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Investigation on Performance and Emission Characteristics of Variable Compression Ration Engine by using Fish Oil Methyl esters

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Abstract: - Investigated are the operation and emission properties of a four –stroke, single cylinder variable compression ratio engine running on methyl ester fuel from fish oil. This study has demonstrated that methyl ester of fish oil is suitable as a bio fuel. This study made use of biodiesel made from fish oil through the Trans esterification process. The experiment was run with CR= 16.0, 17.5, and 19.0, A variable load and a Fixed engine speed 1500 r.p.m, researchers have looked at and presented the effects of CR on brake thermal efficiency, fuel consumption, exhaust gas temperature and pollutants.

KeyWords: *Diesel engine, fish oil methyl ester, Compression ratio, Performance, Emission*

1. Introduction

Recent Years Have Seen A Sharp Rise In Petroleum Prices As Well As An Increase In The Environmental Concern Posed By Greenhouse Gas Emissions And Exit Emissions. Alternative Fuel Sources Are What The Researchers Are Looking For. Made From Vegetable Or Animal Fats, Biodiesel Is A Fuel Composed Of Compressed Mono Alkyl Esters Of Long Chain Fatty Acids. Tran's Esterification Method Produces Biodiesel. Vegetable And Animal Fat Are Transformed Into Esterified Oil Using This Procedure.

One of the main sources of energy is biofuels which also serve as a fossil fuel substitute biodiesel was produced using chicken feather meal. Biodiesel was produced from processed chicken feathers, which contain fat.Tran's esterification method produces biodiesel. Vegetable and animal fat are transformed into esterified oil using this procedure.

One of the main sources of energy is biofuels, which also serve as a fossil fuel substitute. Biodiesel was produced using waste fish. Biodiesel was produced from processed waste fish, which contain fat.

This study aims to examine the effects of a fish oil methyl ester powered variable compression ratio engine on the compression ratio (CR) throughout the three distinct ranges: 16.0, 17.5 and 19.0. The goal of this study is to determine the ideal compression ratio for a diesel fueled compression ignition engine running at constant speed and variable load.

2. Objectives

The main aim of our study is the theoretical and experimental comparison of performance and emission characteristics of biodiesel with diesel using fish oil methyl esters.

1. Performance properties - Break thermal Efficiency and Brake Specific Fuel Consumption.

2. Emission levels - Carbon monoxide, Hydrocarbon, Nitrous oxide andSmoke.

3. Methods

Extraction of fish oil is done by two processes, Boiling process and Gravity separation process. The oil boiling need heat energy; gravity separation is a very slow process. After the oil extraction the raw oil is converted to Biodiesel.

Following steps involved in Extraction of Oil from fish:

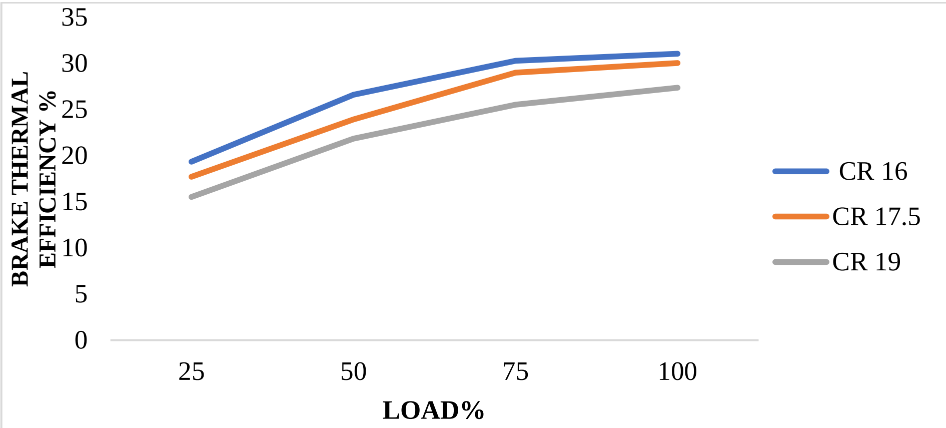
1. Collection of fish from fish farms.

2. Boiling Process

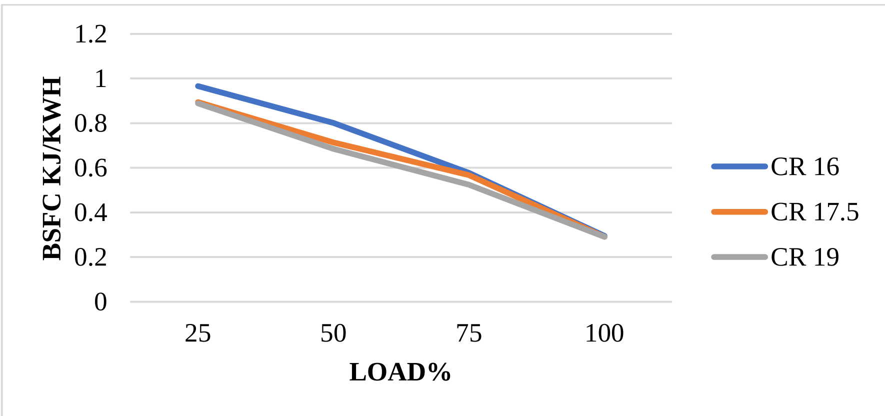
3. Separation Process

4. Results

4.1 Brakethermal efficiency Vs Load



4.2 Breakspecific fuel consumption VS Load



4.3 Exhaust gas temperature Vs Load

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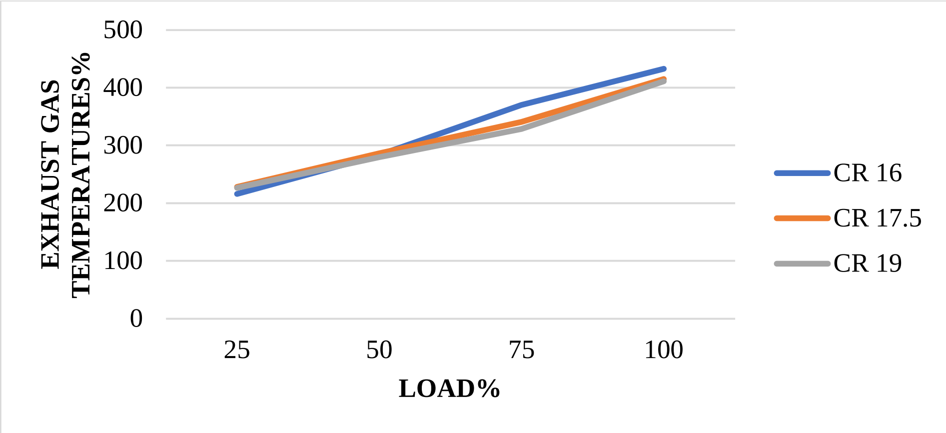
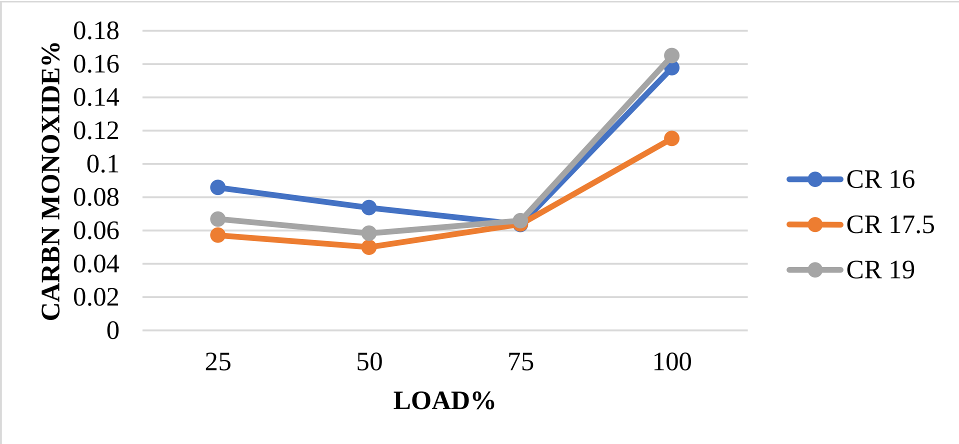
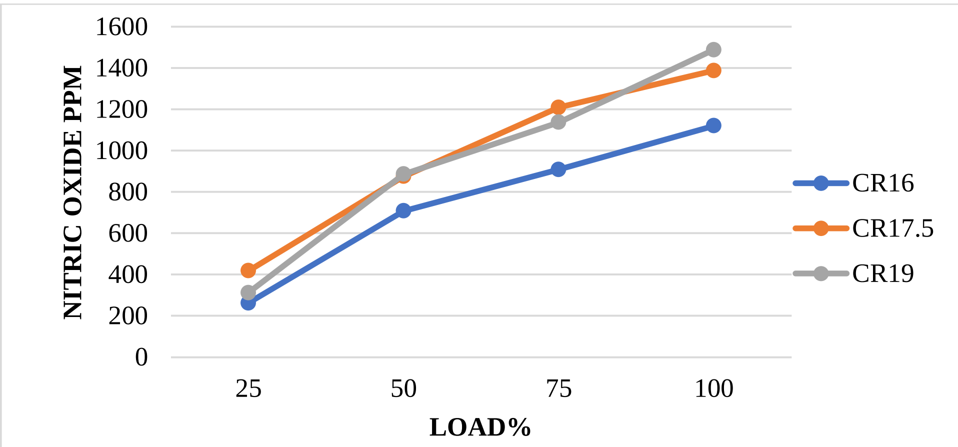


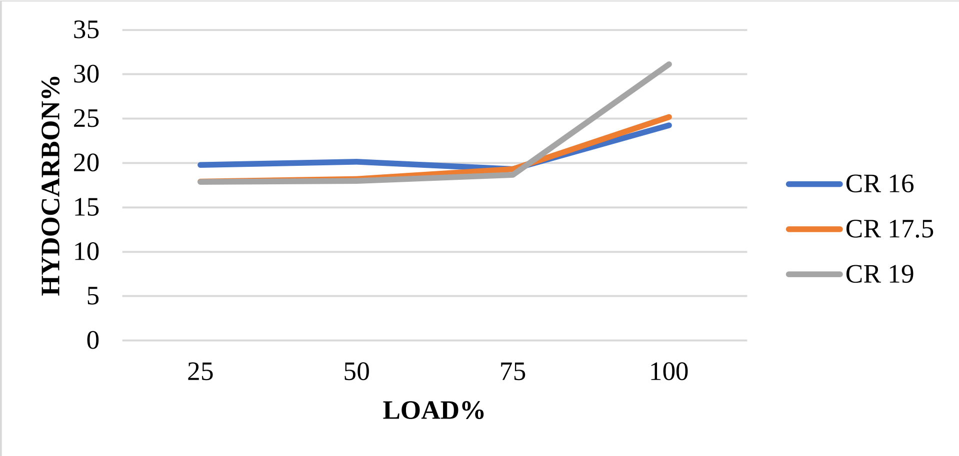
4.4 Carbon monoxide Vs Load



4.5 Carbon monoxide Vs Load



4.6 Carbon monoxide Vs Load



5. Discussion

5.1 BRAKE THERMAL EFFICIENCY

The impact of compression ratio on brake thermal efficiency under load is depicted in Fig 4.1at CR=16.0, the maximum brake thermal efficiency is achieved. At CR=19.0, the lowest brake thermal efficiency is achieved. For brake thermal efficiency, thus, CR = 16.0 can be considered optimal.

5.2 BRAKE SPECIFIC FUEL CONSUMPTION

The figure 4.2 illustrates how the compression ratio affects the amount of fuel used at each brake under load. A compression ratio of 16.0 produced the best fuel consumption. The 19.0 compression ratios led to significant fuel consumption. At 16.0 and 17.5 compression ratios, the fuel consumption was nearly the same.

5.3 EXHAUST GAS TEMPERATURES

Exhaust gas temperature with load is influenced by compression ratio, as seen in Fig. 4.3. The exhaust temperature generally rises with compression ratio, albeit the effect is negligible. More fuel is effectively used when the compression ratio is larger because it causes the combustion process to slightly shift to the earlier stroke of the cycle. To reduce the temperature of the exhaust stream in order to create brake power.

5.4 CARBON MONOXIDE

The impact of the compression ratio on CO under load is displayed in Fig. 4.4 .When organic material is not burned completely that is, when the oxidation process is not given enough time to complete CO is created. It has been noted that CO emissions have decreased with load increases up to 75% and have begun to increase with load increases from 75% to 100%. At 100% load, the CO emission is at its lowest at CR = 17.5 and its maximum at CR = 19.0.

5.5 NITRIC OXIDE

Figure 4.5 illustrates how the compression ratio affects NOX under load. The highest temperature in the cylinder, the concentration of oxygen, and the length of residence time all affect how much NOX is created. NOX production is reduced with greater compression ratios when the exhaust gas's oxygen level is lower. It has been noted that, at 100% load, NOX emissions rose as the compression ratio increased.

5.6 HYDROCARBON

Figure 4.6 illustrates how the compression ratio affects hydrocarbon under load. The HC emission was shown to decrease with increasing load up to 75% and to increase from 75% to 100% load. For generating brake power and lowering the temperature of the exhaust gas.

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