

**The second International Congress on Energy and Industrial Processes Engineering  
ICEIPE'24  
USTHB, Algiers, 14–16 May 2024**

## **Exploring the dynamics of hydrogen enrichment in diesel engines**

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### **ABSTRACT**

The present study investigates the use of hydrogen as a fuel in diesel engines operating under low-load conditions. Due to hydrogen's higher auto-ignition temperature compared to diesel fuel, it cannot be directly utilised in a diesel engine. As an alternative, hydrogen can be used for enrichment or induction. In this study, a single-cylinder research engine was modified to run on a dual-fuel mixture of diesel and hydrogen to examine the combustion characteristics. Hydrogen was introduced into the intake manifold via a mixer to allow it to enter the combustion chamber. The engine operated continuously at 2000 rpm with a 10 N·m load. Hydrogen was added at flow rates of 21.4, 36.2, and 49.6 L/min. Key parameters such as cylinder pressure, efficiency, and specific energy consumption were analysed. At this low load, hydrogen enrichment resulted in a reduction in the peak cylinder pressure. The combustion process, including reaction progress and combustion rate, was further explored using OpenModelica modelling.

*Keywords:* Hydrogen; Diesel; Dual fuel; Combustion; OpenModelica

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