



Standard Practice for Statistical Assessment and Improvement of the Expected Agreement Between Two Test Methods that Purport to Measure the Same Property of a Material¹

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€¹ NOTE—Corrected Eq 8 editorially in November 2003.

1. Scope

1.1 This practice defines statistical methodology for assessing the expected agreement between two standard test methods that purport to measure the same property of a material, and deciding if a simple linear bias correction can further improve the expected agreement. It is intended for use with results collected from an interlaboratory study meeting the requirement of Practice D 6300 or equivalent (for example, ISO 4259). The interlaboratory study must be conducted on at least ten materials that span the intersecting scopes of the test methods, and results must be obtained from at least six laboratories using each method.

NOTE 1—Examples of standard test methods are those developed by voluntary consensus standards bodies such as ASTM, IP/BSI, DIN, AFNOR, CGSB.

1.2 The statistical methodology is based on the premise that a bias correction will not be needed. In the absence of strong statistical evidence that a bias correction would result in better agreement between the two methods, a bias correction is not made. If a bias correction is required, then the *parsimony principle* is followed whereby a simple correction is to be favored over a more complex one.

NOTE 2—Failure to adhere to the parsimony principle generally results in models that are over-fitted and do not perform well in practice.

1.3 The bias corrections of this practice are limited to a constant correction, proportional correction or a linear (proportional + constant) correction.

1.4 The bias-correction methods of this practice are method symmetric, in the sense that equivalent corrections are obtained regardless of which method is bias-corrected to match the other.

1.5 A methodology is presented for establishing the 95 % confidence limit (designated by this practice as the *cross-method reproducibility*) for the difference between two results

where each result is obtained by a different operator using different apparatus and each applying one of the two methods *X* and *Y* on identical material, where one of the methods has been appropriately bias-corrected in accordance with this practice.

NOTE 3—Users are cautioned against applying the cross-method reproducibility as calculated from this practice to materials that are significantly different in composition from those actually studied, as the ability of this practice to detect and address sample-specific biases (see 6.8) is dependent on the materials selected for the interlaboratory study. When sample-specific biases are present, the types and ranges of samples may need to be expanded significantly from the minimum of ten as specified in this practice in order to obtain a more comprehensive and reliable 95 % confidence limits for cross method reproducibility that adequately cover the range of sample specific biases for different types of materials.

1.6 This practice is intended for test methods which measure quantitative (numerical) properties of petroleum or petroleum products.

2. Referenced Documents

2.1 ASTM Standards:

D 5580 Test Method for Determination of Benzene, Toluene, Ethylbenzene plm-Xylene, o-Xylene, C₉ and Heavier Aromatics and Total Aromatics in Finished Gasoline by Gas Chromatography²

D 5769 Test Method for Determination of Benzene, Toluene, and Total Aromatics in Finished Gasoline by Gas Chromatography/Mass Spectrometry²

D 6299 Practice for Applying Statistical Quality Assurance Techniques to Evaluate Analytical Measurement System Performance²

D 6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products and Lubricants²

2.2 ISO Standard³

ISO 4259 Petroleum Products—Determination and application of precision data in relation to methods of test.

¹ This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.94 on Quality Assurance and Statistics.

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² Annual Book of ASTM Standards, Vol 05.03.

³ Available from American National Standards Institute, 11 W. 42nd St., 13th floor, New York, NY 10036.