BRITISH STANDARD

BS EN
14774-2:2009

Solid biofuels — Determination of moisture content — Oven dry method

Part 2: Total moisture — Simplified method

ICS 75.160.10

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 14774-2:2009. It supersedes DD CEN/TS 14774-2:2004 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PTI/17, Solid biofuels.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Biocombustibles solides - Détermination de la teneur en humidité - Méthode par séchage à l'étuve - Partie 2: Humidité totale - Méthode simplifiée

Feste Biobrennstoffe - Bestimmung des Wassergehaltes - Ofentrocknung - Teil 2: Gesamtgehalt an Wasser - Vereinfachtes Verfahren

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Foreword

This document (EN 14774-2:2009) 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of an identical text or by endorsement, at the latest by May 2010, and conflicting national standards shall be withdrawn at the latest by May 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TS 14774-2:2004.

EN 14774 consists of the following parts under the general title *Solid biofuels – Determination of moisture content – Oven dry method*:

— *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 European Standard describes the method of determining the total moisture content of a sample of solid biofuels by drying in an oven and may be used when the highest precision is not needed, e.g. for routine production control on site. 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 descriptions*

CEN/TS 14778 (all parts), *Solid biofuels - Sampling*

prEN 14780, *Solid biofuels - Methods for sample preparation*

3 Terms and definitions

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

4 Principle

The sample of biofuel is dried at a temperature of (105 ± 2) °C in air atmosphere until constant mass is achieved and the percentage moisture calculated from the loss in mass of the sample.

NOTE The difference in the procedure comparing to the reference method EN 14774-1 is that the effect due to buoyancy is neglected in this method. 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.

5 Apparatus

5.1 Drying oven, capable of being controlled (manufacturer's specification) at a temperature within the range of (105 ± 2) °C and in which the air atmosphere changes between three times and five times per hour. The air velocity should be such that the sample particles are not dislodged from their drying container.

5.2 Suitable drying containers of non-corrodible and heat-resistant material as e.g. metal trays, glass-or porcelain dishes.

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

6 Sample preparation

6.1 Samples for the determination of total moisture content shall be sampled in accordance with CEN/TS 14778 and shall be received in the laboratory in sealed air-tight containers or packings. The test portion shall be sample material with a nominal top size of max. 30 mm and prepared in accordance with prEN 14780.

WARNING — Precautions shall be carried out to ensure not loosing moisture during preparation of the sample. Significant losses of moisture from the sample will occur after a few minutes in room atmosphere.

6.2 The mass of the test portion shall be in accordance with prEN 14780 and at all times minimum 300 g.

NOTE For fine particular solid biofuels, e.g. sawdust, shavings, fuel powder, the sample size can be reduced to 200 g or with a balance having a resolution 0,01 g to 100 g.

7 Procedure

7.1 Weigh an empty clean drying container to the nearest 0,1 g, transfer the sample from the container or bag to the drying container. 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. As an alternative for some types of biofuels that can re-absorb condensed moisture (e.g. saw dust), it is permissible that the bag or container together with the sample it contains is shaken so that the condensed moisture is fully re-absorbed into the sample.

NOTE 1 As the necessary drying time among other things depends on the thickness of the sample layer, too deep sample layers should be avoided.

NOTE 2 Do not use larger dimension of the drying container than necessary in relation to the size of the sample due to buoyancy when hot weighing is undertaken (see EN 14774-1).

7.2 Weigh the drying container with the sample and place it in the oven controlled at (105 ± 2) °C. Heat the container with the sample 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 drying containers.

7.3 Dried solid biofuels are hygroscopic and the drying container with the sample shall be re-weighed to the nearest 0,1 g when still hot within 10 s to 15 s to avoid absorption of moisture. Use heat-insulating material on the balance pan to protect it from direct contact with the hot drying container. 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 h.

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

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8 Calculation

The total moisture content shall be calculated using Equation (1) and the result shall be reported on a wet basis in accordance with Clause 10.

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

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

where

m_1 is the mass in g of the empty drying container;

m_2 is the mass in g of the drying container and sample before drying;

m_3 is the mass in g of the drying container and sample after drying;

m_4 is the mass in g of the moisture associated with the packing.

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

9 Precision

Because of the varying nature of the solid biofuels covered by this document it is not possible at this time to give a precision statement (repeatability or reproducibility) for this test method.

10 Test report

The test report shall include at least the following information:

a) identification of the laboratory and the testing date;

b) identification of the product or sample tested (see CEN/TS 14778);

c) a reference to this European Standard;

d) any deviation from the European Standard;

e) test result on wet basis;

f) conditions and observations, i.e. unusual features, during the test procedure, which may affect the result.

The test results shall be expressed with relevant symbols.

Bibliography

[1] Samuelsson, R. , Burvall, J. & Jirjis, R., 2006, Comparison of different methods for the determination of moisture content in biomass, Biomass & Bioenergy, volume 30, issue 1, pp. 929-934.

[2] Samuelsson, R., Nilsson, C. & Burvall, J., 2006, Sampling and GC-MS as a method for analysis of volatile organic compounds (VOC) emitted during oven drying of biomass materials, Biomass & Bioenergy, volume 30, issue 1, pp. 923-928.

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