



SLOVENSKI STANDARD
SIST-TS CEN/TS 14774-1:2004

01-november-2004

Biobrennstoffe - Verfahren zur Bestimmung des Wassergehaltes - Verfahren der Ofentrocknung - Teil 1: Gehalt an Gesamtwasser - Referenzverfahren

Solid biofuels - Methods for determination of moisture content - Oven dry method - Part 1: Total moisture - Reference method

Feste Biobrennstoffe - Verfahren zur Bestimmung des Wassergehaltes - Verfahren der Ofentrocknung - Teil 1: Gehalt an Gesamtwasser - Referenzverfahren

Biocombustibles solides - Méthodes de détermination de la teneur en humidité - Méthode par séchage a l'étuve

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Ta slovenski standard je istoveten z: CEN/TS 14774-1:2004

ICS:

75.160.10 Trda goriva Solid fuels

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TECHNICAL SPECIFICATION
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CEN/TS 14774-1

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ICS 75.160.10

English version

**Solid biofuels - Methods for determination of moisture content -
Oven dry method - Part 1: Total moisture - Reference method**

Feste Biobrennstoffe - Verfahren zur Bestimmung des
Wassergehaltes - Verfahren der Ofentrocknung - Teil 1:
Gehalt an Gesamtwasser - Referenzverfahren

This Technical Specification (CEN/TS) was approved by CEN on 19 January 2004 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.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This document (CEN/TS 14774-1:2004) has been prepared by Technical Committee CEN/TC 335 “Solid Biofuels”, the secretariat of which is held by SIS.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this CEN 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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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CEN/TS 14774-1:2004 (E)

Introduction

CEN/TS 14774 consists of the following parts under the general title *Solid Biofuels – Methods for the determination of moisture content – Oven dry methods*.

Part 1 Total moisture – Reference method

Part 2 Total moisture – Simplified method

Part 3 Moisture in general analysis sample

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1 Scope

This document describes the method of determining the total moisture content of a sample of solid biofuels by drying in an oven and should be used when high precision of the determination of moisture content is necessary. The method described in this document is applicable to all solid biofuels.

The total moisture content of biofuels is not an absolute value and conditions for its determination have to be standardised to enable comparative determinations to be made.

NOTE The term moisture content when used with biomass materials can be misleading since untreated biomass frequently contains varying amounts of volatile compounds (extractives) which may evaporate when determining moisture content by oven drying.

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.

CEN/TS 14588:2003, *Solid Biofuels – Terminology, definitions and description*

prCEN/TS 14778, *Solid Biofuels - Methods of sampling*

prCEN/TS 14779, *Solid Biofuels – Methods for preparing sampling plans and sampling certificates*

prCEN/TS 14780, *Solid Biofuels - Methods of sample reduction*

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3 Terms and definitions

For the purpose of this document, the terms and definitions given in CEN/TS 14588:2003 shall apply.

NOTE In this method the moisture content should be reported on wet basis. The moisture content can also be expressed on dry basis; ratio of the mass of water in the material to the mass of dry matter in the material. (see Clause 8.2)

4 Principle

The sample of biofuel is dried at a temperature of 105 °C in air atmosphere until constant mass is achieved and percentage moisture calculated from the loss in mass of the sample and includes a procedure for the correction of buoyancy effects.

5 Apparatus

5.1 Drying oven, capable of being controlled (manufacturers specifications) at a temperature within the range of (105 ± 2) °C and in which the air atmosphere changes between 3 and 5 times per hour. The air velocity should be such that the sample particles are not dislodged from their tray.

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5.2 Dishes or trays, of non-corrodible and heat-resistant material and of such dimension that they will hold the total sample in the proportion of approximately 1 g of sample per cm². The surface of the trays shall be such, that the possibility to adsorption/absorption is minimised (very clean and even surface).

5.3 Balance, having sufficient accuracy to enable the sample and tray, as received, to be weighed to the nearest 0,1 g.

6 Sample preparation

6.1 Samples for the determination of total moisture shall be sampled and prepared in accordance with prCEN/TS 14778 and prCEN/TS 14780 and shall be received in the laboratory in sealed water resistant air-tight containers or bags.

NOTE Precautions should be carried out to ensure not losing moisture during preparation of the sample. Coarse materials for example small wood and chunk wood should be prepared by using equipment appropriate for the fuel type e.g. slow rotation grinder, handsaw, axe or knife to a thickness of maximum 30 mm for the test material. Weigh the sample for determination of moisture content immediately after this sample preparation.

6.2 The sample mass shall be minimum 300 g but preferably more than 500 g.

NOTE For large particle size samples with a nominal top size of 100 mm, a sample mass of 1 - 2 kg is preferred.

6.3 During the course of its preparation the sample may have been pre-dried (see prCEN/TS 14780), in which case equation (2) detailed in 8.1 shall be used to calculate the total moisture content.

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7 Procedure

7.1 Weigh an empty clean tray to the nearest 0,1 g, transfer the sample from the container or bag to the tray and spread the sample evenly, allowing about 1 cm² of surface area to 1 g of sample. Weigh an identical empty clean tray (reference tray) to the nearest 0,1 g. In case of moisture left on the inner surfaces of the bag or container, this amount of moisture shall be included in the calculation of the moisture content. Dry the sample packing (container, bag etc.) in the oven and weigh the packing before and after the drying. If the packing material cannot stand for the 105 °C, dry it at room temperature by placing it open in the laboratory.

NOTE A reference tray is included in the procedure for a correction of buoyancy. To avoid absorption of moisture from the atmosphere, the tray with the dried sample is reweighed when still hot. The weight of a tray when still hot is, due to buoyancy, less than the weight of the cold tray. The magnitude of the buoyancy effect depends of the size and the weight of the tray.

7.2 Weigh the tray with the sample. Place the loaded tray together with the reference tray in the oven controlled at (105 ± 2) °C. Heat the trays until constant in mass as detailed in 7.3.

NOTE Do not overload the drying cabinet. There should be enough empty room over the sample layer and also between the trays.

7.3 Solid biofuels are hygroscopic and the loaded tray together with the reference tray shall be re-weighed to the nearest 0,1 g when still hot within 10 to 15 seconds to avoid absorption of moisture. Use heat-insulating material on the balance pan to protect it from direct contact with the hot tray. Constancy in mass is defined as a change not exceeding 0,2 % of the total loss in mass during a further period of heating at (105 ± 2) °C over a period of 60 min. The drying time required will depend on the particle size of the sample, the rate of atmosphere change in oven, the thickness of the sample layer etc.

NOTE 1 To prevent unnecessary losses of volatile compounds, generally the drying time should not exceed 24 hours.

NOTE 2 The required drying time can be determined in pre-tests on similar fuel types with comparable particle size.

8 Calculation

The total moisture content shall be calculated on a wet basis in accordance with equation (1) detailed in 8.2. The relationship between total moisture on a wet basis to that on a dry basis is given in equation (3) and (4) as detailed in 8.3. The result shall be reported on a wet or dry basis in accordance with Clause 10.

8.1 Moisture content on wet basis

The moisture content, M_{ar} , in the biofuel, as *received*, expressed as a percentage by mass, shall be calculated using the following equation 1:

$$M_{ar} = \frac{(m_2 - m_3) - (m_4 - m_5) + m_6}{(m_2 - m_1)} \times 100 \quad (1)$$

Where:

m_1 is the mass in grams of the empty tray.

m_2 is the mass in grams of the tray and sample before drying.

m_3 is the mass in grams of the tray and sample after drying

m_4 is the mass in grams of the reference tray before drying (Weight at room temp.)

m_5 is the mass in grams of the reference tray after drying (Weight when still hot)

m_6 is the mass in grams of moisture associated with the packing.

The result shall be calculated to 2 decimal places and rounded to the nearest 0,1 % for reporting.

If the sample has been pre-dried before this moisture determination (according to Clause 6.3), the total moisture, M_T , expressed as a percentage by mass is given by the following equation 2:

$$M_T = M_p + M_r \times (1 - M_p / 100) \quad (2)$$

Where

M_p is the moisture loss of pre-drying, expressed as a percentage by mass of the original sample.

M_r is the residual moisture, expressed as a percentage by mass, determined in the pre-dried sample by this procedure.

8.2 Moisture content on dry basis

The relation between moisture on dry basis, U_d , or wet basis, M_{ar} , expressed as a percentage by mass shall be calculated using the following formulas: