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Usage of Alternative Fuel as a Source of Energy in Engine

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A B S T R A C T

Now a days, there is shortage of conventional fuels , So alternative fuels are very useful to save non renewable sources of energy. As in this review types of available alternative energy sources are mentioned to have a energy as a non polluted zone. As Alcohol and Methanol both are available at less price compare o petrol and diesel but there is issue of knocking in the engine so their usage is little restricted for research area. Promoting the sustainable use of alcohol fuels presents us with a real opportunity for improving transportation emissions—especially global CO2 emissions. Of course, that has long been the focus of our engine technology research at EPA

Keywords: Alternative Fuel, Effect of Temperature, Usage Of Alcohol and Methanol as Alternative Fuel

1. Introduction

Diesel engines are widely used for transportation and power generation applications because of their high fuel efficiency. However, diesel engines can cause environmental pollution owing to their high NOx and soot emissions. Considerable effort has thus been devoted toward reducing these pollutant emissions as these have adverse effects on the environment and human health. In an effort to reduce NOx and soot emissions in-cylinder, while maintaining high thermal efficiency, many new compression ignition combustion strategies have been proposed.

Globally, the awareness of energy issues and environmental problems associated with burning fossil fuels has encouraged many researchers to investigate the possibility of using alternative sources of energy instead of oil and its derivatives. Among them, biodiesel seems very interesting for several reasons: it is highly biodegradable and has minimal toxicity, it can replace diesel fuel in many different applications such as in boilers and internal combustion engines without major modifications and small decrease in performances is reported, almost zero emissions of sulfates, aromatic compounds and other chemical substances that are destructive to the environment, a small net contribution of carbon dioxide (CO2) when the whole life-cycle is considered (including cultivation, production of oil and conversion to biodiesel), it appears to cause significant improvement of rural economic potential. The invention of the vegetable oil fuelled engine by Sir Rudolf Diesel dated back in the 1900s. However, full exploration of biodiesel only came into light in the 1980s as a result of renewed interest in renewable energy sources for reducing greenhouse gas (GHG) emissions, and alleviating the depletion of fossil fuel reserves. Biodiesel is defined as mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats and alcohol with or without a catalyst . Compared to diesel fuel, biodiesel produces no sulphur, no net carbon dioxide, less carbon monoxide, particulate matters, smoke and hydrocarbons emission and more oxygen. More free oxygen leads to the complete combustion and reduced emission

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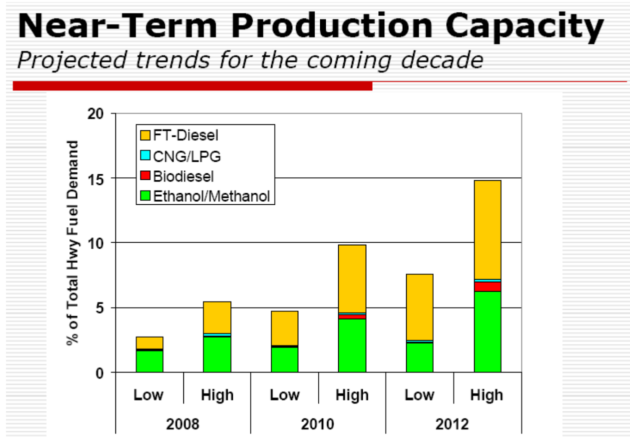

Figure 1. Production of Conventional fuel

2. Usage of Alternative Fuel

The ongoing research described below is part of EPA's Clean Automotive Technology Program, whose goal is to demonstrate the feasibility of cleaner, more efficient engine technologies, and to transfer these technologies to the private sector. The main focus of this work is on alcohol-gasoline blends, since these are more likely to be cost-effective as a transportation fuel than neat alcohol fuels.

The engine and injection controls were managed using the National Instruments Lab view based Driven control unit, which was equipped with the injector drivers for both direct injection (DI) of diesel fuel and port fuel injection (PFI) of gasoline. The same controller was able to simultaneously manage both injection systems while running the engine map. The Driven system allows for full user control over engine parameters and was programmed to allow individual injection control for start-of-injection (SOI) timing, number of injection events and injection duration for each DI diesel injector, as well as injection duration.

A variable geometry turbocharger was employed to maintain the engine's specific power, despite relatively high levels of charge dilution with EGR. EGR, meanwhile, was metered from the turbine exhaust to the compressor inlet using a variable backpressure device in the exhaust, at the expense of a relatively small amount of pumping work (5 kPa or less). The EGR temperature was controlled with a conventional liquid-to-gas cooler, while the fresh air and EGR charge entering the intake manifold (after the compressor) was cooled with a moderately-oversized intercooler. Together, these heat exchangers were able to maintain intake manifold temperatures in the vicinity of 40^{o}C, even at higher speeds and loads.

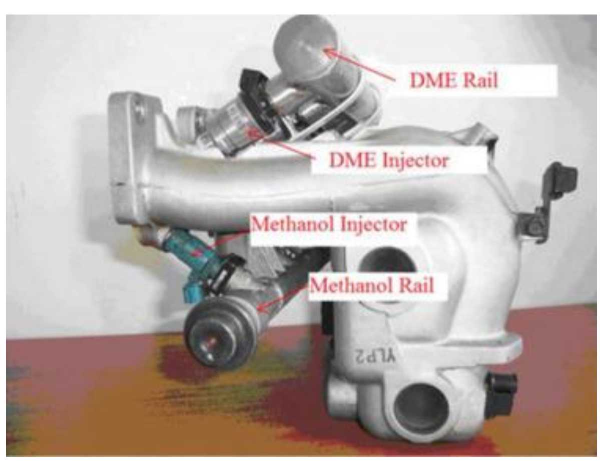

Figure 2. Conversion of normal Engine to Methanol Engine

One of the major advantages of a partially premixed combustion strategy is the added control flexibility allowed by varying the direct fuel's injection timing. For both single fuel PPC and dual fuel RCCI with pump fuel, a single direct injection with DI timing closer to TDC was used, which resulted in an advance in combustion phasing at the cost of increased NOx emissions due to the lower volatility of gasoline compared to diesel fuel. As the DI timing was advanced beyond _50_ TDC, combustion phasing control was diminished with the PRF fuel for both combustion strategies.

3. Technology Used in Engine

This supercharged and turbocharged spark-ignition engine combines a methanol reforming system with the direct injection of methanol fuel to extend the efficiency of internal combustion engines to more than 40% over conventional gas engines, and to more than 10% over clean diesel and typical gasoline/electric hybrid vehicles. This methanol-fueled engine system uses direct injection during high-load operation and, during low-load operation, sends a fraction of the fuel to an in-engine methanol reformer to generate a hydrogen-rich gas that improves combustion stability by speeding up the combustion process. Such increased efficiency at both load-ends of engine operation can enable engine downsizing. Reforming the methanol also reduces vehicle emissions to very low levels with lean or heavy exhaust gas recirculation (EGR) operation at low loads. This methanol-reforming/direct-injection engine could be employed with other fuels in addition to or instead of methanol, including gasoline, ethanol and natural gas.

2.1 Problem exists while performance

A very high efficiency spark ignition engine can be made possible by the combination of two modes of operation: Ultra dilute operation at low loads and highly turbocharged, high compression ratio operation at high loads increases the overall efficiency. Conventional gasoline engines are naturally aspirated - rely only on atmospheric pressure for air intake - and port fueled - fuel is sprayed into the intake ports directly into the engine cylinder. This technology increases efficiency by more than 40% over conventional gasoline engines by using direct injection and methanol reforming.

4. Application of Engine

Reformer enhanced direct injection methanol engines improve efficiency over traditional combustion engines by carefully injecting ethanol directly into the cylinders. The ethanol is injected at high loads and can be used in conventional gasoline engine applications.

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5. Outcome of Review

The initial phase of engine testing focused mainly on neat fuels, beginning with M100 and E100. Figure 2 below shows the brake thermal efficiency versus speed and load with M100, over the full range of stable, unthrottled operation.

The lower load boundary of the operating envelope follows the limit of dilute operation, while the upper boundary represents the limit to the range of full spark authority. The upper load limit was able to be extended to beyond 20 bar BMEP with M100, at the cost of some limitation on the spark advance, resulting in a moderate drop in engine efficiency. Nevertheless, Figure 2 demonstrates the high brake thermal efficiency levels possible with M100 over a broad range of engine speeds and loads. The brake efficiency exceeded 40% over a power range of 12 to 75 kW.

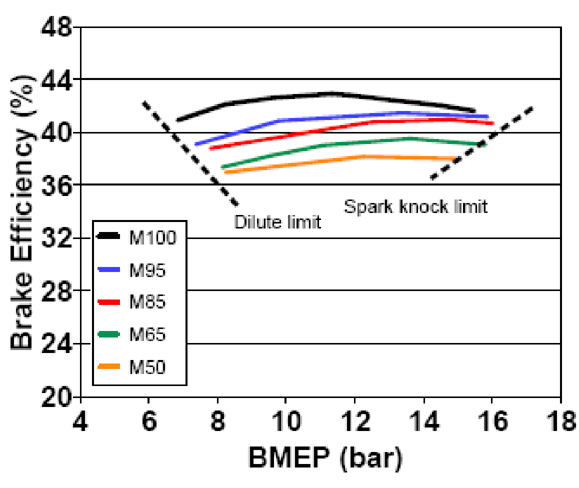

Figure 3. Brake efficiency Vs BMEP

6. Conclusion

Methanol produced by renewable means is used in the chemical industry and in the energy sector as a substitute for fossil-based alternatives. The renewable methanol production from hydrogen obtained via water electrolysis from excess renewable electricity and renewable CO2 from a variety of feed stocks was examined. The traditional methanol production method through syngas to methanol process, as well as the necessary adaptations towards the new generation CO2 to methanol (CTM) process for sustainable methanol production, were discussed. The use of methanol both in the chemical industry and the energy sector were explored, with a special attention on high-temperature fuel cells, where all the components and processes of an integrated reformed methanol fuel cell system were described. Finally, renewable methanol and compressed hydrogen pathways were compared as renewable electricity storage solutions with the automotive application as an example. The comparison was based on environmental impact, energy efficiency and cost analysis..

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