

# Alternative fuel for a standard diesel engine

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**Abstract:** Alternative fuels have been developed for the commercial diesel products Mkl and EN590. Appropriate additives were selected from a broad range of oxygenates including alcohols, acetals, ethers, esters, and nitrates by a process of systematic elimination. The resulting fuels called Biodiesel 15 meet all existing standards in force for diesel fuel, are stable, and have similar performance characteristics to standard diesel. Significantly Biodiesel 15 is much cleaner than standard diesel with around 30 per cent or more reductions in particulate matter in the exhaust emissions. Carbon dioxide (CO<sub>2</sub>) emissions are much lower with Biodiesel 15 than with standard diesel products. Other regulated emissions are on a par with Mkl. The fuel consumption of Biodiesel 15 is 2 per cent lower than that of conventional Mkl.

**Keywords:** alternative diesel fuel, oxygenates, diesel engine performance, diesel engine emissions, particulate emissions

## 1 INTRODUCTION

Industry worldwide has a strong incentive to develop alternative motor fuels to protect the environment and adhere to tighter emissions requirements. In 1997 in Kyoto, representatives from 105 states signed the Kyoto Protocol [1], which is designed to reduce excess carbon dioxide (CO<sub>2</sub>) emissions produced when burning oil, mineral gas, coal, and related products.

The combustion of motor fuels adds considerably to the imbalance of CO<sub>2</sub> in the atmosphere. Nitrogen and sulphur oxides (NO<sub>x</sub> and SO<sub>x</sub>) are also formed and cause the acidification of lakes and other fresh water supplies, affecting the vital functions of humans, animals, and vegetation. Finally, solid particles, which are the products of incomplete combustion, cause cancers in humans and animals.

The use of motor fuel components derived from renewable raw materials, so-called biocomponents, enables a reduction of the harmful impact of burning fuel on the environment. Accordingly in 2003 the European Commission passed a directive [2] to

member states promoting the use of biocomponents in motor fuel starting from 2005. The European Commission has also defined requirements on the amount of harmful pollutants in exhaust emissions of internal combustion engines, specifically for SO<sub>x</sub>, NO<sub>x</sub>, and particulates.

The stipulations of the directive are such that by 2010 the amount of harmful pollutants in exhaust emissions will reach an entirely new level. Clearly, reaching such a reduced level of harmful pollutants will require considerable investment from motor fuel producers. The existing inventory of vehicles and machinery with standard engines prevents the use of motor fuels consisting completely of biocomponents within the time frame set by the European Commission. So it is evident that in the years to come the role of mixed fuels produced partly from petroleum and partly from renewable raw materials will grow considerably. Gasoline-ethanol blends for spark ignition (SI) engines and diesel mixtures containing methyl ethers of higher fatty acids for use in diesel engines are examples of this type of fuel.

The development and marketing of a diesel fuel containing biocomponents, a biodiesel, is complicated by the standards requirements [3] for diesel fuel, which impose substantial restrictions on potential

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Ibrahim Dincer, Adnan Midilli, Haydar Kucuk, 2014-06-17 This thorough and highly relevant volume examines exergy energy and the environment in the context of energy systems and applications and as a potential tool for design analysis optimization It further considers their role in minimizing and or eliminating environmental impacts and providing for sustainable development In this regard several key topics ranging from the basics of the thermodynamic concepts to advanced exergy analysis techniques in a wide range of applications are covered [The Potential of Methanol as an Alternative Fuel for Heavy Duty Engines](#) Engine Manufacturers Association. Alternate Fuels Committee, 1989 [Proceedings of Transpac '84](#), 1985

**Emission Control and Fuel Economy** John H Johnson, 2005-06-27 Emission and fuel economy regulations and standards are compelling manufacturers to build ultra low emission vehicles As a result engineers must develop spark ignition engines with integrated emission control systems that use reformulated low sulfur fuel Emission Control and Fuel Economy for Port and Direct Injected SI Engines is a collection of SAE technical papers that covers the fundamentals of gasoline direct injection DI engine emissions and fuel economy design variable effects on HC emissions and advanced emission control technology and modeling approaches All papers contained in this book were selected by an accomplished expert as the best in the field reprinted in their entirety they present a pathway to integrated emission control systems that meet 2004 2009 EPA standards for light duty vehicles

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