



Designation: D8304 – 19

Standard Test Method for Determination of Compounded Forms of Iron in In-service Fluids¹

This standard is issued under the fixed designation D8304; 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.

1. Scope

1.1 This method covers a procedure for determining the concentration of compounded forms of iron in in-service fluids. It is applicable over an iron concentration range of 20 mg/kg to 800 mg/kg (ppm by mass hereafter). The test is not sensitive to metallic iron and thus provides a means of discrimination between the two forms of iron. It is suitable for monitoring the condition of equipment where iron contamination in the lubricating oil or functional fluid may not originate solely from physical wear, for example from corrosion or other forms of undesirable chemical processes within the equipment.

1.2 *Units*—The values stated in SI units are to be regarded as standard. Concentrations are reported as parts per million by mass (ppm) equivalent to iron contents expressed in mg per kg of oil sample (mg/kg).

1.3 *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.*

1.4 *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

D1193 Specification for Reagent Water

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products and Lubricants

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

3. Terminology

3.1 Definitions:

3.1.1 *condition monitoring, n*—the recording and analyzing of data relating to the condition of equipment or machinery for the purpose of predictive maintenance or optimization of performance.

3.1.2 *machinery health, n*—qualitative indication of the overall condition of equipment or machinery. May depend on data and trend analysis from several sources.

3.1.3 *trend analysis, n*—the interpretation of regular or continuous (in time) condition monitoring data in order to determine any changes indicative of deterioration or incipient failure in equipment or machinery.

3.1.4 *wear, n*—the loss of material from a surface, generally occurring between two surfaces in relative motion, and resulting from mechanical or chemical action, or a combination of both.

4. Summary of Test Method

4.1 A sample of oil is extracted from the equipment and collected in a clean sample bottle. Two small, but equal volumes of the sample are subsequently transferred to two clean optical cuvettes. In one, a combined reagent is added. This combined reagent provides:

4.1.1 a means for reducing any iron present in an oxidation state of +3, ferric iron, to an oxidation state of +2, ferrous iron,

4.1.2 a means of transferring the ferrous iron ions from the oil phase to the aqueous phase of the combined reagent,

4.1.3 a complexing reagent which can react with the ferrous iron ions to form a product having a purple color of peak wavelength 538 nm.

4.2 In the second cuvette, a blank reagent is added. This provides all of the above apart from the complexing reagent in step iii. The intensity of the color developed in the sample

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.96.02 on Chemistry for the Evaluation of In-Service Lubricants. Current edition approved Dec. 1, 2019. Published February 2020. DOI: 10.1520/D8304-19.

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.