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Trdna alternativna goriva - Metode za vzorļenje

Solid recovered fuels - Methods for sampling

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English Version

Solid recovered fuels - Methods for sampling

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (prEN 15442:2009) has been prepared by Technical Committee CEN/TC 343 “Solid recovered fuels”, the secretariat of which is held by SFS.

This document is currently submitted to the CEN Enquiry.

This document will supersede CEN/TS 15442:2006.

This document is one of a series of Standards dealing with solid recovered fuel.

prEN 15442, *Solid recovered fuels — Methods for sampling*

prEN 15443, *Solid recovered fuels — Methods for laboratory sample preparation*

prEN 15413*, Solid recovered fuels —- Methods for the preparation of the test sample from the laboratory sample*

Introduction

The testing of solid recovered fuel enables informed decisions about their subsequent handling and use. In order to carry out a test on a solid recovered fuel a sample of the material is required. Before any sampling operation is devised it is important that the objectives for sampling are clearly identified and subsequently well executed to ensure that the expectations of any involved parties are recognized and satisfied. The identification of objectives helps to define the level of testing required, e.g. thorough examination or routine testing and in addition desired reliability of testing / assessment and frequency of testing. The sampling objectives, along with the sequence of operations required to fulfil them are detailed in an overall sampling plan. After a sampling plan has been prepared the sampling of solid recovered fuel itself can be implemented.

Figure 1 shows the links between the essential elements of a testing program.

Sampling procedures are provided for a range of process streams and common storage conditions. The sampling 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 situation at the sampling location/ the way in which the material occurs (e.g. in a stockpile, on a conveyor belt, in a lorry);

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

This Standard is primarily geared toward laboratories, producers, suppliers and purchasers of solid recovered fuels, but is also useful for the authorities and inspection organizations.

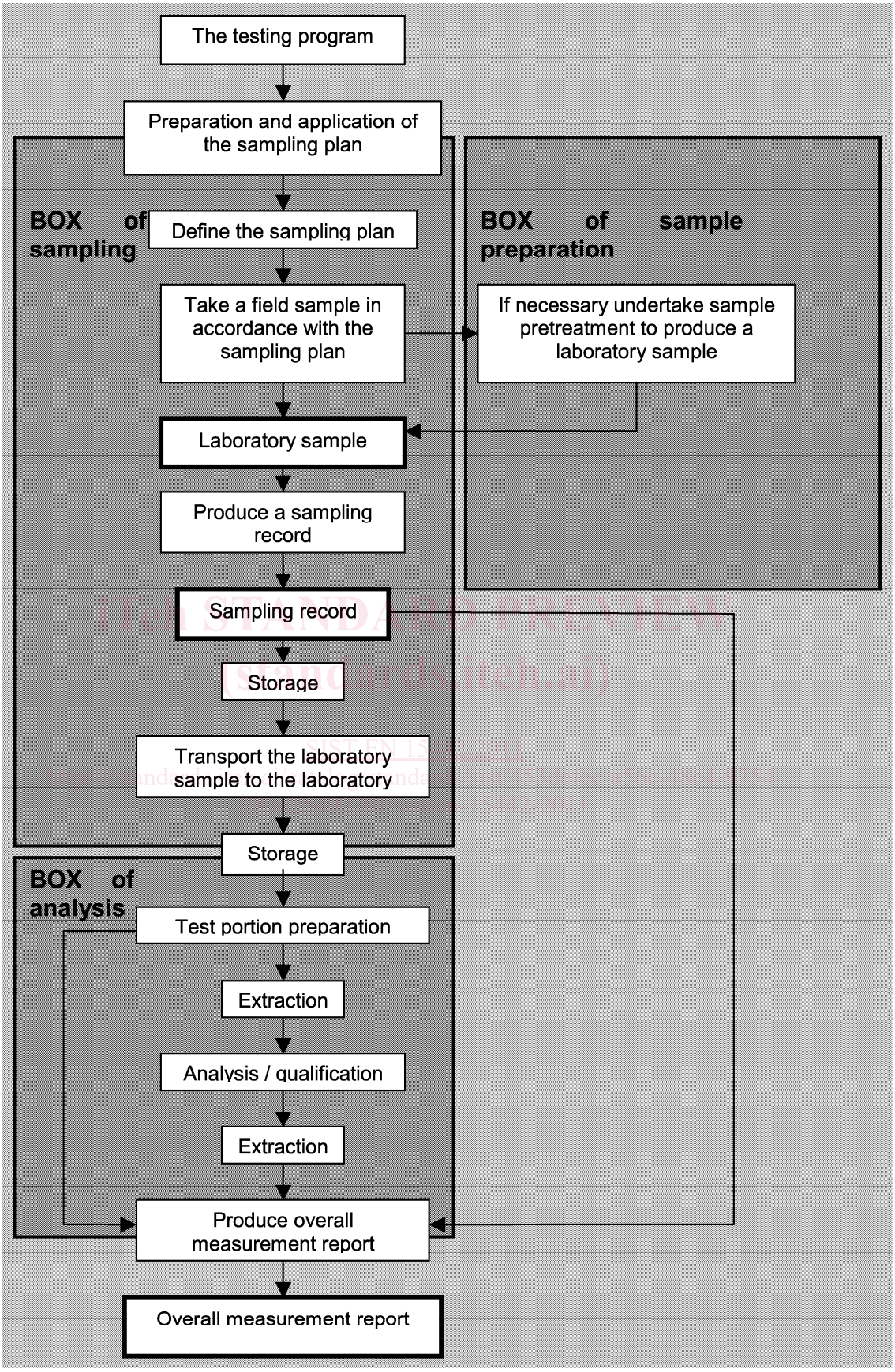

Figure 1 — Links between the essential elements of a testing program

Standards for sampling of solid biofuels are available from Technical Committee CEN/TC 335 “Solid biofuels” (1) (2) (3). A European standard and a Technical Report for the sampling for the purpose of the characterization of waste are available from CEN/TC 292 (4) (5).

1 Scope

This Standard describes methods for taking samples of solid recovered fuels for example from production plants, from deliveries or from stock. It includes manual and mechanical methods.

It is not applicable to solid recovered fuels that are formed by liquid or sludge, but it includes dewatered sludge.

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 15357, *Solid recovered fuels — Terminology, definitions and descriptions*

prEN 15401, *Solid recovered fuels — Methods for the determination of bulk density (revision of CEN/TS 15401 as WI 00343047)*

prEN 15413, *Solid recovered fuels — Methods for the preparation of the test sample from the laboratory sample (revision of CEN/TS 15413 as WI 00343062)*

prEN 15415, *Solid recovered fuels — Determination of particle size distribution by screen method (revision of CEN/TS 15415 as WIs 00343063, 00343064, 00343065)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 15357 and the following apply.

3.1
coefficient of variation

an estimate of the standard deviation of a population from a sample of n results divided by the mean of that sample. Frequently stated as a percentage

NOTE Adapted from Eurachem/Citac Guide CG 4 [13]

3.2
duplicate sample
Two samples taken under comparable conditions. This selection may be accomplished by taking units adjacent in time or space.

NOTE 1 Although the replicate samples are expected to be identical, often the only thing replicated is the act of taking the physical sample.

NOTE 2 A duplicate sample is a replicate sample consisting of two portions.

NOTE 3 The replicate sample is usually used to estimate sample variability.

3.3
effective increment size
minimum sample size divided by the number of increments

NOTE The effective increment size should never be smaller than the minimum increment size.

3.4
effective sample size
effective increment size multiplied by the number of increments

NOTE The effective sample size should never be smaller than the minimum sample size.

3.5
granular
more or less spherical or cubic

3.6
heterogeneity
degree to which a property or type of particle of a solid recovered fuel component is not uniformly distributed throughout a quantity of material

3.7
homogeneity
degree to which a property or a type of particle of a solid recovered fuel component is uniformly distributed throughout a quantity of material

3.8
increment
portion of fuel extracted in a single operation of the sampling device

3.9
lot
defined quantity of fuel for which the quality is to be determined

NOTE Adapted from ISO 13909:2002

NOTE The different types of waste are identified by the number of the European Waste List (6).

3.10
minimum increment size
minimum dimension or size of the increment that shall be taken from a lot, from the point of view of preserving its representativeness

NOTE The product of the minimum increment size and the number of increments to be taken should never be smaller than the minimum sample size.

3.11
minimum sample size
minimum sample size or dimension of the sample required during sampling and sample preparation from the point of view of preserving its representativeness

NOTE The minimum sample size is equal to the ultimate increment size multiplied by the number of increments, and is linked directly to the nominal top size.

3.12
nominal top size
d_{95}

aperture size of the sieve used for determining the particle size distribution of solid fuels through which at least 95% by mass of the material passes

3.13
precision
closeness of agreement between independent test/measurement results obtained under stipulated conditions

NOTE 1 Precision depends only on the distribution of random errors and does not relate to the true value or the specified value.

NOTE 2 The measure of precision is usually expressed in terms of imprecision and computed as a standard deviation of the test results or measurement results. Less precision is reflected by a larger standard deviation.

NOTE 3 Quantitative measures of precision depend critically on the stipulated conditions.

[ISO 3534-2]

3.14
random sampling
taking a sample at a random location within a specified range or from a specified lot. A random location is determined by lot

3.15
repeatability
precision under repeatability conditions

[ISO 3534-2]

NOTE Repeatability can be expressed quantitatively in terms of the dispersion characteristics of the results.

3.16
reproducibility
precision under reproducibility conditions

[ISO 3534-2]

NOTE 1 Reproducibility can be expressed quantitatively in terms of the dispersion characteristics of the results.

NOTE 2 Results are usually understood to be corrected results.

3.17
sample
quantity of material, representative of a larger quantity for which the quality is to be determined

3.18
sample preparation
actions taken to obtain representative analysis samples or test portions from the original sample

3.19
sampling
process of drawing or constituting a sample

[ISO 3534-1]

3.20
sampling plan
predetermined procedure for the selection, withdrawal, preservation, transportation and preparation of the portions to be removed from a population as a sample

[ISO 11074-2:1998]

3.21
sampling record
report which serves as a check list and provides the investigator with all necessary information about the sampling techniques applied at the site and any additional important information

[ISO 11074-2:1998]

3.22
shape factor
s
factor that corrects the minimum sample size if the particles in a lot have not a regular shape (e.g. spherical or cubic)

3.23
static lot
lot that is not in motion during the sampling, or transported by a conveyor or alternative transport system

3.24
stratified sampling
sampling consisting of portions obtained from identified subparts (strata) of the parent population

3.25
stratified random sampling
sampling consisting of portions obtained from identified subparts (strata) of the parent population. Within each stratum, the samples are taken randomly

3.26
trueness
closeness of agreement between the expectation of a test result or a measurement result and a true value

[ISO 3534-2]

NOTE 1 The measure of trueness is usually expressed in terms of bias.

NOTE 2 Trueness is sometimes referred to as “accuracy of the mean”. This usage is not recommended.

NOTE 3 In practice, the accepted reference value is substituted for the true value.

NOTE 4 The determination of the exact trueness for waste and from waste derived materials such as solid recovered fuels is by definition not possible.

4 Symbols and abbreviated terms

For the purposes of this document, the following symbols and abbreviated terms apply.

b is the breadth of the flow, in m

cv is the coefficient of variation

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

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

g is the correction factor for distribution in the particle size

G is the conveyor load, in kg/m

λ_b is the bulk density of the solid recovered fuel, in kg/m^3

λ_p is the particle density, in kg/m^3

m is mass, in kg

n is the number of increments to be taken per lot

p is the fraction of the particles with a specific characteristic (such as a specific contaminant), in kg/kg, and is equal to 0,1

Φ_f is the bulk density of the flow, in kg/m^3

Φ_d is the drop flow, in kg/s

s is the shape factor, in m^3/m^3

V is volume

v is conveyor velocity, in m/s

5 Principle

Every particle in the lot or sub-lot to be represented by the sample should have an equal probability of being included in the sample. When this principle cannot be applied in practice, the sampler shall note the limitations in the sampling plan.

6 Development of a sampling plan

6.1 Principle

From a pre-defined lot of solid recovered fuel, samples shall be taken representatively on the basis of a sampling plan that shall be drawn up before the sampling takes place. Annex A specifies how this sampling plan shall be made. Annex J specifies according to this Clause and Annex A simplified sampling plans for three common standard situations. Figure 2 determines whether a simplified sampling plan can be used.

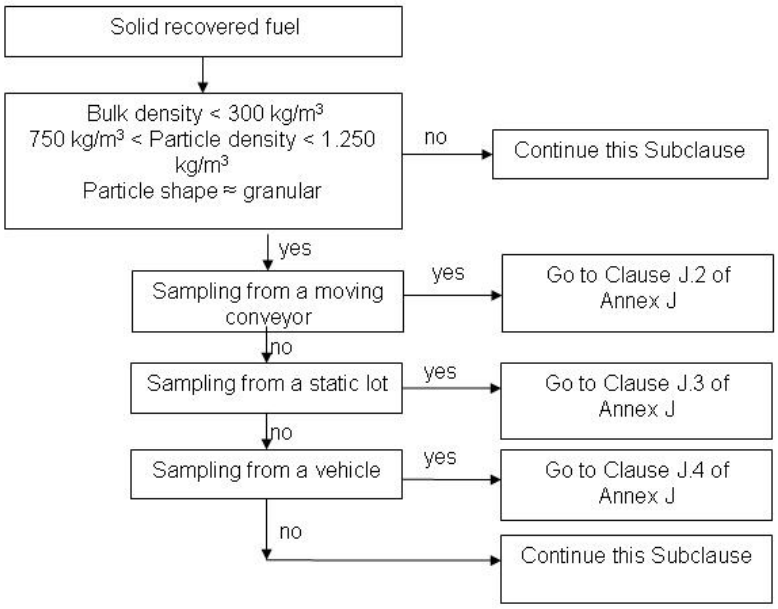

Figure 2 — Check for the standard sampling plan

The sampling plan shall be drawn up on the basis of the objective for the sampling process, using the available data on a solid recovered fuel and the accessibility of the lot, see Annex B. The sampling plan shall be completed. If certain estimates concerning specific parameters relating to the lot cannot be determined with sufficient certainty on the basis of the information available, these shall be verified in the field. If necessary, the sampling plan shall be adjusted in the field and the deviations shall be reported in the sampling record. Figure 3 shows the actions that are necessary for the development of a sampling plan.