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Coal and coke~~–~~ — Mechanical sampling~~–~~ —

Part 6:
Preparation of test samples of coke

~~*Houille et coke — Échantillonnage mécanique — Partie 1: Introduction générale*~~

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Foreword

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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 document 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).

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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 27, *Coal and coke*, Subcommittee SC 4, *Sampling*.

This third edition cancels and replaces the second edition (ISO 13909-~~-~~6:~~2023~~2016), which has been technically revised.

The main changes are as follows:

— ~~—~~the title has been modified and aligned with the rest of the ISO 13909 series;

— ~~—~~the Scope has been revised to specifically refer to coke;

— ~~—~~the references have been updated;

— ~~—~~legends for Formulae (1)~~Formulae (1)~~ and (3)~~(3)~~ have been updated;

— ~~—~~requirements have been specified throughout the document.

A list of all parts in the ISO 13909 series can be found on the ISO website.

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

The objective of sample preparation is to prepare one or more test samples from the primary increments for subsequent analysis. The requisite mass and particle size of the test samples depend on the test to be carried out.

Examples of tests which require different masses are shatter index (ISO 616), Micum and Irsid Index (ISO 556), reactivity tests (ISO 18894), density (ISO 567, ISO 1013) and size distribution (ISO 728, ISO 2325).

The process of sample preparation may involve constitution of samples, reduction, division, mixing and drying, or all, or a combination of these.

Primary increments may be prepared individually as test samples or combined to constitute samples either as taken or after having been prepared by either reduction ~~and/~~or division, or both. Samples may either be prepared individually as test samples or combined on a weighted basis to constitute a further sample.

Coal and coke — Mechanical sampling — Part 6: Preparation of test samples of coke

Part 6: Preparation of test samples of coke

1 Scope

This document describes the preparation of samples of coke from the combination of primary increments to the preparation of samples for specific tests.

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 579, *Coke — Determination of total moisture*

ISO 687, *Coke — Determination of moisture in the general analysis test sample*

ISO 13909-1, *Coal and coke — Mechanical sampling — Part 1: General introduction*

ISO 13909-5, *Coal and coke — Mechanical sampling — Part 5: Sampling of coke from moving streams*

ISO 13909-7, *Coal and coke — Mechanical sampling — Part 7: Methods for determining the precision of sampling, sample preparation and testing*

ISO 13909-8, *Coal and coke — Mechanical sampling — Part 8: Methods of testing for bias*

ISO 21398, *Coal Hard coal and coke — Guidance to the inspection of mechanical sampling systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13909-1 apply.

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

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

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

4 Precision of sample preparation

From the formulae given in ISO 13909-7, the estimated absolute value of the precision of the result obtained for the lot at the 95 % confidence level, P_L, for continuous sampling is given by Formula (1):

(1)

$$P_L = 2\sqrt{\frac{\frac{V_I}{n}+V_{PT}}{m}} \quad (1)$$

where

2 is a conversion factor from the sample estimate of the population standard deviation to an index of precision, dimensionless;

V_I is the primary increment variance;

n is the number of increments in the sample;

V_{PT} is the variance of preparation and testing for both off-line and on-line systems;

m is the number of sub-lots.

The procedures given in this document are designed to achieve levels of V_{PT} of 0,05 or less for moisture tests. Better levels may be expected for other chemical characteristics.

For some preparation schemes, however, practical restrictions ~~may~~can prevent the preparation and testing variance being as low as this. Under these circumstances, the user shall decide whether to achieve the desired overall precision by improving the preparation scheme or by dividing the lot into a greater number of sub-lots.

The errors occurring in the various stages of preparation and analysis, expressed in terms of variance, can be checked by the methods given in ISO 13909-~~-~~7.

5 Constitution of a sample

5.1 General

Examples of the constitution of samples are shown in Figure 1~~Figure 1.~~.

Primary increments shall be taken in accordance with the procedures specified in ISO 13909-~~-~~5.

Individual increments are usually combined to form a sample. A single sample may be constituted by combination of increments taken from a complete sub-lot or by combining increments taken from individual parts of a sub-lot. Under some circumstances, e.g. size analysis or bias testing, the sample consists of a single increment which is prepared and tested.

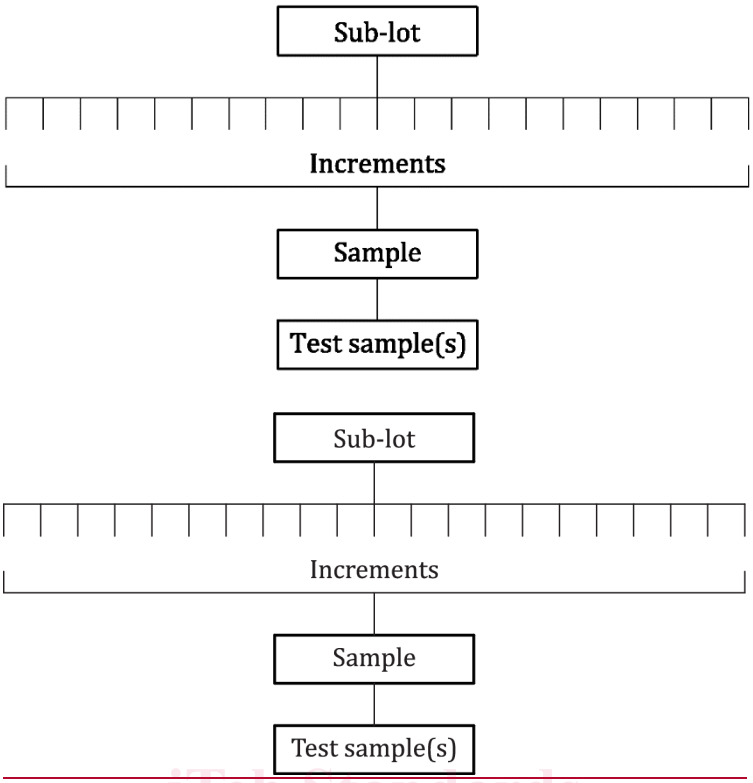
Samples may also be prepared by the combination of other samples.

5.2 Combination of increments

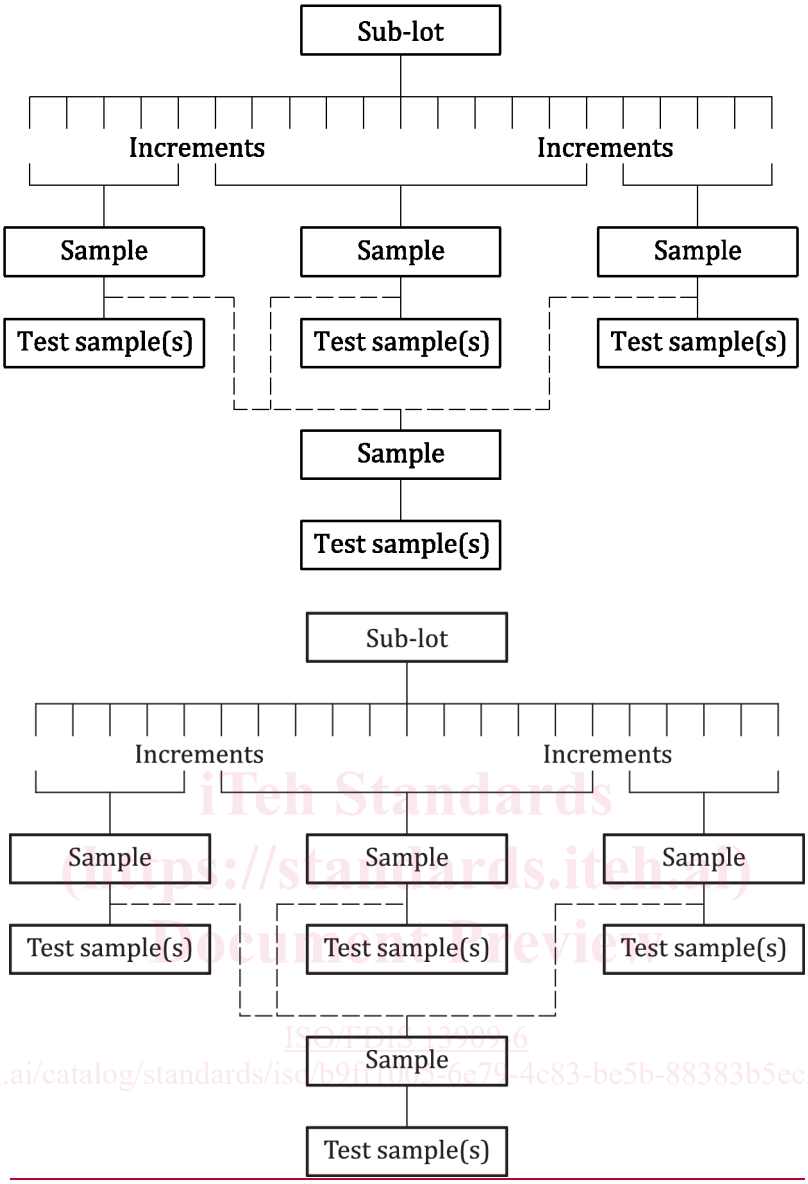
The mass of the primary increments shall be proportional to the flow rate at the time of sampling. The primary increments may be combined into a sample, either directly as taken or after having been prepared individually to an appropriate stage by fixed-ratio division (see Clause 6~~Clause 6).~~.).

5.3 Combination of samples

When combining samples, the mass of the individual samples shall be directly proportional to the mass of the coke from which they were taken in order to obtain a weighted mean of the quality characteristic for the sub-lot. Prior to combination, division shall be by fixed-ratio (see Clause 6~~Clause 6).~~.).



a) Example 1



b) Example 2

Figure 1 — Examples of the constitution of samples

6 Division

6.1 General

Since the cutter aperture will be at least three times the nominal top size, this will result in a very large increment mass in many cases. The handling and preparation of such large increments would be either manpower or equipment intensive. Division prior to further treatment may be necessary to provide a manageable sample mass.

Sample division can be:

— on-line mechanically; or

— off-line mechanically or manually.

Whenever possible, mechanical methods are preferred to manual methods to minimize human error. Examples of dividers are shown in Figures 2 to 10~~Figure 2.~~.

Mechanical dividers are designed to extract a part of the coke in a number of cuts of relatively small mass. When the smallest mass of the divided sample that can be obtained in one pass through the divider is greater than that required, further passes through the same divider or subsequent passes through further dividers are necessary.

Manual division is normally applied when mechanical methods would result in loss of integrity (e.g. loss of moisture or size degradation). Manual division of coke is also applied when the nominal top size of the coke is such as to make the use of a mechanical divider impracticable. Manual methods may themselves result in bias, particularly if the mass of coke to be divided is large.

In the rotating disc type of mechanical divider in Figure 2~~Figure 2(a),~~ the material from a mixing container is fed by scrapers to the centre of the dividing disc. From there it is discharged over the range of the disc through special clearing arms. The sample falls through adjustable slots into chutes; the reject is carried away through a cleaning conduit. The whole interior space is cleaned by scrapers.

For the rotating cone type of divider in Figure 3~~Figure 2(b),~~ a stream of coke is allowed to fall onto a rotating cone, the adjustable slot with lips in the cone allows the stream to fall directly onto the sample receiver for part of each revolution.

In the container type dividers in Figure 4~~Figure 2(c),~~ the coke stream flows to the hopper and this flow is intercepted by the top edge of a number of sector-shaped containers dividing the flow into equal parts. Either the hopper or the containers may rotate. The machine can be controlled for the following operations:

1) for dividing;

2) for collecting duplicates:

3) for collecting replicates.

For the chain bucket type divider in Figure 5~~Figure 3(d),~~ a chain mechanism as shown is equipped with buckets spread at equal pitch. The buckets travel in a single direction or change direction at preset time periods. The bucket intercepts the free-falling coke stream to extract cuts which discharge to sample as the bucket inverts.

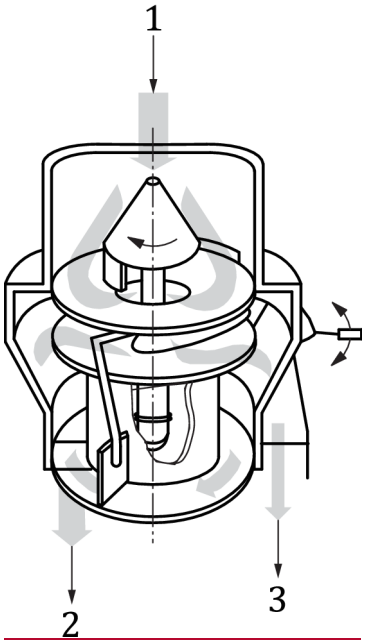
The slotted-belt type divider in Figure 6~~Figure 3(e)~~ comprises an endless belt as shown having slots spaced at equal pitch with lips that act as cutting edges passing below a feed chute. The coke stream is fed to the chute and, as each slot passes through the stream, a cut is taken. The stream which falls onto the plain part of the belt is carried to rejects.

The rotating plate divider in Figure 7~~Figure 3(f)~~ consists of a flat plate with lipped slots spaced at equal pitch rotating beneath a feed chute. Coke is fed into the feed chute, then, falls onto the rotating plate to form a ribbon bed which is carried to the plough and discharged to rejects. As a slot passes through the stream, a cut is taken.

The rotating chute type divider in Figure 8~~Figure 3(g)~~ incorporates a hollow shaft with a rotating conical hopper and chute which distributes the coke to one or more stationary cutters within a housing as shown. Each cutter is designed to take cuts from the coke stream and the rejects are discharged through the hollow shaft.

The rotating cutter divider in Figure 9~~Figure 3(h)~~ comprises one or more rotating cutters taking cuts from the coke stream as it is fed into the housing through a feed chute as shown. Coke not collected by the rotating cutters is directed to reject at the bottom of the housing.

Finally, the cutter-chute type divider in Figure 10~~Figure 3(i)~~ incorporates a cutter-chute that traverses the full coke stream and diverts a portion from the stream. When the coke stream is not being cut by the chute, it is deflected by the angle plate to reject.



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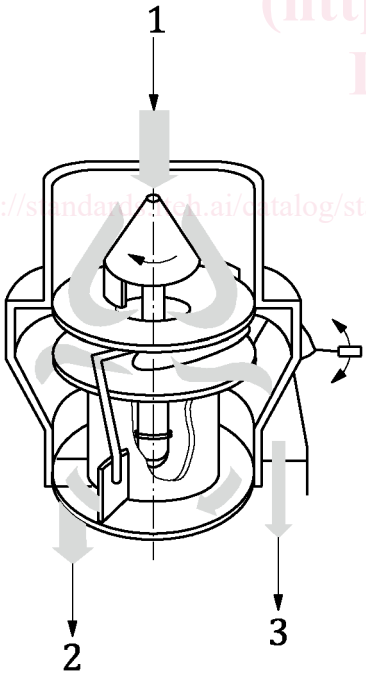
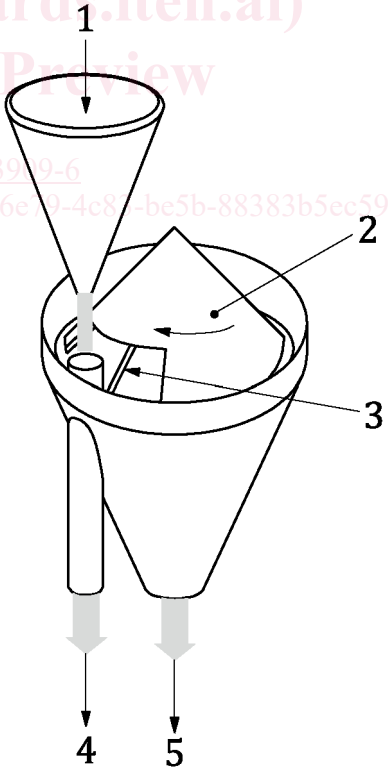


~~Key~~

~~1 1feed~~
~~2 reject~~
~~3 divided sample~~



~~Key~~

feed~~1 feed~~
~~2 rotating cone~~
~~3 adjustable slot~~