ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION
SERVICE DEPARTMENT

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 good quality commercial fuels 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

Method Of Test	ASTM Designation	Limits
Cetane Number	D-613	40 (Min.)
90% Boiling Point	D-86	650° F (Max.)
Final Boiling Point	D-86	700° F (Max.)
Distillation Recovery	D-86	99.0% (Min.)
Total Sulfur	D-129	0.50% (Max.) - Note 1
Corrosive Sulfur (3 hr. @ 212° F)	Modified D-130	No. 2 Strip Or Better
Conradson Carbon Residue (on 10% bottoms)	D-189	0.35% (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	U.O.P. No. 395	20 ppm Total Chloride (Max.) - Note 4
Filtration Cleanliness Test (solid matter such as rust, cracking catalyst, and clays)	D-2276	1.3 Mg. Per Liter (Max.) Of Ash Residue On 0.80 Micron Filter - Note 5.
Viscosity	D-445	32-45 SUS at 100° F (1.8 - 5.8 cs)
Ash, Weight %	D-482	0.02% (Max.)

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

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.

NOTES ON TEST LIMITS:

1. The maximum total sulfur content has been set at 0.50% or legal. 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. EMD will assist, upon request, in selection of lube oils to minimize accelerated wear rates expected when fuels with sulfur content in excess of 0.5% are used. Legal limits on total sulfur content must be considered where they apply.

2. The "Cloud And Pour Points" of a fuel are measures of its fluidity at low temperatures. To ensure 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. The use of wax dispersant additives effectively lowers the pour point of the fuel without lowering the cloud point. In this case, the cloud point may be disregarded.

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. The use of fuel containing organic chlorides results in rapid wear of chrome plated and iron surfaces in the combustion chamber. 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 inexperienced 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, EMD prefers the U.O.P. method No. 395, which employs the sodium biphenyl reduction procedure to obtain ppm of the organic chloride.

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 engines. The "Filtration Cleanliness Test" has been added to our diesel fuel recommendations to guard against contaminants of this nature.

   Because an involved laboratory procedure is required to distinguish the objectionable catalyst particles from other impurities, EMD suggests that all ashable material should not exceed 1.3 Mg. per liter 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. The filtration tests are run on the whole sample as a measure of the ashable solids present in the fuel.

   Although the "Filtration Cleanliness Test" will check the fuel for ashable contaminants, it does 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 suitable biocide, if necessary.

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