This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

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Standard Practice for Sampling of Green Petroleum Coke[1]

This standard is issued under the fixed designation D8145; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Green petroleum coke is a byproduct of certain oil refining technologies but has multiple uses, such as a solid mineral fuel or a key constituent of making anodes. The chemical and physical characteristics of green petroleum coke, particularly the moisture content, are not always distributed equally in the different sized particles. As such, the sampling of green petroleum coke must follow the general sampling principals of capturing the particle size distribution of the consignment into the gross sample that is collected to represent it.

Green petroleum coke sampling has relied on the sampling standards for Coal and Coke under ASTM Subcommittee D05.05 for guidance on how to collect and prepare samples, in particular, Practice D2234/D2234M for the Collection of a Gross Sample of Coal, Practice D2013/D2013M for the Preparation of Coal Samples for Analysis, and Practice D346 for the Collection and Preparation of Coke Samples for Laboratory Analysis have been used, among others. With the growing use of mechanical sampling equipment, Practice D7430 for the Mechanical Sampling of Coal has been added to the mix. The above cited standards are useful, but do not account for some of the unique characteristics of petroleum coke, which has led to widespread confusion as to which parts are applicable, especially Practice D346, which is really used for coke made from coal and not from petroleum refining.

This practice gives guidelines for the user on how to sample green petroleum coke. The intent is not to write a standalone standard for green petroleum coke but to direct the user as to how to apply the D05.05 coal standards already in existence.

1. Scope*

1.1 This practice primarily references Practice D2234/D2234M and applies its sampling principles to green petroleum coke. Green petroleum coke is typically more homogeneous than coal and this practice provides specific guidance for the application of D05.05 coal standards to the sampling of green petroleum coke.

1.1.1 Practice D2234/D2234M references the four conditions of collecting sample increments: Condition A (Stopped Belt Cut), Condition B (Full-stream Cut), Condition C (Part-stream Cut), and Condition D (Stationary Sampling). This practice directs the user to the appropriate coal standard to apply to each condition, as well as key considerations.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D121 Terminology of Coal and Coke

D346 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis

D2013/D2013M Practice for Preparing Coal Samples for Analysis

[1] This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.05 on Properties of Fuels, Petroleum Coke and Carbon Material.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

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D2234/D2234M Practice for Collection of a Gross Sample of Coal
D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants
D5709 Test Method for Sieve Analysis of Petroleum Coke
D6609 Guide for Part-Stream Sampling of Coal
D6883 Practice for Manual Sampling of Stationary Coal from Railroad Cars, Barges, Trucks, or Stockpiles
D7430 Practice for Mechanical Sampling of Coal
E456 Terminology Relating to Quality and Statistics

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this practice, refer to Terminologies D121 and D4175.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *cross-belt sampler, n*—a single sampling machine or component of a mechanical sampling system designed to extract an increment directly from a conveyor belt surface by sweeping a sampling device (cutter) through the material on the conveyor.

3.2.2 *falling-stream sampler, n*—a single sampling machine or component of a mechanical sampling system designed to extract an increment from a falling stream of green petroleum coke at the discharge end of a conveyor or chute by moving a sampling device (cutter) through the falling stream of material.

3.2.3 *increment, n*—a small portion of a lot collected by one operation of a sampling device and normally combined with other increments from the lot to make a gross sample.

3.2.4 *judgment sampling, n*—a procedure whereby enumerators select a few items of the population, based on visual, positional, or other cues that are believed to be related to the variable of interest, so that the selected items appear to match the population.

3.2.4.1 *Discussion*—In the case of sampling green petroleum coke, this statistical terminology from Terminology E456 is stating that the enumerator (human sampler) selects items from the population (collects sample increments) based on various cues (time/tonnage, at transfer point, etc.) so that the items (sample increments) appear to match the population (representative sample). The key dynamic here is that the sampler is attempting to collect a representative sample using their best judgment as to when and how to collect increments when, (*a*) so many particles in the consignment have a zero chance of being selected; and (*b*) there is no sure way to overcome particle size segregation in the material.

3.2.5 *mechanical sampling system, n*—a single machine or series of interconnected machines whose purpose is to extract mechanically, or process (divide and reduce), or a combination thereof, a sample of green petroleum coke.

3.2.6 *nonprobability sample, n*—a sample of which the sampling units have not been selected in a manner that satisfies the minimum requirements of probability sampling.

3.2.6.1 *Discussion*—No meaningful statistical inference can be made with data obtained by a nonprobability sample. No meaningful statement can be made concerning the precision, standard error, or bias of the sample.

3.2.7 *probability sample, n*—a sample collected using a sampling process such that at each stage of the process, a specified non-zero probability of being selected for the sample can be attached to every sampling unit in the lot to be sampled.

3.2.7.1 *Discussion*—Given adequate information about the sample results obtained using probability sampling, the probability distribution of sampling errors can be estimated.

3.2.8 *sample, n*—a quantity of material taken from a larger quantity for the purpose of estimating properties or composition of the larger quantity.

3.2.9 *size consist, n*—the particle size distribution of a consignment of green petroleum coke.

4. Summary of Practice

4.1 This practice applies the requirements of Practice D2234/D2234M to the sampling of green petroleum coke. Practice D2234/D2234M is an umbrella standard which defines four different conditions of sample increment collection. This practice delineates which ASTM standard to use based on the condition of sampling available.

4.1.1 *Conditions of Increment Collection*—The conditions under which individual increments are collected are the conditions of the main body of green relative to the portion withdrawn. Four conditions are recognized:

4.1.1.1 *Condition A (Stopped-belt Cut),* in which a loaded conveyor belt is stopped, and a full cross-section cut with parallel sides is removed from the green petroleum coke stream. The distance between the parallel faces shall not be less than three times the normal top size of the green petroleum coke.

4.1.1.2 *Condition B (Full-stream Cut),* in which a full cross-section cut is removed from a moving stream of green petroleum coke.

4.1.1.3 *Condition C (Part-stream Cut),* in which a portion, not a full cross-section, is removed from a moving stream of green petroleum coke.

4.1.1.4 *Condition D (Stationary Coal Sampling),* in which a portion of green petroleum coke is collected from a pile, a rail car, a barge, or a ship hold. Mechanical sampling with an auger is Condition D sampling.

4.2 The first two conditions, A (Stopped-belt Cut) and B (Full-stream Cut), are considered probability samples because every particle in the lot has a non-zero chance of being selected and the sample collection method overcomes any particle size segregation in the material. The latter two conditions, C (Part-stream Cut) and D (Stationary Coal Sampling), are considered nonprobability samples primarily because there are large numbers of particles in the lot that have a zero chance of being selected for the sample and the sampling method cannot ensure overcoming any particle size segregation in the consignment. In addition, Conditions C and D are often referred to as judgment samples because the increments are not collected according to probability but primarily based on the human judgment of the sampling personnel.

4.3 The highest feasible condition should be used for sample collection and probability sampling is strongly preferred over nonprobability or judgment sampling.