ISSN: 2320-5407

International Journal of Advanced Research

Publisher's Name: Jana Publication and Research LLP

www.journalijar.com

REVIEWER'S REPORT

Manuscript No.: IJAR-50615 Date: 13-03-2025

Title: Experimental Study on Direct Injection of Propane and Hydrogen in a SI Engine with a Mechanical Injector

Recommendation:
Accept as it is……**YES……**
Accept after minor revision……
Accept after major revision ……
Do not accept (*Reasons below*) ……

Rating	Excel.	Good	Fair	Poor
Originality	√			
Techn. Quality		√		
Clarity		√		
Significance			√	

Reviewer's Name: Dr Aamina

Reviewer's Decision about Paper: **Recommended for Publication.**

Comments (*Use additional pages, if required*)
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Reviewer's Comment / Report

This paper presents a detailed experimental study on the direct injection of propane and hydrogen into a single-cylinder, air-cooled, four-stroke spark-ignition engine using a mechanically actuated hydrogen injector. The research effectively examines the modifications made to the engine, the measurement techniques used, and the comparative performance analysis of both fuel types.

The abstract provides a concise summary of the study, outlining the key objectives, methodology, and findings. It highlights the modifications made to the cylinder head, the integration of a hydrogen injector, and the performance outcomes when the engine operates on propane versus hydrogen. The comparative analysis of engine performance metrics—such as torque, brake power, thermal efficiency, and specific fuel consumption—offers valuable insights into the effects of using different fuels under various operating conditions. The findings regarding hydrogen's lower volumetric energy density and its impact on engine output are well-supported by experimental data. The study also provides a unique perspective on hydrogen fuel injection, addressing common challenges such as knocking, pre-ignition, and backfire.

The introduction effectively sets the stage for the study, discussing the advantages of propane and hydrogen as alternative fuels. It incorporates relevant literature to contextualize the environmental

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benefits of these fuels, including reduced CO_2 and NOx emissions compared to conventional gasoline engines. The inclusion of a comparative table detailing combustion products for different fuels further strengthens the discussion on emission characteristics. The study presents a well-structured comparison of hydrogen and propane-fueled internal combustion engines, emphasizing the potential and challenges associated with each fuel type.

The materials and methods section provides a comprehensive explanation of the experimental setup, detailing the modifications made to the engine and the instrumentation used to collect data. The schematic diagrams referenced in the text contribute to a clear understanding of the test procedures. The safety measures taken to prevent backfiring and overheating, as well as the regulation of fuel supply pressure, demonstrate careful experimental planning. The use of a specialized hydrogen injector synchronized with the intake valve is a notable aspect of the study, offering a novel approach to hydrogen injection in SI engines.

Overall, this paper presents a well-organized and technically sound study on the direct injection of hydrogen and propane in an SI engine. It provides valuable insights into the operational characteristics of these fuels and contributes to the ongoing research on alternative fuel technologies.