BRITISH STANDARD

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14774-3:2009

Solid biofuels — Determination of moisture content — Oven dry method

Part 3: Moisture in general analysis sample

ICS 75.160.10

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 14774-3:2009. It supersedes DD CEN/TS 14774-3:2004 which is withdrawn.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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Feste Biobrennstoffe - Bestimmung des Wassergehaltes - Ofentrocknung - Teil 3: Wassergehalt in allgemeinen Analysenproben

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Foreword

This document (EN 14774-3:2009) 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of an identical text or by endorsement, at the latest by April 2010, and conflicting national standards shall be withdrawn at the latest by April 2010.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 14774-3:2004.

EN 14774 consists of the following parts:

— 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*;

— EN 14774-3, *Solid biofuels – Determination of moisture content – Oven dry method – Part 3: Moisture in general analysis sample*.

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1 Scope

This European Standard describes the method of determining the moisture in the analysis sample by drying the sample in an oven. It is intended to be used for general analysis samples according to CEN/TS 14780. The method described in this document is applicable to all solid biofuels.

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 the moisture content of the general analysis sample by oven drying (see Bibliography).

Since small particle size biofuels are very hygroscopic, their moisture content will vary with change of humidity of the atmosphere and therefore the moisture of the analyses sample should always be determined simultaneously when portions are weighed out for other analytical determinations, for example calorific value, carbon, nitrogen.

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 14778-1, *Solid biofuels – Sampling – Part 1: Methods for sampling*

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

CEN/TS 14780, *Solid biofuels – Methods for sample preparation*

3 Terms and definitions

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

NOTE In this method the moisture content should be reported on an as analysed basis.

4 Principle

The analysis sample of biofuel is dried at a temperature of 105 °C and the moisture content is calculated from the loss of mass of the test sample. Automatic equipments may be used when the method is validated with biomass reference samples of an adequate biomass type. This equipment shall fulfill all the requirements given in Clause 7 regarding sample size, temperature, atmosphere and weighing accuracy.

NOTE The analysis sample can be dried in air atmosphere or in nitrogen atmosphere. If the sample material is susceptible to oxidation (at 105 °C), drying in nitrogen atmosphere is to be preferred and detailed in ISO 11722. The used drying atmosphere should be reported in accordance with Clause 10.

5 Apparatus

5.1 Drying oven, capable of being controlled (manufacturers specification) at a temperature within the range of (105 ± 2) °C and in which for air the atmosphere changes between three and five times per h.

The air velocity should be such that the sample particles are not dislodged from their weighing dish. The use of nitrogen atmosphere is detailed in ISO 11722.

5.2 Weighing dish, of glass or corrosion- and temperature resistant material, with a well-fitting lid and of such a size that the sample layer does not exceed 0,2 g/cm^2.

5.3 Balance, having sufficient accuracy to weigh the sample within ± 0,1 mg.

5.4 Desiccator with desiccant, to avoid absorption of moisture from the atmosphere to the sample.

6 Sample preparation

6.1 The sample used for the determination is the general analysis test sample with a particle size of 1 mm or less, prepared according to CEN/TS 14780.

6.2 Before commencing the determination, mix the analysis sample, preferably by mechanical means.

7 Procedure

A minimum of two determinations shall be carried out on the test sample.

7.1 Dry an empty weighing dish with its lid at (105 ± 2) °C until constant in mass and cool it to room temperature in a dessicator.

NOTE Several dishes can be handled at the same time.

7.2 Weigh the weighing dish with its lid to the nearest 0,1 mg.

7.3 Add minimum 1 g of the analysis sample into the weighing dish in an even layer and weigh the weighing dish with its lid plus sample to the nearest 0,1 mg.

7.4 Dry the uncovered dish and its lid together with the sample at (105 ± 2) °C until constant in mass. Constancy in mass is defined as a change not exceeding 1 mg in mass during a further period of heating at (105 ± 2) °C over a period of 60 min. The drying time required is normally between 2 h and 3 h.

7.5 Replace the lid while the dish is still in the oven. Transfer the dish and its contents to a dessicator. Let it cool to room temperature.

7.6 Weigh the dish and its lid with the sample to the nearest 0,1 mg. Since small particle-sized biofuels are very hygroscopic it is important to weigh rapidly once the sample is cooled.

8 Calculation

For each determination the moisture content, M_{ad}, in the analysis sample, *as analysed*, expressed as a percentage by mass, shall be calculated using the following formula:

$$M_{ad} = \frac{(m_2 - m_3)}{(m_2 - m_1)} \times 100 \qquad (1)$$

where

m_1 is the mass in g of the empty dish plus lid;

m_2 is the mass in g of the dish plus lid plus sample before drying;

m_3 is the mass in g of the dish plus lid plus sample after drying.

The result shall be reported as the mean of duplicate determinations to the nearest 0,1 %.

9 Precision

9.1 Repeatability

The result of duplicate determinations, carried out in the same laboratory, by the same operator, with the same apparatus on representative portions weighed out at the same time from the analysis sample, shall not differ more than 0,2 % absolute.

9.2 Reproducibility

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 (reproducibility) for this test method.

10 Test report

The test report shall include at least the following information:

— identification of the laboratory and the testing date;

— identification of the product or sample tested (see CEN/TS 14778-1 and CEN/TS 14778-2);

— reference to this document;

— any deviation from the standard;

— the used drying atmosphere;

— test result expressed with relevant symbols and on an analysed basis;

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

Bibliography

[1] ISO 11722, Solid mineral fuels – Hard coal – Determination of moisture in the general analysis test sample by drying in nitrogen

[2] 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.

[3] 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 11, pp. 923-928.

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