



Standard Guide to the Evaluation of Measurements Made by On-Line Coal Analyzers¹

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€¹ NOTE—Figs. 7–10 were editorially corrected in December 2000.

1. Scope

1.1 This guide provides techniques to be used for the evaluation of the measurement performance of on-line coal analyzers.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 121 Terminology of Coal and Coke²

D 2013 Method of Preparing Coal Samples for Analysis²

D 2234 Test Methods for Collection of a Gross Sample of Coal²

D 4702 Guide for Inspecting Crosscut, Sweep Arm, and Auger Mechanical Coal Sampling Systems for Conformance with Current ASTM Standards²

D 6518 Practice for Bias Testing Mechanical Coal Sampling Systems

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods³

E 178 Practice for Dealing With Outlying Observations³

E 456 Terminology Relating to Quality and Statistics³

3. Terminology

3.1 Definitions:

3.1.1 *analyzer system, n*—a coal quality measurement system which includes an on-line coal analyzer and which may include one or more stages of a coal-sampling system.

3.1.2 *calibration, n*—mathematical modeling of analyzer and comparative coal sampling and analysis data. Factors from the model are used in the on-line analyzer control software.

3.1.3 *Grubbs estimator, n*—an estimate of the measurement precision of an on-line analyzer (1-3).⁴

3.1.4 *on-line analyzer, n*—an analytical tool consisting of an instrument and systems, which together provide measurements, or estimates, or both, of coal quality parameters.

3.1.5 *outlier, n*—an extreme value that statistical tests indicate to be far enough from other results in a population under consideration to cause suspicion that the value is not a member of the population.

3.1.6 *reference material, n*—material of stable composition that may be used to generate static analyzer measurements.

3.1.7 *reference system, n*—a measurement system used to measure the characteristics of a lot of coal that are also measured by an on-line-analyzer, and against which the on-line analyzer measurements are compared.

3.1.8 *standardization, n*—calibration of an instrument to a reference material using static stability measurements.

3.1.9 *static stability, n*—an estimate of the measurement precision of an instrument obtained on material that is not moving. The estimate normally is expressed as the standard deviation and average of the measurements for a given period of time.

3.1.10 *synchronization error, n*—an error that occurs from comparing measurements made by an on-line analyzer and a reference system that are not measuring exactly the same lot because of temporal and/or spatial offsets.

4. Summary of Guide

4.1 This guide outlines the evaluation of the measurement performance of an on-line analyzer using comparative measurements. The comparative test uses a paired comparison of analysis from a reference method using ASTM sampling, sample preparation, and analysis methods for a lot of coal with the analysis from the on-line analyzer for the same lot of coal. The data resulting from the comparative test may be evaluated using graphical and statistical techniques outlined below.

¹ This guide is under the jurisdiction of ASTM Committee D05 on Coal and Coke and is the direct responsibility of Subcommittee D05.23 on Sampling.

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² *Annual Book of ASTM Standards*, Vol 05.06.

³ *Annual Book of ASTM Standards*, Vol 14.02.

⁴ The boldface numbers in parentheses refer to the list of references at the end of this standard.