



SERVICE DEPARTMENT

ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION

MAINTENANCE INSTRUCTION

DIESEL FUEL RECOMMENDATIONS ALL EMD AND FORMER CDED ENGINES

It has been and continues to be General Motors policy to manufacture engines that will operate satisfactorily on commercial fuels of good quality that are regularly provided by the petroleum industry via clean and adequate fuel supply facilities.

These recommendations, which are based on many years of operating experience, provide test limits for qualifying fuels being supplied to the engine. The inherently low level of maintenance required by our engines can best be realized if the engine fuel systems are supplied with fuel which meets these recommendations.

The cleanliness, quality, and uniformity of the fuels supplied to the engine fuel tanks are the responsibilities of all who are involved in the manufacture, transportation, and handling of the fuels. Electro-Motive will consult, upon request, with any user, supplier, or petroleum refiner on any question pertaining to fuels to be used in our engines.

RECOMMENDED LIMITS FOR FUELS

As Supplied to EMD and Former CDED Engine Fuel Systems

<u>Method of Test</u>	<u>ASTM Designation</u>	<u>Limits</u>
Cetane Number	D-613	40 (Min.)
90% Boiling Point	D-158	650° F. (Max.)
Final Boiling Point	D-158	700° F. (Max.)
Distillation Recovery	D-158	97.5% (Min.)
Total Sulfur	D-129	0.75% (Max.) Note 1
Corrosive Sulfur (3 Hr. @ 212° F.)	Modified D-130	#2 Strip or Better
Conradson Carbon Residue (on 10% Bottoms)	D-189	0.15% (Max.)
Water and Sediment	D-96	0.05% (Max.)
Cloud and Pour Point	D-97	Note 2
Flash Point	D-93	Note 3
Organic Chlorides	D-808 or D-1266	20 PPM Total Chlorine (Max.) Note 4
Filtration Cleanliness Test (Solid matter such as rust, cracking catalyst, clays)	1962 ASTM-D2 Report, App. X, Page 35	5.0 Mg. Per Gallon (Max.) of Ash Residue on 0.80 Micron Filter Note 5.

GENERAL COMMENTS

The use of any fuel additives should be limited until it is established that there are no detrimental effects such as rapid engine wear, corrosion, or excessive deposits.

The fuel should be free from acid, which, when in contact with any metal, forms enough soap to plug the fuel filters.

*This bulletin is revised and supersedes all previous Fuel Oil Recommendation bulletins.

NOTES ON TEST LIMITS:

1. The maximum total sulfur content has been set at 0.75%. Fuels containing larger amounts of sulfur can be used but will increase engine wear and maintenance. The user should weigh the economics of less expensive higher sulfur fuels against the increases in maintenance costs.
2. The "Cloud and Pour Points" of a fuel are measures of its fluidity at low temperatures. To assure an adequate flow through the filters and strainers in the fuel system during cold weather, the user must specify the proper "Cloud and Pour Point" requirements based on the lowest temperature expected. Fuels with lower than normal flash points may be required when unusually low pour points are essential.
3. Fuels normally used have minimum flash points of 150° F. Fuels with lower flash points can be used without affecting engine operation, however fuel handling and storage may require added precautions.
4. Rapid wear of chrome plated and iron surfaces in the combustion chamber results from the use of fuel containing organic chlorides. The presence of organic chlorides in fuel is rare but can occur from the use of halogenated dewaxing agents in cold weather pipeline operations or from improper desalting of crude oils at an unexperienced refinery followed by a reaction between the olefins and salt in the distillation unit. From past experiences, most refineries in the U.S.A. are alert to prevent the presence of chlorides in the fuel. Their precautions are now so automatic that cases of chlorides in the fuel seldom occur, and since routine control testing for chlorides is a time consuming procedure involving relatively large samples of fuel, it is not considered necessary in the United States.

When testing for chlorides, we prefer the ASTM D-1266 procedure, where at least 10 grams of fuel are burned followed by Volhard Titration, rather than combining a number of burnings in the ASTM D-808 procedure.

5. Until recently Filtration Cleanliness Tests have not been generally employed or required in connection with diesel fuel. Experience has been that usual foreign contaminants, rust for instance, are removed by the filtration facilities at fueling stations and by the filtration equipment normally supplied with engines. The increasing use of catalytically cracked fuels, however, has produced instances where minute catalyst fines were accidentally introduced into the diesel fuel production. These cannot be removed by the commercial filters used at fueling stations and on the engines. It is to guard against contaminants of this nature that we have added the Filtration Cleanliness Test to our diesel fuel recommendations.

Because an involved laboratory procedure is required to distinguish the objectionable catalyst particles from other impurities, we suggest that all ashable material should not exceed 5.0 mg. per gallon of fuel when filtered through an 0.80 micron Millipore paper. This sample should be taken at the refinery where any significant ash material is most likely to be catalyst fines in the fuel.

In checking the cleanliness of diesel fuel samples taken from tank cars or customer fuel storage tanks, the sample should be taken by acceptable sampling methods. Before the laboratory filtration evaluation is made, the sample of fuel should be well agitated and permitted to settle for five minutes. The upper portion of the fuel sample should be decanted so that any sediment which has settled will not be disturbed. The filtration tests are run on the decanted fuel as a measure of the ashable solids present in the fuel which will not settle quickly or which might be difficult to filter.

Although the Fuel Filtration Cleanliness Test will check the fuel for ashable contaminants, it will not limit the amount of combustible organic contaminants. If fuel filters plug prematurely, the fuel should be checked for bacteria or fungus contamination and be treated with a suitable biocide if necessary.