



Gasoline Detergent Additive Requirements – GM Aftermarket

1 Scope

The specification describes the minimum technical requirements of potential GM global aftermarket gasoline detergent packages for use in gasoline formulations containing up to 15% ethanol by volume. The intent is to have an effective gasoline detergent specification for all markets. Additionally, GM Owners Manuals caution the vehicle owners to not use any aftermarket additives in their Flex Fuel Vehicles. The General Motors Powertrain (GMPT) Fuels Group will evaluate the technical merits of the additive package prior to being considered by GM Purchasing for the Customer Care and Aftermarket Division.

The requirements are a combination of engine dynamometer cleanliness tests, chemical laboratory tests, and supplier specific vehicle performance demonstration tests as a basis for consistent fuel additives performance evaluation.

1.1 Material Description. The gasoline detergent additive package candidates shall prevent and remove deposits from all spark ignited engines including, but not limited to, intake valve carbon deposits, fuel injector deposits, and combustion chamber deposits. The detergent may not contain organo-metallic additives, nor methanol. The additive package must be materially and functionally compatible with all aspects of automotive drivetrains and vehicles.

1.2 Symbols. Not applicable.

1.3 Applicability. The gasoline detergent package must be shown to be effective at removing deposits in gasoline containing up to 10% by volume ethanol and shown to be soluble and “clear and bright”.

1.3.1 Carbon Clean-up Performance. The additive package will remove > 70% of carbon Intake Valve Deposit weight relative to a dirty reference fuel test with “one fuel tank” full of use, nominally a 45 L (12 gal) to 95 L (25 gal) tank, and not increase Combustion Chamber Deposit weight by more than 40%.

1.4 Remarks. Program specific technical specifications may include additional requirements that are not referenced in this document and may supersede any requirements included in this document. In case of any conflicts between this document and the program specific technical specifications, the program specific technical specifications take precedence.

1.4.1 Additional Benefits. Fuel additive packages can offer additional non-detergent benefits but must be supported with extensive performance data. Two examples of additional performance benefits include but are not limited to fuel economy benefits from friction modification and/or corrosion protection from metal passivation. GMPT Fuels Group technical reviews with the supplier will be completed and approved or rejected on a case by case basis.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

29 CFR 1910.1200	ASTM D381	ASTM D4806	CEC F-16-T-96
40 CFR 86.113-04	ASTM D471	ASTM D4814	CEC F-20-098
40 CFR Part 79	ASTM D525	ASTM D5453	EN 228
40 CFR Part 80	ASTM D1094	ASTM D5580	EN ISO/FDIS 2719
ASTM D86	ASTM D1319	ASTM D6201	ISO 17025
ASTM D93	ASTM D2622	ASTM D7039	

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2.2 GM Standards/Specifications.

GMW3059

GMW16678

2.3 Additional References.

- California Air Resources Board (CARB) Scrape and Weigh Procedure (available at www.arb.ca.gov/fuels/gasoline/deposit).
- Environmental Protection Agency (EPA) Clean Air Act Section 211(f).
- New York City Cab Data (available at www.epa.gov).
- Southwest Research Institute (SWRI) Intake Valve Sticking (IVS) Test (available at www.swri.org).
- TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).
- Urban Cycle Fleet Data (available at www.epa.gov).

3 Requirements

3.1 Regulatory Compliance. The deposit control additive used to meet all performance requirements specified in this section shall meet the US Federal gasoline “substantially similar definition” under Section 211(f) of the Clean Air Act. In addition, the additive shall be certified to have met the minimum deposit control requirements established by the US EPA in 40 CFR Part 80. Lastly, all components of the additive package shall be registered with the EPA and TSCA in accordance with 40 CFR Part 79. Documentation demonstrating such compliance is required. As an alternative to the EPA registration, the additive package may be registered according to other country detergent regulations but GM will review these registrations on an individual basis. If this alternative registration is sought, it is expected that significant gasoline detergent additive efficacy and health and safety regulation documentation will accompany the application.

3.2 Compatibility with Gasoline.

3.2.1 Gasoline blends with the additive, at the prescribed treat rate, shall meet regional fuel quality specifications, such as ASTM International's Automotive Spark Ignition Engine Fuel Standard ASTM D4814 and/or Europe's EN 228 gasoline specification with the exception that the use of organo-metallic additives are prohibited.

3.2.2 Gasoline blends made with the additive at the prescribe treat rate and using clear and bright ethanol blended gasoline according to Section 3.2.2, shall remain clear and bright at all temperatures. See Applicability Section 1.3.

3.2.3 The fuel additive supplier must submit data to demonstrate compatibility with common marketplace gasoline and additive formulations used in the industry under a wide variety of conditions and because of varying levels of fuel ethanol in global markets, it is anticipated that there will need to be three GM fuel system treatment package formulations to covering the following global markets.

- a. Ethanol content 0% to 15% volume (majority of sales regions).
- b. Ethanol content < 30% volume (South America; Central America; South Asia).
- c. Ethanol content 30% to 83% (Sweden; Australia).

Example: ASTM D1094 testing for filtration and water interaction.

3.3 Engine Deposit Cleanliness Requirements.

3.3.1 General Requirements. “One Tank” Intake Valve Deposit (IVD) Clean-up Performance data is required to show the proposed detergent additive package will remove greater than or equal to 70% of the average intake valve deposit weight left behind by a Dirty Reference Deposit Base fuel tested in the ASTM D6201, Standard Test Method for Dynamometer Evaluation of Unleaded Spark-Ignition Engine Fuel for Intake Valve Deposit Formation Engine Dynamometer Test. Development dynamometer test data can be conducted at the additive supplier. The engine dynamometer test final approval certification data must be conducted at an ISO 17025 certified laboratory, independent to the Additive Supplier presenting the data.

3.3.2 The Dirty Reference Deposit Base fuel is intended to represent severe global market quality gasoline and shall produce IVD weights greater than 800 mg averaged over all intake valves in the ASTM D6201 test.

3.3.3 The Dirty Reference Deposit Base fuel composition shall be pre-approved by the GMPT Fuels Group prior to additive qualification testing and meet the following properties/conditions:

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