



SURFACE VEHICLE RECOMMENDED PRACTICE

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Fuel Dispensing Filter Test Methods

RATIONALE

This SAE Recommended Practice is being revised to update current practices.

FOREWORD

Fuel dispensing filters are the last line of defense, the final opportunity to control fuel quality, before the contamination burden is transferred to the vehicle on-board fuel filtration system. Contamination is often considered to be in the form of solid particulate, but can also consist of chemical compounds, coarse or emulsified water, or, in the case of ethanol blended gasoline, as a phase separated water/ethanol mixture. Particulate contamination can be managed with current technologies common to the filtration industry. As bio-fuel usage increases, the occurrence of water contamination issues escalates in a similar trend. Therefore, it is desirable to understand the contamination involved and to develop industry standard test methods for proper evaluation of dispensing filter performance, which can facilitate protection of vehicle fuel systems.

Heavy-duty (HD) equipment and automotive vehicles are fueled frequently, exposing the fuel system to contaminants that are often unknown and in varying quantities. Automotive on-board fuel filters are predominantly in-tank, and comparatively small in size, having limited particulate holding capacity. In-tank filters and fuel pump modules are designed to be durable long-life components and they are correspondingly costly to replace, so it is progressively more important to prevent gross contamination of vehicle fuel tanks. The solid particulate removal function is the most straightforward to address from a dispensing filter design, manufacturing, and testing aspect.

Vehicle on-board fuel systems have limited ability to deal with water-in-fuel. Depending on the fuel chemistry, small amounts of raw, (slug) water can be rejected by a coarse hydrophobic screen at the in-tank fuel pickup (automotive), or by a fuel water separator, (HD) diesel applications. Rejection efficiency is largely dependent on fuel flow demand established by the power-train management system.

HD compression ignition (diesel) on-board fuel filters are more readily accessible, yet they must protect sophisticated ultra-high pressure injection systems from abrasive wear and the damaging effects of water contamination existing in fuel chemistries that are often not conducive for water separation.

Automotive on-board gasoline fuel filter elements will allow gross amounts of raw water, and/or a phase separated water/alcohol mixture, to pass through and be delivered to the engine. Gasoline engines will not operate with high water content, or a phase separated fuel condition, often stranding vehicles in the vicinity of the fueling station.

HD diesel on-board fuel filters are largely dependent on the fuel chemistry as to their ability to separate water from fuel. Certainly, water complicates cold weather operations and contributes to: icing issues, microbiological growth, generally corrosive conditions, fuel system deterioration, and fuel quality degradation.

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Documents

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Certain types of fuel dispensing filters are tasked to reduce the severity of “water-on-board” situations and alert the station operators to the impending condition in their storage tanks. This alert may be through electronic monitoring of dispensing rates or complaints of “slow-flow” from the person filling a vehicle. The water alert function of these types of dispensing filters is in addition to the particulate control function.

The opportunities for fuel contamination are varied and include; refining operations, pipelines, distribution terminals, truck transportation, real estate at the fueling station, and inattention to detail while setting up fuel drops into the storage tanks at the fuel station.

The following test procedure is relevant to neat gasoline, ethanol blended fuels, diesel, and biodiesel fuel blends. It is applicable to filters installed on fuel dispensing equipment and describes the tests required to evaluate them for reaction to water contaminant in modern fuels. Other SAE and ISO standards are referenced for structural integrity and filtration performance rating.

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1. SCOPE

This SAE Recommended Practice is applicable to gasoline and diesel fuel filters installed on fuel dispensing equipment, mobile or stationary. It describes a set of tests used to characterize the structural integrity, filtration performance, and reaction to water contaminant with fuel dispensing filters.

1.1 Purpose

To provide a standardized method for evaluating performance characteristics on laboratory bench equipment. The laboratory data may be utilized with actual field data to establish dispensing filter performance specifications.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J905 Fuel Filter Test Methods

SAE HS 806 Oil Filter Test Procedure

2.1.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO 12103-1 Road Vehicles - Test Dust for Filter Evaluation Part 1: Arizona Test Dust

ISO 16889 Hydraulic Fluid Power - Filters - Multi-Pass Method for Evaluating Filtration Performance of a Filter Element

ISO 19438 Diesel Fuel and Petrol Filters for Internal Combustion Engines - Filtration Efficiency Using Particle Counting and Contamination Retention Capacity

2.1.2.1 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D975 Standard Specification for Diesel Fuel Oils

ASTM D6751 Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels

ASTM D7467 Standard Specification for Diesel Fuel Oil, Biodiesel Blend (B6 to B20)

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 API Publications

Available from API, 1220 L Street, NW, Washington, DC 20005-4070, Tel: 202-682-8000, www.api.org.

API/IP Specification 1583 Specifications and Qualification Procedures for Aviation Fuel Filter Monitors with Absorbent Type Elements, 3rd Edition 2000

3. DEFINITIONS

3.1 BIODIESEL

A renewable fuel for compression ignition engines, (diesel) which contains modified animal fats and/or vegetable oils blended into petroleum diesel and conforming with ASTM D6751, ASTM D7467, and ASTM D975.

3.2 E-10

Spark ignition motor fuel usually referring to a 10% fuel ethanol (max) and 90% gasoline product.

3.3 GASOHOL

Spark ignition motor fuel usually referring to a 10% fuel ethanol (max) and 90% gasoline product.

3.4 LSD

Low sulfur diesel fuel, ≤ 500 ppm, conforming to ASTM D975.

3.5 METHYL SOYATE

Biodiesel blending component, soybean base stock, conforming to ASTM D6751.

3.6 NEAT DIESEL FUEL

Commercial petroleum fuel, straight diesel, no bio-component, conforming to ASTM D975.

3.7 NEAT GASOLINE

Commercial petroleum fuel, straight gasoline, no bio-component.

3.8 PHASE SEPARATION

Disassociation of a liquid containing multiple solvents into two distinct layers (phases) due to over-saturation of one or more components in the base solvent. Typically characterized by a hydrocarbon based layer over an aqueous layer.

3.9 RAPESEED METHYL ESTER

Biodiesel blending component, rapeseed base stock (RME), conforming to ASTM D6751.

3.10 SUPER ABSORBENT POLYMER (SAP)

A water absorbing material having a high rate of swell volume compared to its free state and capable of retaining water under pressure.