



Technical Requirements for GM Aftermarket Diesel Cold Flow Additive

1 Scope

1.1 Material Description. This document provides standard technical requirements for the GM aftermarket Diesel Cold Flow Additive which prevents plugging of diesel filters in cold weather due to wax formation. It is specifically formulated for low sulfur and ultra-low sulfur applications including biodiesel blends up to B20 (20% biodiesel blends).

1.2 Symbols. Not applicable.

1.3 Applicability. The additives can be used in all GM diesel engine applications including in-direct fuel injection systems and modern common rail fuel injection systems.

1.3.1 This Diesel Fuel Cold Flow Improver is expected to provide following benefits:

- Prevents filter plugging due to wax formation.
- Enhances cold winter startability.
- Reduces icing in fuel filter and fuel system due to water contamination

As such, the diesel cold flow additive is envisioned to be used during extreme cold winter days by addition to the fuel tank. The tests defined in Section 3, must be regarded as minimum requirements for compliance for diesel cold flow additive. Additional requirements may be defined based on the type of additive, its specific chemistry, and application. This specification applies to diesel and biodiesel blended fuels only.

Note: The effectiveness of the cold flow improver additive varies based on the composition of the base diesel and biodiesel blended fuels. The current product is expected to prevent gelling of diesel fuels, especially the higher paraffinic, low sulfur diesel, during cold weather operation. The effectiveness of this additive is expected to be moderate in the biodiesel blended fuels especially at > B5 blend levels.

1.4 Remarks. Program specific technical specifications may include additional requirements that are not referenced in this document and may supercede 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 shall take precedence.

This specification describes the technical requirements for GM aftermarket diesel fuel detergent packages. The GM Propulsion System-Fuels Group will evaluate the technical merits of the additive package prior to being considered by GM Purchasing for the Customer Care and Aftersales Division. These specifications will cover requirements for performance as well as requirements for ensuring compatibility of the additives with fuel system, engine, and the after treatment catalyst system. The requirements are a combination of standardized fuel analysis tests and supplier specific vehicle performance demonstration tests, as a basis for consistent fuel additives performance evaluation.

GM Confidential

© Copyright 2017 General Motors Company All Rights Reserved

November 2017

Page 1 of 7

2 References

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

2.1 External Standards/Specifications.

40 CFR Part 79	ASTM D971	ASTM D7501	ISO 10370
ASTM D93	ASTM D975	DIN EN 590	ISO 12156
ASTM D130	ASTM D2274	DIN EN 12662	ISO 23015
ASTM D412	ASTM D2500	ISO 37	SAE J2643
ASTM D471	ASTM D6079	ISO 1817	TM0172
ASTM D524	ASTM D6217	ISO 2160	
ASTM D664	ASTM D7467	ISO 2719	

2.2 GM Standards/Specifications.

GMW3059	GMW14270	GMW14914
---------	----------	----------

2.3 Additional References.

- dexos® 2 approved brands for diesel engine oil available at www.gmdexos.com.
- GMPT-5-019
- National Association of Corrosion Engineers (NACE) TM0172 available at www.NACE.org.
- Program Specific Technical Specifications.
- Safety and Industrial Hygiene (S&IH) Technical Standard (TS), S&IH TS 3.4-160-02 (available at www.gmsupplypower.covisint.com)

3 Requirements

3.1 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to submit a full material composition disclosure to GM via the International Material Data System (IMDS) or via a completed GMW3059 report form.

Note: The additives shall not contain any metallic content or methanol.

3.2 Performance Requirements. The cold flow improver additive performance will be evaluated based on measurements of Cloud Point and Cold Filter Plugging points of the reference fuel and the additized fuel.

3.3 Cloud Point. The cloud point is the temperature at which the wax is first seen to crystallize in the fuel when it is cooled. The cloud point is generally a very conservative estimate for predicting low temperature operability of the diesel vehicle.

3.3.1 Test Method and Demonstration of Performance. The cloud point of the fuel should be measured as per ASTM D2500 or ISO 23015 test method. The test fuel for demonstration purpose should be US certification diesel fuel as per Environmental Protection Agency (EPA) Generic CFR 86.113-07 requirements. This fuel can be obtained from GM fuel supplier and has a test fuel number GMPT-5-019. Details on suppliers of test fuels can be found in 3.7.

For demonstration of the performance the following two requirements should be fulfilled:

- Cloud point of the fuel with cold flow improver should be equal or below that of the un-additized reference fuel.
- Limiting CFPP to +8 °C or +10 °C below diesel fuel cloud point. (CP – CFPP = +8 °C to +10 °C.)

3.4 Compatibility with Diesel/Biodiesel Blended Fuels. Diesel fuel or biodiesel blends after the treatment with the additive, at the prescribed treat rate, shall meet regional fuel quality specifications, such as ASTM D975; Standard Specifications for Diesel Fuel Oils, DIN EN 590; European Automotive Diesel Fuel Requirements, or ASTM D7467; Standard Specifications for Diesel Fuel Oil, Biodiesel Blend (B6 to B20).

3.5 No-Harm Testing Requirements. The requirements for no-harm testing should demonstrate suitability of the candidate additive with fuel system components as measured against the reference fuel. The acceptable reference fuels shall be the fuel meeting the ASTM D975 specifications or DIN EN 590 specifications. For each test, the additive shall be mixed at 3X the recommended concentration in the reference fuel and its performance

GM Confidential

© Copyright 2017 General Motors Company All Rights Reserved

November 2017

Page 2 of 7

will be compared to that of the relevant reference fuel. Tests defined in Table 1 shall be used to determine the candidate additive compatibility.

Table 1: Tests for Fuel Compatibility

Properties	Standard	Unit	Pass/Fail Criteria for additized fuel
Fuel Contamination by Additive Precipitation	ASTM D6217 or	mg/L	< 20
	DIN EN 12662	mg/kg	24
Cold Soak Filterability	ASTM D7501	Seconds	< 360 s
Carbon Residue (on 10% Distillation Residue), Mass%	ASTM D524 or ISO 10370	%	0.35
Lubricity Test by High Frequency Reciprocating Rig (HFRR), Maximum	ASTM D6079 or ISO 12156	Microns	No change relative to reference fuel unless additive package has additional functionality to improve lubricity
Copper Strip Corrosion (3 h at +50 °C), Maximum	ASTM D130 or ISO 2160	Rating	No change relative to reference fuel unless additive package has additional functionality to improve corrosion
National Association of Corrosion Engineers (NACE International)	NACE TM0172	Rating	No change relative to reference fuel unless additive package has additional functionality to improve corrosion
Acid Number, milligrams (mg) potassium hydroxide (KOH/g), Maximum	ASTM D664	mg KOH/g	0.3
Flash Point	ASTM D93 or ISO 2719	°C	55 Minimum (Summer Grade) 38 Minimum (Winter Grade)
Water Interfacial Tension	ASTM D971	Dynes/cm	To Report

GM Confidential

© Copyright 2017 General Motors Company All Rights Reserved

November 2017

Page 3 of 7