~~Designation:D3240–05~~ Designation: D3240 – 11

An American National Standard

Standard Test Method for Undissolved Water In Aviation Turbine Fuels[1]

This standard is issued under the fixed designation D3240; 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 Department of Defense.

Balloted and approved material has been included editorially, and the year date was changed on March 3, 2011.

1. Scope*

1.1 This test method covers the measurement of undissolved water in aviation turbine fuels in flowing fuel streams without exposing the fuel sample to the atmosphere or to a sample container. The usual range of test readings covers from 1 to 60 ppm of free water. This test method does not detect water dissolved in the fuel, and thus test results for comparable fuel streams can vary with fuel temperature and the degree of water solubility in the fuel.

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. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *free water*—water not dissolved in the fuel.

3. Summary of Test Method

3.1 A measured sample of fuel is passed through as uranine dye-treated filter pad. Undissolved (free) water in the fuel will react with the uranine dye. When the pad is subsequently illuminated by ultraviolet (UV) light, the dye previously contacted by free water will fluoresce a bright yellow with the brightness increasing for increasing amounts of free water in the fuel. The ~~UV~~ light-illuminated pad is compared to a known standard using a photocell comparator, and the free water in the fuel sample is read out in parts per million by volume. By varying the fuel sample size, the range of the test method can be increased.

4. Significance and Use

4.1 Undissolved (free) water in aviation fuel can encourage the growth of microorganisms and subsequent corrosion in the tanks of aircraft and can also lead to icing of filters in the fuel system. Control of free water is exercised in ground fueling equipment by use of filter-coalescers and water separators.

5. Apparatus

5.1 ~~*Test Pad Rater*~~Test Pad Rater (UV Source Device)—A device[2,3,4] for comparing the fluorescence of the test pad to a known standard, while both are illuminated by the same source of UV light, shall be used. The amount of UV light striking the standard shall be modulated until the total fluorescence of the test pad and the standard are equal; this shall be determined using a photocell bridge circuit null indicator. The light modulating device for controlling the UV light striking the standard shall provide a direct reading in parts per million by volume of free water.

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[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.J0.05 on ~~Aviation Fuels.~~Fuel Cleanliness.

Current edition approved ~~Nov. 1, 2005.~~March 3, 2011. Published ~~November 2005.~~March 2011. Originally approved in 1973. Last previous edition approved in ~~2001~~2010 as ~~D3240–91(2001).~~D3240–10. DOI: ~~10.1520/D3240-05.~~10.1520/D3240-11.

[2] The Aqua-Glo Series II instrument manufactured by Gammon Technical Products, Inc., P.O. Box 400, Manasquan, NJ 08736-0400 was used in the precision test program. The unit is currently available in a Series V configuration, which is changed only in the power supply. All water content measuring components remain of the same configuration as the Series II instrument. Manufacturers who wish to offer similar products are referred to Committee D02 Equipment Replacement Guidelines.

~~[3] The sole source of supply of the apparatus known to the committee at this time is Gammon Technical Products Inc., P.O. Box 400, Manasquan, NJ 08736-0400. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.~~

[3] The sole source of supply of the apparatus known to the committee at this time is Gammon Technical Products Inc., P.O. Box 400, Manasquan, NJ 08736-0400.

~~[4] Aqua-Glo test pads were used in the Precision Test Program.~~

[4] If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

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

5.2 *Test Pad Rater (LED Source Device)*—A device[4,5] for rating the fluorescence of the test pad directly by illumination by a narrow band light source provided by colored LED's. The total fluorescence of the test pad is measured directly using a photo sensitive transistor. The intensity of the fluorescence measurement is converted by the device and shall provide a direct reading in parts per million by volume of free water.

5.3 *Test Pads*—Absorbent filter disks of 25-mm diameter shall be coated on one side with uranine (sodium fluorescein) dye at a concentration of 0.23 to 0.29 mg per 25 mm pad. The test pads[3,6] shall be individually packaged in hermetically sealed envelopes or other suitable containers. Fresh, unused test pads shall have an orange color over the dyed surface. Any discoloration, unevenness in dye content, or faded (to a yellow color) appearance shall be cause for rejection.

~~5.3~~

5.4 *Test Pad Holder*[3,7] *and Sampling Line*—A test pad holder and sampling line shall be used to draw the fuel sample through the test pad at a rate of 600 to 800 mL/min. Means shall be provided to flush the test pad sampling line and holder immediately prior to use. The test pad holder shall include an orifice of 1-mm (0.040-in.) diameter upstream of the pad to disperse water droplets in the fuel.

~~5.4~~

5.5 *Tweezers*—Suitable clean, dry tweezers shall be used at all times when handling the test pad.

~~5.5~~

5.6 *Blotting Paper*—Clean, dry, absorbent paper towels, blotters, etc., shall be provided for blotting the test pad prior to rating to remove excess fuel. The blotter paper shall neither impart color or stain nor leave any residue on the test pads.

~~5.6~~

5.7 *Sampling Valve Connection*, designed to meet the following requirements: (*1*) It shall be mounted in the sampling point and must incorporate a self-sealing quick action coupling designed to mate with a suitable connection leading to the selector valve of the sampling assembly. (*2*) It must be completely resistant to fuel and be leak proof up to the maximum working pressures to be encountered. (*3*) It must have a minimum of internal recesses which could cause the holdup of contaminant. (*4*) It must be provided with a dust cap.

~~5.7*Calibrating Standard*, calibration of the instrument should be performed using a calibrating standard of known values.~~

5.8 *Calibrating Standard (UV Source Device)*—Field calibration of the instrument should be performed using a calibrating standard of known values.

5.9 *Calibrating Standard (LED Source Device)*—Factory calibration of the device shall be performed as prescribed in Section 8.

5.10 *Field Verification (LED Source Device)*—If the operation of the instrument needs to be verified, an unused pad may be inserted for reading; the value shall be less than 0.5 ppm. A reference target, available from the manufacturer, when inserted into the device shall read within the limits printed on the rear of the reference target.

6. Sampling

6.1 The following procedure is applicable for dynamic line samples only; that is, taking the fuel sample directly from the test system and through the test pad without exposing the sample to the atmosphere or to a sample container. The use of sample containers such as bottles or cans for the temporary storage of the sample will result in large errors and is not recommended.

NOTE 1—The amount of free water in a sample is very sensitive to the temperature of the sample. The use of sample containers such as bottles or cans can result in large errors due to changes in sample temperature, adsorption of water on container walls, etc.

6.2 Attach the test pad holder assembly to the sampling port on the system.

6.3 Flush the test pad holder assembly immediately prior to sampling, displacing the sampling line with at least two volumes of test fuel.

6.4 Remove the sampling assembly, open the pad holder, and insert the new test pad using tweezers making sure that the treated side of the test pad is facing upstream. Installation of a three-way valve immediately upstream of the test pad holder will permit flushing with the test pad in place.

NOTE 2—Do not remove the test pad from the hermetically sealed package until ready for use. Do not allow any discrete water droplets to come into contact with the pad (from rain, sneezing, coughing, etc.). Exposure of the test pad to the atmosphere, especially on humid days, will also ruin the pad in a matter of minutes.

6.5 Pass 500 mL of fuel through the pad, accurately measuring the test sample quantity. Normal sample volume is 500 mL of test fuel, but if the reading is off scale (on high side), sample volumes down to 100 mL in volume may be used. In the latter case, a small graduated cylinder should be used to measure the sample volume.

~~[5] A test pad holder was used in the Precision Test Program.~~

[5] The sole source of supply of the LED Source Device JF-WA1 instrument known to the committee at this time is manufactured by D-2 Incorporated, 19 Commerce Park Road, Pocasset, MA 02559. This instrument was used in a precision test program; reference Research Report RR:D02-1712.

~~[6] Replacement calibrating standards, but only if the fluorescing standard for the instrument is returned for comparison rating.~~

[6] Aqua-Glo test pads were used in the Precision Test Program.

~~[7] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1195.~~

[7] A test pad holder was used in the Precision Test Program.