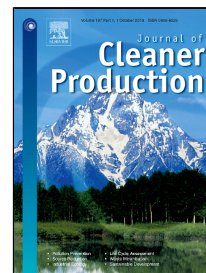


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Spirulina microalgae biodiesel – A novel renewable alternative energy source for compression ignition engine

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Abstract

The present study aims to investigate emulsion fuel characteristics with B20 blend level of microalgae *spirulina* biodiesel (MSB) concentration and their effects on performance, combustion and exhaust emissions of a direct injection diesel engine. The engine was operated at three different engine speeds. This has been analyzed by Diesel-RK commercial software and engine parameters such as specific fuel consumption, thermal efficiency, exhaust gas temperature, ignition delay, the rate of heat release, emissions particulate matter, carbon dioxide, oxides of nitrogen and smoke emission were obtained. Investigations were performed on a, naturally aspirated, single-cylinder, diesel engine using diesel (B0), MSB-B20 (80 diesel + 20 *spirulina*) and *spirulina* biodiesel (B100) at 100% load condition. Result shows that MSB-B20 a reduction of 1.63%, 1.2%, 0.55%, 10.5%, 6.2% and 2.6% in parameters like, cylinder pressure, brake thermal efficiency, indicated thermal efficiency, particulate matter, oxides of nitrogen and smoke emission respectively. The MSB-B20 shows an increase by 5.08%, 4.5%, 2.45% and 2.7% for the parameters of specific fuel consumption, peak heat release rate, ignition delay period, and carbon dioxide emission respectively at 1500 rpm with 100% engine load. The numerical results are verified against experimental results conducted under the same operating conditions.

Keyword: Compression ignition engine; *spirulina* biodiesel; engine speed; performance; emission; numerical

1. Introduction

A diesel engine has higher conversion efficiency of fuel, engine output power and produces higher pollutant gases (Rajesh and Saravanan, 2015). Nowadays new challenges are that there must be a reduction in soot, hydrocarbon (HC), nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (PM) and have higher thermal efficiency, power, reliability and durability (Seokhwan and Tae; 2017). In this regard, all the biodiesel fuels, an alternative is one of the

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