



Designation: D2276 – 22



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Standard Test Method for Particulate Contaminant in Aviation Fuel by Line Sampling^{1,2}

This standard is issued under the fixed designation D2276; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This test method covers the determination of particulate contaminant in aviation turbine fuel using a field monitor.

1.2 There are two test methods described. The basic test method is used to evaluate the level of contamination gravimetrically. The second test method, presented in **Appendix X1**, describes a color rating technique that is used for rapid qualitative assessment of changes in contamination level without the time delay required for the gravimetric determinations by stringent laboratory procedures.

1.3 There are two Annexes and two Appendixes in this test method.

1.3.1 **Annex A1** provides some precautionary information regarding the use of the required reagents.

1.3.2 **Annex A2** describes a standard practice for obtaining a sample of the particulates present in a flowing stream of aviation turbine fuel.

1.3.3 **Appendix X1** describes a test method for rating the particulate level in an aviation turbine fuel on the basis of the color of a filter membrane after sampling the fuel in the field.

1.3.4 **Appendix X2** provides some safety precautions to avoid static discharge resulting from the accumulation of electrical charges in the fuel and on the equipment while following the procedures.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

¹ This test method is under the jurisdiction of ASTM International Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of ASTM Subcommittee D02.J0.05 on Fuel Cleanliness. The technically equivalent standard as referenced is under the jurisdiction of the Energy Institute Subcommittee SC-B-11.

This test method has been approved by the sponsoring committees and accepted by the Cooperating Societies in accordance with established procedures.

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² This test method has been developed through the cooperative effort between ASTM and the Energy Institute, London. ASTM and IP standards were approved by ASTM and EI technical committees as being technically equivalent but that does not imply both standards are identical.

1.5 *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.*

1.6 *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:³

D1193 Specification for Reagent Water

D1535 Practice for Specifying Color by the Munsell System

D1655 Specification for Aviation Turbine Fuels

D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

D4865 Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems

D5452 Test Method for Particulate Contamination in Aviation Fuels by Laboratory Filtration

D6615 Specification for Jet B Wide-Cut Aviation Turbine Fuel

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology **D4175**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *membrane color, n*—a visual rating of particulate on a filter membrane against ASTM Color Standards.

³ 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

3.2.2 *membrane filter, n*—a porous article of closely controlled pore size through which a liquid is passed to separate matter in suspension.

3.2.2.1 *Discussion*—RR:D02-1012⁴ contains information on membrane filters that meet the requirements therein.

3.2.3 *monitor, n*—something that reminds or warns.

3.2.3.1 *Discussion*—A plastic holder for a membrane filter held in a field sampling apparatus.

3.2.4 *particulate, adj*—of or relating to minute separate particles.

3.2.4.1 *Discussion*—Solids generally composed of oxides, silicates, and fuel insoluble salts.

3.2.5 *volatile fuels, n*—relatively wide boiling range volatile distillate.

3.2.5.1 *Discussion*—These are identified as Jet B in Specification D6615 or the military grade known as JP-4.

4. Summary of Test Method

4.1 A known volume of fuel is filtered through a preweighed test membrane filter in a field monitor and the increase in membrane filter mass determined after washing and drying. The change in mass of a control membrane filter located immediately below the test membrane filter is also determined. The objective of using a control membrane is to assess whether the fuel itself influences the weight of a membrane. The particulate contaminant is determined from the increase in mass of the test membrane filter relative to the control membrane filter.

4.2 This test method employs a field monitor to filter a sample of fuel that is taken in the field by the sampling procedure detailed in Annex A2.

4.3 For situations where it is not possible to take a field monitor sample, procedures are given in Test Method D5452 for the determination of particulate contaminant in a fuel sample by laboratory filtration.

4.4 Appendix X1 describes a method for color-rating used filter membranes.

5. Significance and Use

5.1 This test method provides a gravimetric measurement of the particulate matter present in a sample of aviation turbine fuel by line sampling. The objective is to minimize these contaminants to avoid filter plugging and other operational problems. Although tolerable levels of particulate contaminants have not yet been established for all points in fuel distribution systems, the total contaminant measurement is normally of most interest. The Appendix X1 color rating method is useful for fuel system monitoring purposes. No quantitative relationship exists between gravimetric and color rating test results.

⁴ Supporting data (and a list of suppliers who have provided data indicating their membranes, field monitors, and field monitor castings) have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1012. Contact ASTM Customer Service at service@astm.org.

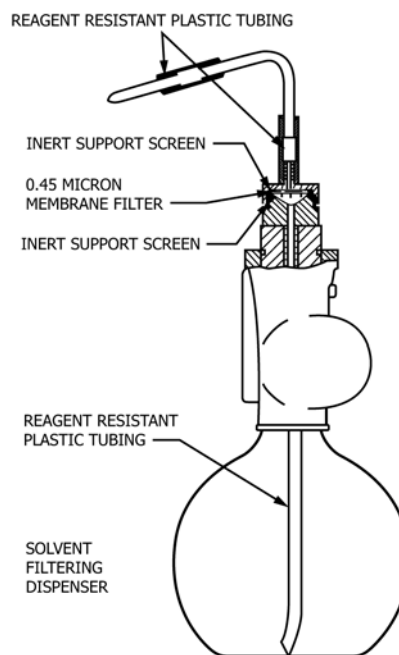


FIG. 1 Apparatus for Filtering and Dispensing Flushing Fluid

6. Apparatus

6.1 *Analytical Balance*, single- or double-pan, the precision standard deviation of which must be 0.07 mg or better.

6.2 *Oven*, of the static type (without fan-assisted air circulation), controllable to $90^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

6.3 *Petri Dishes*, approximately 125 mm in diameter with removable glass supports for membrane filters.

6.4 *Forceps*, flat-bladed with unserrated, non-pointed tips.

6.5 *Vacuum System*.

6.6 *Test Membrane Filters*, ^{4,5} plain, 37 mm diameter, nominal pore size $0.8\ \mu\text{m}$ (see Note 1).

6.7 *Control Membrane Filters*, ^{4,5} 37 mm diameter, nominal pore size $0.8\ \mu\text{m}$. (Gridded control membrane filters may be used for purpose of identification.)

NOTE 1—Matched weight membrane filters, ⁵ 37 mm diameter, nominal pore size $0.8\ \mu\text{m}$, may be used as test and control membrane filters if so desired. Use of matched-weight membrane filters precludes the necessity for carrying out subsequently the procedures detailed in Section 8.

6.8 *Dispenser for Flushing Fluid*, $0.45\ \mu\text{m}$ membrane filters to be provided in the delivery line (see Fig. 1). Alternatively, flushing fluid that has been pre-filtered through a $0.45\ \mu\text{m}$ membrane before delivery to the dispenser flask is acceptable.

6.9 *Field Monitors*, ⁵ complete with protective plugs and 34 mm support pads.

6.10 *Air Ionizer*, for the balance case (see Note 2 and Note 3).

NOTE 2—When using a solid-pan balance, the air ionizer may be

⁵ All available membrane filters are not suitable for this application. Apparatus considered for this application shall be checked by the user for suitability in accordance with the requirements of RR:D02-1012, 1994 revision.