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ROLE OF BIOFUELS IN REDUCING DIESEL ENGINE EMISSIONS: A SYSTEMATIC REVIEW

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Abstract:

Diesel engines are widely used due to their high thermal efficiency and reliability, but they contribute significantly to environmental pollution, especially nitrogen oxides (NO_x), particulate matter (PM), carbon monoxide (CO), and unburned hydrocarbons (UHC). Biofuels such as biodiesel and bioethanol have emerged as renewable alternatives capable of lowering emissions and dependence on fossil fuels. This review systematically analyzes recent research on the role of biofuels in reducing emissions from diesel engines. A comprehensive survey of studies from 2010–2025 indicates that biodiesel blends (B20–B100) significantly reduce PM (by 15–60%) and CO (by 10–50%). However, biodiesel can increase NO_x by 2–15% depending on blend ratio and engine conditions. The review also discusses fuel properties, combustion characteristics, environmental impacts, and challenges, presenting both quantitative and qualitative data.

Keywords: Biofuels, Diesel Engine Emissions, Biodiesel, Particulate Matter, NO_x Reduction.

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