



Review

An overview: Energy saving and pollution reduction by using green fuel blends in diesel engines



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HIGHLIGHTS

- The use of green diesel blends reduces the emissions of NO_x, PM, PAHs and POPs.
- Micro-explosion mechanism of water–diesel emulsions leads to NO_x–PM trade-off.
- Highlighting the research gap concerning the use of green fuels in diesel engine.

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ABSTRACT

The diesel engine offers superior fuel and thermal efficiencies, greater power output, superior torque and better durability compared to the spark ignition engine. On the other hand, the diesel engine is a major source of both criteria and non-criteria air pollutants, which contribute to the deteriorating air quality further putting the health of mankind at risk. Thus, there is a need to find sustainable and environmental friendly fuel types for the diesel engine application. Therefore, in this review, we embark on a discourse on the application of oxygenated alternative fuels such as biodiesel, acet one–butanol–ethanol (ABE) solution and water-addition as green fuel reformulation strategies aimed at achieving engine pollutant reduction, while maintaining the integrity of the energy performance of the diesel engine. Furthermore, more research and study is recommended on these green fuels to gain more insight on their effect especially on the unregulated vehicle emissions such as polycyclic aromatic hydrocarbons (PAHs), persistent organic compounds (POPs) and carbonyls. Compared with conventional fossil diesel, by using the biodiesel and/or ABE solution in the diesel blends do reduce the emissions of particulate matter (PM), CO, PAHs and POPs, while in the most cases, the NO_x emission will be increased. However, due to the combination mechanisms of higher oxygen content, more complete combustion and cooling effect, if the diesel blend contains proper amount of biodiesel, ABE solution and a small amount of water (0.5%), it is a green fuel, which displays a excellent performance in both brake thermal efficiency (BTE) and NO_x–PM trade-off and in significant emission reductions for PAHs and POPs, while, the emissions of both carbon monoxide (CO) and hydrocarbons (HCs) may elevated and therefore a diesel oxidation catalyst (DOC) is needed. This review article proposes a green diesel fuel blend not only for scientific study but also for future practical application.

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