

Documentation, Monitoring and Laboratory Testing of Aviation Fuel During Shipment from Refinery to Airport

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Downstream Segment

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Introduction

Aviation fuels pass through a variety of storage and handling facilities from refinery to airport. As aviation fuels are stored and transported in storage and transportation systems where contact with non-aviation products may occur (e.g. multiproduct pipelines, nondedicated ship or barge) a fuel quality monitoring program is required in addition to equipment, operating, inspection and maintenance standards. This program should consist of documentation from the refinery source showing the quality of fuel being released which can be compared to ongoing monitoring of the fuel at downstream sites, typically by laboratory means as it is transported towards the aircraft. The purpose of this practice is to ensure the fuel remains on specification.

If this original documentation is not available then full certificate of analysis (COA) laboratory testing is required to verify the fuel is still within the limits of the fuel specification. Although in this case the amount, type, and usage of approved additives in the fuel is unknown.

The consequences of a failure to supply the correct, on specification product to aircraft is potentially so serious that it is essential for each organization in the supply chain have a fuel quality monitoring program in place with documents demonstrating that the fuel continues to meet the original fuel specification.

This RP provides guidance for documenting, ongoing monitoring and laboratory testing (fuel quality monitoring program) of aviation fuel quality throughout the supply chain. This document is not intended to offer guidance on all aspects of fuel handling.

An effective fuel quality monitoring program will facilitate the delivery of on specification fuel which is fit for use. Fit for use means that the fuel not only meets the relevant specification, but also is essentially free of non-aviation products, unapproved additives and other contaminants.

Design, construction, operations, maintenance and additional inspection requirements for pre-airfield storage terminals can be found in [API 1595](#).

Design, construction, operations, maintenance and additional inspection requirements for airport facilities can be found in the airport site operations standard/manual (i.e. ATA 103 or other applicable industry standards). Additional information may be found in API/EI 1540.

Documentation, Monitoring and Laboratory Testing of Aviation Fuel During Shipment from Refinery to Airport

1 Scope and Purpose

This recommended practice (RP) was developed to provide guidance on the development of an aviation fuel monitoring and testing program (fuel quality monitoring program) for aviation fuel from point of manufacture to delivery to the airport. "Proper handling" entails documenting and testing aviation fuel quality as product is transported throughout the supply chain to maintain the original product specification.

Mandatory requirements in this standard are designated by the word "shall." Recommendations are designated by the word "should." Optional items are designated by the word "may." This standard incorporates by reference a number of other standards and RPs that need to be referred. The distinction between mandatory, recommended and optional provisions in the referenced documents are not changed by nature of their reference in this standard.

The values stated for this standard are in U.S. (USC) customary units.

2 References

The following referenced documents are cited in this document for informational purposes. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Manual of Petroleum Measurement Standards (MPMS) Chapter 8, Sampling

API Recommended Practice 1540, Design, Construction, Operation and Maintenance of Aviation Fueling Facilities, IP Model Code of Safe Practice Part 7

API Recommended Practice 1595, Design, Construction, Operation, Maintenance, and Inspection of Aviation Pre-airfield Storage Terminals

ASTM D156¹, Standard Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)

ASTM D910, Standard Specification for Aviation Gasolines

ASTM D1655, Standard Specification for Aviation Turbine Fuels

ASTM D3420, Standard Test Method for Pendulum Impact Resistance of Plastic Film

ASTM D4057, Standard Practice for Manual Sampling of Petroleum and Petroleum Products

ASTM D4306, Standard Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination

ASTM E1, Standard Specification for ASTM Liquid-in-Glass Thermometers

ASTM E100, Standard Specification for ASTM Hydrometers

ATA 103², Standard for Jet Fuel Quality Control at Airports

EI HM50³, Guidelines for the Cleaning of Tanks and Lines for Marine Tank Vessels Carrying Petroleum and Refined Products

¹ ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.

² Air Transport Association, 1301 Pennsylvania Ave, NW, Suite 1100, Washington, DC 20004, www.airlines.org.

³ Energy Institute, 61 New Cavendish Street, London, UK W1G 7AR, www.energyinst.org.

EI 64 C, *Standard Thermometers*

ISO 649-1 ⁴, *Laboratory glassware—Density hydrometers for general purposes—Part 1: Specification*

3 Definitions

For the purposes of this document, the following definitions apply.

3.1

batch

A distinct quantity of fuel that can be characterized by one set of test results including the type and amount of additives present.

3.2

batch makeup and clearance record

A document used to establish new batches and record the individual batch information that defines a newly formed batch. This document provides the history on how incoming receipts were managed to assure product quality and traceability (see Annex F).

3.3

batch number

A unique traceable batch reference number.

3.4

control check

This is a visual check (for color, clear and bright, solid material, and undissolved water) plus fuel API Gravity (or density) determination. This check is frequently made to confirm the correct grade and unchanged quality of fuel stocks by comparison of the API Gravity result (or density) with the relevant batch API Gravity (or density). Should the (temperature corrected) gravities (densities) differ by more than 0.7 API [3 kg/m^3 ($\pm 0.003 \text{ kg/l}$)] a possibility of contamination exists and the matter shall be investigated further before the product is accepted for aviation use. It may be necessary to carry out further testing before such acceptance can be given.

3.5

dedicated

Tankage, piping, valves, filters, etc. that are used to handle one grade of aviation product and no other products.

3.6

grade dedicated road transports

Road transports that are used to handle one grade of aviation product and no other products. Before becoming grade dedicated, road transports are required to go through a grade change process before being used in aviation fuels (see [API 1595](#)).

3.7

line sample

A sample obtained from a line sampling point, drawn while the product is flowing.

3.8

lower sample

A sample obtained from the middle depth of the lower third of the tank contents.

3.9

middle sample

A sample obtained from the middle depth of the tank contents.

3.10

multiple-tank composite sample (ships, barges, etc.)

⁴ International Organization for Standardization, 1 ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, www.iso.org.

This is a mixture of individual composite samples (see 3.14 below) from multiple compartments containing the same grade of product. The mixture is blended in proportion to the volume of product in each compartment.

3.11

quality certification statement

A certification statement shall appear on all quality certificates confirming that the product meets the requirements of the relevant specification. An example of a suitable statement is as follows:

“Certified that this sample meets the relevant specification with respect to the above tests and complies with ASTM DXXXX, Latest Revision.”

3.12

retention sample

A sample taken and stored in a retention sample container for the purpose of laboratory analysis at a later date in the event that the quality of the original product needs to be verified.

3.13

segregated (isolated tanks and pipelines)

To achieve positive segregation for product quality control, the inlet and outlet pipelines on each tank, as well as any piping connections to other grades of products shall be fitted with either:

- a) a double block and bleed (DBB) valve arrangement (either using a single DBB valve, or using two valves with a drain arrangement in a pipe spool between them);
- b) a removable distance piece; or
- c) a spectacle blind.

3.14

single-tank composite sample

Sample obtained by blending upper, middle and lower samples. For a vertical tank of uniform cross-section, the blend consists of equal parts of the three samples.

3.15

test certificates

The purposes of a properly documented series of test certificates outlining the properties of the aviation fuel is listed below.

- a) Provide assurance that the product has been tested and meets the relevant specification.
- b) All records shall be dated and signed by the person responsible. For computer-generated records, a password-protected access system, traceable to the individual person, is acceptable as an alternative to a signature.
- c) Support the release of products for delivery to customers. Facility management is responsible for ensuring that the appropriate certificates cover aviation products in their care. The key documents include the RQC, COA, RTC, RC, and DD.

The key documents are listed below.

3.15.1

certificate of analysis

COA

This certificate is issued by a laboratory other than that of the originating refinery, often at some point downstream of the point of manufacture. It contains determinations of all the properties required in the relevant specification, but will not necessarily provide information regarding the type and amount of any additives in the fuel. COAs shall be dated and signed by an authorized representative of the laboratory concerned and identify the fuel specification.