SLOVENSKI STANDARD
oSIST prEN ISO 21646:2021

01-marec-2021

Trdna alternativna goriva - Priprava vzorca (ISO/DIS 21646:2020)

Solid recovered fuels - Sample preparation (ISO/DIS 21646:2020)

Feste Sekundärbrennstoffe - Probenvorbereitung (ISO/DIS 21646:2020)

Combustibles solides de récupération - Préparation des échantillons (ISO/DIS 21646:2020)

Ta slovenski standard je istoveten z: **prEN ISO 21646**

ICS:

75.160.10	Trda goriva	Solid fuels

oSIST prEN ISO 21646:2021 **en,fr,de**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 21646

ISO/TC **300**

Secretariat: **SFS**

Voting begins on:
2021-01-04

Voting terminates on:
2021-03-29

Solid recovered fuels — Sample preparation

Combustibles solides de récupération — Préparation des échantillons

ICS: 75.160.10

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 21646:2021(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 300, *Solid recovered fuels*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Solid recovered fuels (SRF's) are a major source of renewable energy. International Standards facilitate the production, trade and use of solid recovered fuels. For sampling and sample preparation of solid recovered fuels, ISO 21645 and this document, respectively, can be used (in conjunction) by different types of organizations, including but not limited to:

— solid recovered fuel production and trading companies;

— energy companies;

— regulatory bodies;

— conformity assessment bodies;

— laboratories.

The sample preparation technique adopted depends on a combination of different characteristics of the material and circumstances encountered at the sampling location. The determining factors are:

— the type of solid recovered fuel;

— the physical behaviour of the specific solid recovered fuel;

— the (expected) degree of heterogeneity (e.g. monostreams, mixed fuels, blended fuels).

In laboratory practise, different analytical procedures often need to be applied to the laboratory sample that has been taken according to the sampling plan. For this purpose, sub-sampling is applied in a way that the different test portions are representative of the laboratory sample with respect to the compounds of interest and the specific analytical procedures. The representativeness of the laboratory sample and of the test portions is of major importance to guarantee the quality and accuracy of analytical results. The representativeness of the laboratory sample is specified by the sampling plan.

This document is largely based on the work done by CEN/TC 343 "Solid recovered fuels" and CEN/TC 292 "Characterization of waste" (now integrated in CEN/TC 444 “Environmental characterization of solid matrices”), and in particular EN 15002:2015 which was developed for the majority of waste samples. Most of its concepts and specifications are also applicable to solid recovered fuel samples. However, the foundations of EN 15002 are not completely applicable to solid recovered fuel as the nature of this material is substantially different and can lead to misrepresentation of the fuel quality.

The main characteristic that makes solid recovered fuel samples significantly different from other kinds of waste is that very often solid recovered fuels are solid, but neither ‘granular’ nor monolithic. It often happens that solid recovered fuel samples are fibrous-like materials, so that the statistical formula for sampling as defined in EN 15002:2015 is not applicable. One additional term in the statistical formula is needed, namely the ‘shape factor’ (f).

This document is part of the testing program for solid recovered fuels. This program consists of various steps leading to the analysis sample for fuel quality testing as outlined in Figure 1.

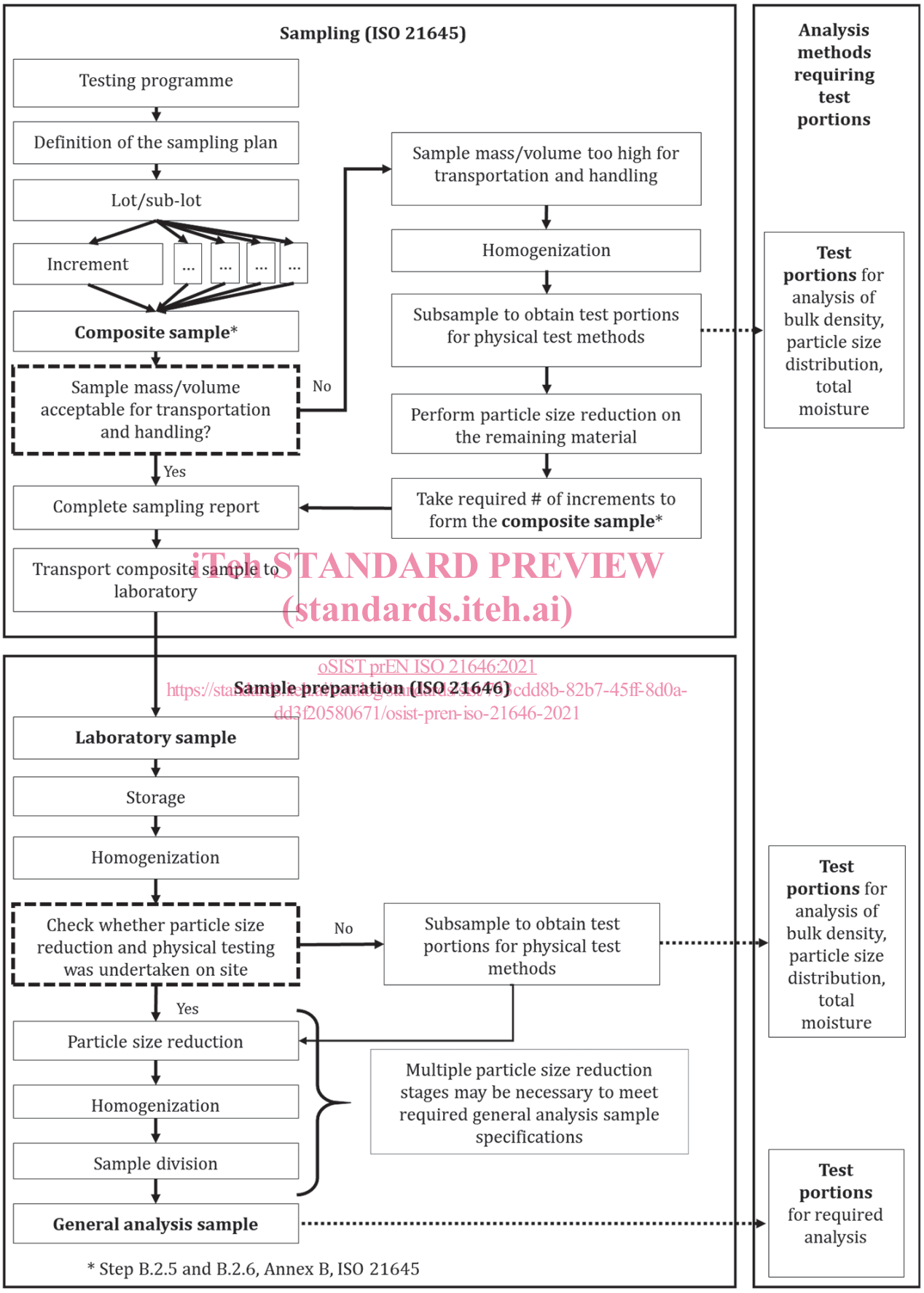

Figure 1 — Links between the essential elements of a testing program

Solid recovered fuels — Sample preparation

1 Scope

This document specifies methods for sample preparation to ensure representativeness of the samples throughout the preparation procedures to produce general analysis samples. Suitable test portions can be taken from the laboratory or general analysis samples and used for analysis in conformance with the specific requirements defined in the corresponding analytical procedures.

This document specifies the correct sample preparation sequence to be applied to:

a) the field sample in order to produce a laboratory sample (taking into account large pieces of solid recovered fuel);

b) each sub-sampling step throughout the testing program;

c) the laboratory sample in order to obtain suitable test portions;

d) ensure the representativeness of the test portions that have been taken according to the sample preparation plan, prior to physical and/or chemical analysis (e.g. extractions, digestion and/or analytical determinations).

The methods described in this document can be used for sample preparation, for example, when the samples are to be tested for bulk density, biomass content determination, mechanical durability, particle size distribution, moisture content, ash content, ash melting behaviour, calorific value, chemical composition, impurities and self-heating properties. The methods are not intended to be applied to the very large samples required for the testing of bridging properties.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 3310-2, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

ISO 21637:2020, *Solid recovered fuels — Vocabulary*

ISO 21660-3:—[1)], *Solid recovered fuels — Determination of moisture content using the oven dry method — Part 3: Moisture in general analysis sample*

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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21637:2020 and the following apply.

1) Under preparation. (Stage at the time of publication: ISO/FDIS 21660-3.)

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
composite sample
sample consisting of all the increments taken from a lot or a sub-lot

Note 1 to entry: The increments can be reduced by division before being added to the composite sample.

Note 2 to entry: The minimum sample mass shall be retained during the collection of increments to form the composite sample.

3.2
drying
process of removing water from a sample

Note 1 to entry: For the purpose of test portion preparation, it can be useful to remove just the amount of water that could interfere with other processes involved (e.g. during crushing or milling). In order to minimize the alteration of the sample during test portion preparation, removing the total amount of water present in the sample is not necessarily needed.

[SOURCE: ISO 21637:2020, 3.19, modified: "solid fuel" was replaced with "sample" in Note 1 to entry]

3.3
fraction separation
process of dividing components, particles or layers if homogenization of the sample is practically not applicable and/or the analyses of different fractions or phases are appropriate

[SOURCE: ISO 21637:2020, 3.32]

3.4
general analysis sample
sub-sample of a laboratory sample having a nominal top size of 1 mm or less and used for a number of chemical and physical analyses

3.5
homogenization
process of combining of increments making up a combined sample, components, particles or layers into a more homogeneous state than in the samples (in the case of composite samples) or pre-treated fractions of samples in order to ensure equal distribution of substances in and properties of the sample

3.6
increment
portion of solid recovered fuel extracted from a lot or sub-lot in a single operation of the sampling device

[SOURCE: ISO 21637:2020, 3.39]

3.7
laboratory sample
combined sample received by the laboratory on which sample preparation procedures are undertaken

Note 1 to entry: When the laboratory sample is further prepared (reduced) by subdividing, mixing, grinding, or by combinations of these operations, leading to a nominal top size ≤ 1 mm, the result is the general analysis sample. A test portion is removed from the general analysis sample for the performance of the test or for analysis. When no preparation of the laboratory sample is required, the laboratory sample may become the test portion.

Note 2 to entry: The combined sample becomes the laboratory sample when it is delivered into the laboratory for commencement of the sample preparation procedures.

3.8
lot
defined quantity of fuel for which the quality is to be determined

[SOURCE: ISO 21637:2020, 3.40]

3.9
minimum sample mass
minimum sample mass or dimension of the sample required during sampling and sample preparation from the point of view of preserving its representativeness

Note 1 to entry: The minimum sample mass is equal to the increment mass multiplied by the number of increments and is linked directly to the nominal top size.

3.10
nominal top size
d_{95}
aperture size of the sieve used for determining the particle size distribution of solid recovered fuels through which at least 95 % by mass of the material passes

[SOURCE: ISO 21637:2020, 3.48 – modified: "Smallest" and "through the sieve" were removed]

3.11
particle size reduction
reduction of the nominal top size of a sample or sub-sample

3.12
sample
quantity of material, representative of a larger quantity for which the quality is to be determined

3.13
sample division
reduction of the mass of a sample or sub-sample

[SOURCE: ISO 21637:2020, 3.64, modified: "by mass" was deleted from term]

3.14
sub-sample
portion of a sample

Note 1 to entry: A sub-sample is obtained by procedures in which the particles are randomly distributed in part of equal or unequal size.

Note 2 to entry: A sub-sample may be either a portion of the sample obtained by selection, or division of the sample itself, or the final sample of a multistage sample preparation procedure.

[SOURCE: ISO 21637:2020, 3.82, modified – "items of interest" was replaced by "particles" in Note 1 to entry and Note 2 to entry was added]

3.15
sub-sampling
process of selecting one or more sub-samples from a sample

3.16
test portion
sub-sample of a laboratory or general analysis sample consisting of the quantity of material required for a single execution of a test method

Note 1 to entry: The test portion may be taken from the laboratory sample directly, if no preparation of sample is required (e.g. for bulk density determination or particle size distribution).

3.17
total moisture sample
sample taken specifically for the purpose of determining the total moisture content

4 Symbols

For the purposes of this document, the following symbols apply.

α constant in third power law, in g/mm^3

d_{05} is the nominal minimum particle size (a mass fraction of 5 % of the particles are smaller than d_{05}), in mm

d_{95} nominal top size of a particle (a mass fraction of 95 % of the particles are smaller than d_{95}), in mm

f shape factor, in m^3/m^3

M moisture, in percent by weight

m mass of a sample, in g

5 Safety remarks

The safety in handling of potentially hazardous materials is dealt with relevant national and international regulations, to which every laboratory should refer.

In addition, the following applies:

a) The apparatus for grinding, cutting, milling, and homogenization can be harmful for the users. They shall be operated by skilled persons strictly according to the manufacturer's instructions

b) All operations shall be performed in a hood or in closed force-ventilated equipment, due to the possibility of generation of fine powders.

6 Principles of correct sample preparation

The main purpose of sample preparation is to reduce a sample to one or more test samples that are in general smaller than the laboratory sample. The principle of correct sample preparation is that the composition of the composite sample collected does not change during each step of the sample preparation procedures. When correct sampling is performed, any sub-sample or test portion is representative of the laboratory sample and every particle in that sample has then an equal probability of being included in any sub-sample retained during sample preparation. Also, the loss of moisture and other volatile components is minimized following the procedures described in this document. Equally, any contamination of the sample during the sample preparation processes is addressed and measures are taken to avoid contamination.

Three basic methods are used during the sample preparation:

— homogenization;

— sample division;

— particle size reduction of the sample.

For granular materials generally the principle of the third-power law is accepted and respected at each sample division step. Formula (1) shows this third-power law:

$$m > \alpha \times {d_{95}}^3 \quad (1)$$

where

m is the mass retained after each sample division step in g;

d_{95} is the nominal top size in mm;

α is a constant over the whole sample preparation procedure for a particular material in g/mm^3.

The value and unit of constant α is fixed by the nominal particle size, d_{95}, and the sample mass, m, of the sample collected following the sampling plan and before sample preparation.

The minimum amount of sample for each step of sample preparation and sub-sampling can be directly estimated by the formula provided in Annex E.

EXAMPLE A sample of 10 kg of solid recovered fuel has d_{95} of 50 mm. For the analysis, a test portion of 5 g is required. The third-power law results in α = 10 000 g / (50 mm)^3 = 0,08 g/mm^3. Using this value in Formula (1) for a reduced sample mass results in a nominal top size for the particles in the test portion of 3,97 mm (i.e. $\sqrt[3]{}$ (5,0 g / 0,08 g/mm^3)). The resultant figures are shown in the table below.

m g	α g/mm^3	d_{95} mm
10 000	0,08	50
5	0,08	3,97

Table 1 shows the resulting reduction factors for the minimum (sub-)sample mass, if a certain reduction of the nominal top size is chosen and the third-power law is respected. The reduction factor of the nominal top size can be calculated by dividing the current nominal top size by the proposed nominal top size after mass reduction.

Table 2 shows the desired reduction factors for the minimum nominal top size, if a certain reduction of the (sub-)sample mass is chosen and the third-power law is respected. The reduction factor of the minimum (sub-)sample mass can be calculated by dividing the current minimum (sub-)sample mass by the proposed minimum (sub-)sample top size after mass reduction.

Formula (1) can be used to calculate the exact values for each specific situation.