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
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English Version

Solid biofuels - Determination of bulk density

Biocombustibles solides - Détermination de la masse volumique apparente

Feste Biobrennstoffe - Bestimmung der Schüttdichte

This European Standard was approved by CEN on 10 October 2009.

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Foreword

This document (EN 15103:2009) has been prepared by Technical Committee CEN/TC 335 “Solid biofuels”, the secretariat of which is held by SIS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2010, and conflicting national standards shall be withdrawn at the latest by June 2010.

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This document supersedes CEN/TS 15103:2005.

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Introduction

Bulk density is an important parameter for fuel deliveries on volume basis and together with the net calorific value, it determines the energy density. It also facilitates the estimation of space requirements for transport and storage. This document describes the determination of the bulk density of pourable solid biofuels which can be conveyed in a continuous material flow.

For practical reasons two standard measuring containers with a volume of 5 l or 50 l were chosen for the determination. Due to the limited volume of these containers, some fuels are therefore excluded from the scope of this document. This, for example, applies for chunk wood, uncomminuted bark or baled material and larger briquettes. The bulk density of such fuels can be calculated from their mass and the volume of the container or lorry used to transport them.

To decide on the actual storage room requirement of a solid biofuel the different storage conditions (e.g. height of heap or moisture content), which usually differ largely from the sample volume of the standard measuring container, should also be taken into account.

The here described method includes a defined shock exposure to the bulk material. The decision for this procedure was based on several reasons. It leads to a certain volume reduction which accounts for compaction effects occurring during the production chain. These compaction effects are mainly due to the fact that the fuel is usually transported and/or stored in containers or silos that are much larger than the measuring container as chosen for the here described method. Thus, in practice the higher mass load leads to an increased load pressure and to fuel settling, which can also be additionally enhanced by the vibrations during transportation. Furthermore, filling or unloading operations in practise usually apply a higher falling depth than the one chosen for the here performed test. This will also result in a respectively higher compaction due to the increased kinetic energy of the particles falling. A procedure which applies a controlled shock to the sample was thus believed to reflect the practically prevailing bulk density in a better way than a method without shock. This is particularly true when the mass of a delivered fuel has to be estimated from the volume load of a transporting vehicle, which is a common procedure in many countries. For a rough estimation on how susceptible the different solid biofuels are towards the shock exposure some research data are given in Annex A. The data show a compaction effect between 6 % and 18 % for biomass fuels.

1 Scope

This European Standard describes a method of determining bulk density of solid biofuels by the use of a standard measuring container. This method is applicable to all solid biofuels with a nominal top size of maximum 100 mm.

Bulk density is not an absolute value, therefore conditions for its determination have to be standardised in order to gain comparative measuring results.

NOTE 1 The nominal top size is defined as the aperture size of the sieve where at least 95 % by mass of the material passes (see CEN/TS 15149-1).

NOTE 2 Bulk density of solid biofuels is subject to variation due to several factors such as vibration, shock, pressure, biodegradation, drying and wetting. Measured bulk density can therefore deviate from actual conditions during transportation, storage or transhipment.

2 Normative references

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

prEN 14588:2009, *Solid biofuels — Terminology, definitions and descriptions*

EN 14774-1, *Solid biofuels — Determination of moisture content — Oven dry method — Part 1: Total moisture — Reference method*

EN 14774-2, *Solid biofuels — Determination of moisture content — Oven dry method — Part 2: Total moisture — Simplified method*

prEN 14778-1, *Solid biofuels — Methods for sampling*

CEN/TS 14778-2, *Solid biofuels — Sampling — Part 2: Method for sampling particulate material transported in lorries*

CEN/TS 14779, *Solid biofuels — Sampling — Methods for preparing sampling plans and sampling certificates*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 14588:2009 apply.

4 Symbols and abbreviations

Abbreviations used in this document:

BD_{ar}	bulk density as received in kg/m³
BD_{d}	bulk density of the sample on dry basis in kg/m³
M_{ar}	moisture content, as received, as percentage by mass (wet basis)
m_1	mass of the empty container in kg
m_2	mass of the filled container in kg
V	net volume of the measuring container in m³