Bibliometric analysis, physical properties, and experimental evaluation of additives-diesel ternary blends

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Chandan Kumar, Muk

Mukesh Kumar

University of Engineering & Management, Jaipur, India

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Abstract

The availability of petroleum fuels is being challenged due to high demand and heavy dependence on imports, raising awareness of the need for cleaner alternatives. Urbanization, air quality, economic factors, and emissions limits motivate the search for alternative fuels compatible with compression ignition engines. A comprehensive bibliometric analysis further underscores the escalating worldwide research efforts in this critical domain. According to the existing literature, nitromethane and 2-ethoxy ethyl acetate have demonstrated superior physical and combustion properties compared to other additives. To explore their potential, a meticulous performance and emission

analysis was conducted using a single-cylinder, 4-stroke VCR CI engine, employing varying proportions of 2-ethoxy ethyl acetate and a constant 2% blend of nitromethane, with EEA concentrations ranging from 5, 10, to 15% (v/v). This research delved into the influence of these diverse fuel blends on the performance of CI engines and exhaust characteristics within a compression ratio spectrum spanning from 17 to 20. The experimental findings revealed that ternary blends, although having a marginal impact on engine performance, exhibited lower emissions compared to pure diesel. The pinnacle of this investigation emerged with the EEA5NM2D93 blend, which yielded optimal results in terms of both performance and emission characteristics.

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Data Availability

Not applicable.

Abbreviations

BP: Brake power

BSFC: Brake specific fuel consumption

BTE: Brake thermal efficiency

CI: Compression ignition

CO: Carbon monoxide

CO_2***:*** Carbon dioxide

CR: Compression ratio

EEA: 2−Ethoxy ethyl acetate

HC: Hydrocarbon

kg: Kilogram

kJ: Kilojoules

MEA: 2−Methoxy ethyl acetate

NM: Nitromethane

NO_x: Nitrogen oxides

ppm: Parts per million

rpm: Revolutions per minute

UHC: Unburnt hydrocarbon

VCR: Variable compression ratio

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Author information

Authors and Affiliations

Department of Mechanical Engineering, Swami Keshvanand Institute of Technology, Management and Gramothan, Jagatpura, Jaipur, India

Chandan Kumar

University of Engineering & Management, Jaipur, India
Mukesh Kumar & Umesh Kumar Das

Department of Mechanical Engineering, Poornima College of Engineering, Jaipur, India
Sumit Sharma

Contributions

All authors contributed to the conception, design, writing, and experimental work conducted to prepare this article. Material preparation, data collection, and analysis were done by Chandan Kumar and Mukesh Kumar. The first draft of the manuscript was written by Chandan Kumar and Sumit Sharma. The manuscript was reviewed, analyzed, and edited by Umesh Kumar Das. All authors have read and approved the final manuscript.

Corresponding author

Correspondence to Chandan Kumar.

Ethics declarations

Ethical approval

The authors hereby approves that principles of ethical and professional conduct have been followed in the work.

Consent to participate

The present research does not involve any human or animal participation.

Consent for publication

The authors and the responsible authorities at the institute/organization where this work has been carried out give their explicit consent to submit and publish the work in ESPR, if found suitable.

Competing interests

The authors declare no competing interests.

Additional information

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