



LOMBARDINI U.S.A., INC.
Engineering Department

10 January 1997

Lombardini engines are commercial/ industrial diesel engines. Naturally, all combustion system design was geared toward the use of commercial grade diesel fuels. As such, use of fuels other than those designated "DF", i.e. DF2 (No.2 Diesel Fuel), will result in degradation of performance and/ or a reduction in component/ engine life. It is understood that applications in certain situations require the use of fuels other than No. 2 diesel fuel. Below is a list of various fuels and comments pertaining to each.

Fuel Grade/ Type	Comments
No. 2 Diesel Fuel (DF2)	Recommended fuel type for normal ambient operation
No. 1 Diesel Fuel (DF1)	Recommended fuel type for cold weather operation in ambients which would result in DF2 "waxing". No degradation in performance or engine/ component life.
JP 4 Turbine Fuel	Not recommended. JP 4 should be used only in emergency situations. JP 4 severely reduces engine life and potential power due to the lack of lubricity as compared to DF2.
JP 8 Turbine Fuel	5-12 % reduction in power and up to a 30% reduction in fuel system component and upper cylinder life.
JP 5 Turbine Fuel	Refer to JP 8
DF A Arctic	Acceptable fuel for use in sub-zero ambients only.

Based on the above, and many years of experience, it should be noted that the operation of Lombardini diesel engines, or any other diesel engine, on fuels other than DF2/ DF1 will require the use of a revised maintenance schedule, including, but not limited to, oil change interval, injectors/ injection system, and cylinder head components. Also of note, the amount and severity of engine/ component and power degradation will depend upon load and operational conditions to which the engine is subjected.

Due the fact that that Lombardini diesel engines are commercial/ industrial engines and thus designed to operate utilizing commercial diesel fuel (DF2/ DF1), engine/ component failures that can be directly attributed to the use of fuels other than commercial diesel fuel (DF2/ DF1) cannot be covered under the standard limited commercial warranty.



J. Trent Dailey

ELECTRONIC SIGNATURE

J. Trent Dailey
Application Engineer

DIESEL FUEL SPECIFICATIONS

Diesel fuel must be clean, fresh, meet Lombardini fuel specifications and be sourced from a known and reputable supplier. Clean, fresh and properly specified diesel fuel will provide assurances of maximum engine performance and maximum fuel injection system longevity. The use of out-of-spec, dirty or questionable quality diesel fuel will result in engine performance and start ability problems as well as reductions in engine and fuel injection system life.

Lombardini diesel engines are designed to operate on No. 2 diesel fuel. However, some geographical areas, by virtue of cold winter temperatures, change the diesel fuel supply depot to No. 1 diesel fuel in winter months. No. 2 diesel fuel provides maximum viscosity and lubricity but can have "waxing" problems at lower temperature. Lombardini expressly recommends the use of No. 2 diesel fuels when temperatures are above -10°C (14°F). Lombardini recommends that No. 1 diesel fuel be used when temperatures are at or below -10°C (14°F). Lombardini allows the use of either EPA- High Sulfur, off-highway diesel fuel or EPA- Low Sulfur, on-highway fuel for non-CARB certified engines. CARB certified engines must consume only EPA- low sulfur diesel fuels conforming to EPA 40 CFR 86-113-94. For general non-CARB certified engines, Lombardini highly recommends that either low sulfur or high sulfur fuel be used on a continuous basis. Mixing the usage of low sulfur and high sulfur fuels can cause complications within the fuel injection system and thus is not recommended.

Lombardini does not recommend the use of "heating oil", blended fuel/ waste engine oil, or low grade diesel fuel of any kind. The use of aviation fuels- JP4, JP5 or JP8 must be approved on an application basis and is not recommended for broad range commercial applications.

EPA FUEL SPECIFICATIONS (No. 2 DIESEL FUEL):

	ASTM TEST	EPA 40CFR 86.113-90 (OFF-HIGHWAY FUEL)	EPA 40CFR 86.113-94 (ON-HIGHWAY FUEL)
CETANE NUMBER	D613	42-50	40-48
DISTILLATION RANGE			
BP	D86	340-400°F (171.1-204.4°C)	340-400°F (171.1-204.4°C)
10% point	D86	400-460°F (204.4-237.8°C)	400-460°F (204.4-237.8°C)
50% point	D86	470-540°F (243.3-282.2°C)	470-540°F (243.3-282.2°C)
90% point	D86	550-610°F (287.8-321.1°C)	560-630°F (287.8-321.1°C)
EP	D86	580-660°F (304.4-348.9°C)	610-690°F (304.4-348.9°C)
GRAVITY (API)	D287	33-37	33-37
TOTAL SULFUR (pct.)	D129 D2622	0.2-0.5	0.03-0.05
HYDROCARBONS			
AROMATICS (min. pct.)	D1319	27	27
PARAFFINS, OLEFINS, NAPHTHENES (pct.)	D1319	73	73
FLASHPOINT	D93	130°F (54.4°C)	130°F (54.4°C)
VISCOSITY (CSt)	D445	2.0-3.2	2.0-3.2

NOTE: BY LAW, EPA 40CFR 86.113-90 FUEL MUST BE DYED RED.

FUEL QUALITY/ STORAGE:

No. 1 and No. 2 Diesel fuel degrades with time. No. 2 diesel fuel has a storage life of approximately one(1) year. No. 1 diesel fuel has a maximum storage life of two(2) years. Further, storage of diesel fuel in contaminated storage tanks can lead to excessive impurities within the stored fuel. As such, aged or contaminated diesel fuel should not be consumed by Lombardini diesel engines. Aside from the specifications listed above, fuel measured to have total insolubles > 1mg/100mg, organic matter > 1mg/100ml or rust/mineral matter > 2mg/ml should not be consumed by Lombardini diesel engines.