International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-9 Issue-2, December 2019

Characteristics of Cyan Bacteria (Green Algae) As Biodiesel in VCR Engine for Different Nozzles

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Abstract: This present study investigates the performance and emission characteristics different injection pressure on variable compression ratio of a diesel engineusing cyanobacteria (greenalgae).In the Diesel Engine the experiments were controlled withvarious hole injection to study the effect onemission and performance by using conventional diesel future emission regulation will require substantial reductions of NOX and CO2 emissions from diesel engines. With cyanobacteria (green algae) as a biodiesel and diesel blends are prepared to use as fuel on variable compression ratio diesel engine.

Key words: cyanobacteria (green algae),B20,B40,B60,Injection nozzle.

I. INTRODUCTION

Green Algae (Cyanobacteria) Oil based energizes have been the essential sort of transportation fuel far and wide for quite a longtime[1]. Until the 1960s, residential creation of these fills met by far most of the country's interest[2]. The oil generation crested during the 1970s, yet request kept on developing. The desire to reduce reliance on foreign oil imports and boost vitality security has begun interest in elective power's innovative work (R&D)[3].

In U.S The Fuels Development Office of the Energy Division (DOE) has launched the Aquatic Species Program, which aims to create inexhaustible energy from green growth[4]. This project promoted the understanding of the potential of green growth as a fuel feedstock through its advancement and representation of a vast assortment of oil-creating green growth, its analysis to enhance understanding of the natural triggers for green growth upgrading oil production, and its research to show open-lake frameworks for vast green growth[5]&[6].

Revised Manuscript Received on December 30, 2019.

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Bio-fuels got from green growth and cyanobacteria were viewed as a promising elective fuel for improving vitality security for the accompanying reasons[7]. Green growth for the most part expects light to develop[8]. Microalgae,macro algae, and cyanobacteria convert sunlight based vitality to compound vitality for their development and advancement through the procedure of photosynthesis[9]. A few animal types likewise can be developed in heterotrophic conditions, where an exogenous wellspring of natural carbon is given[10].Fig.1and Fig.2 shows the green algae in stagnant water.

Fig. 1.Green Algae in stagnant water .

Fig. 2.Green Algae in stagnant water.

While green growth develop quickly and creates a lot of oil, gathering the green growth and separating the oil present difficulties to the business scale advancement of green growth[11]. Numerous new advances are being created to address the reaping and extraction challenges[12]. The key will be whether the advancements are cost-proficient [13]. New innovations are coming on the web that can possibly drive down the expense fundamentally to deliver green growth oil so it is aggressive with the market[14].

These advancements incorporate imaginative green growth development frameworks and extraction forms[15]. Now and again, the "new innovations" are advances from existing applications that have been imaginatively applied to the green growth bio-fuels creation process[16]. Ultrasonic cavitations, for instance, is a procedure for separating follow measures of minerals or supplements from green growth and different mixes in the nutraceuticals business. Green growth organizations presently are exploring different avenues regarding utilizing ultrasonic cavitations for collecting green growth oil. In spite of the difficulties of reaping green growth oil on a business scale for green growth bio fuels creation, there is a critical bit of leeway in utilizing a feedstock that isn't dependent upon the swings of the items advertise. Research endeavours as of late have been centred around creating innovations that concentrate oil from the green growth cells while the cells flawless.

II. METHODS AND MATERIALS

Discharge test is done in an electronic diesel motor. At first it is controlled by B20 then B40 lastly B60 of cyanobacteria (green growth biodiesel). Fumes gas investigation (CO, CO2, HC, NOx, and O2) completed for the two powers.

A. EXPERIMENTAL TEST SET UP

A 3.5 kW, 1500 rpm, Kirloskar diesel motor is utilized in this examination. Two separate fuel tanks with a fuel trading system are used, one for diesel (D100) and the other for biofuel (B100).Fuel use is assessed using visual or optical sensor. To measure wind current rate differential pressure transducer is used. The engine is connected to a spin current dynamometer to get a control over engine force through the PC. Engine speed and weight are required by the dynamometer controller to move the current excitation current to the current dynamometer. A piezoelectric weight transducer is introduced with the calibration starting pressure on the engine head chamber. The sign from the pressure transducer prolongs charging. A high precision wrench margin encoder can be used to provide complete engagement and wrap point signaling. Identification from fee intensification and wrench point encoders is provided to the data acquisition framework. For assessments & monitoring AVL exhaust gas analyzer and AVL smoke meter is used to check exhaust temperature, coolant temperature, and channel air temperature.Fig.3 shows the schematic view of experimental set-up.

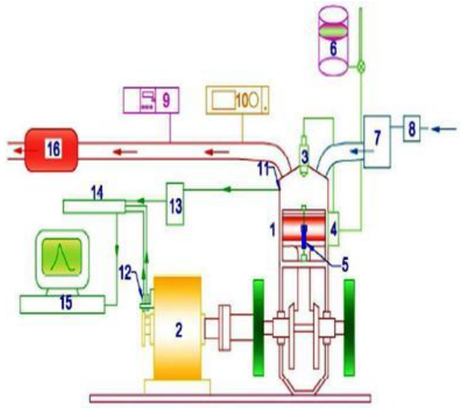

Fig. 3.Schematic view of Experimental Set-up.

III. USAGE OF NOZZLES

The subtleties of the spouts and fuel infusion pressures utilized are given in Table. Consistent speed execution tests were conducted maintaining coat water temperature at 45°C so as to keep up enduring state conditions. The fuel infusion pressure was set to 200 bar, 220 bar and 240 bar. Infusion pressure was changed by methods for modifying the injector spring strain as appeared in Fig.4. Every preliminary was rehashed multiple times and on various days, enough care was taken to stack the motor precisely at each progression of burden and furthermore to keep up encompassing conditions steady.

Fig. 4.Diameter of each hole.

Table 1 shows the detailed specification of parameters and Table II show the Engine specifications.

Table- I: The Detailed Specification

SERIAL NO.	SPECIFICATIONS
1	KIRLOSKAR TV1 ENGINE.
2	EDDY CURRENT DYNAMOMETER.
3	INJECTOR.
4	FUEL PUMP.
5	AIR STABLIZING TANK.
6	AIR FILTER.
7	AVL SMOKE METER
8	AVL DI-GAS ANALYZER
9	PRESSURE TRANSDUCER.
10	TDC ENCODER.
11	CHARGE AMPLIFIER
12	INDIMETER.
13	MONITOR.
14	EXHAUST SILENCER.

Table- II: Engine Specifications

Make	Kirloskar –TV1
Power and Speed	3.5 kW and 1500 rpm
Type of engine	Single cylinder, DI and 4 Stroke
Compression ratio	17.5:1 to 12:1
Bore and Stroke	80 mm and 110 mm
Method of loading	Eddy current dynamometer
Method of starting	Manual cranking or Self Starter
Method of cooling	Water
Type of ignition	Compression ignition
Inlet valve opening	4.5° before TDC
Inlet valve closing	35.5° after BDC
Exhaust valve opening	35.5°before BDC
Exhaust valve closing	4.5° after TDC
Fuel injection timing	23° before TDC
Nozzle opening pressure	210 bar
Lube oil	SAE40

IV. EMISSION ANALYZER

Five gas analyzers (AVL 444 Di-gas Analyzer) are used to measure exhaust gas emissions from HC, CO, CO2, O2 and NOX A 5 G – 10.The measured tenacity of NOX:1ppm, CO2:0.01percent,HC:1ppm,O2:0.01percent,CO:0.01percent, CO: 0.01 per cent, CO2: 0.01 per cent, O2: 0.01 per cent, NOX: 1ppm, CO: 0.01 per cent.Probe is inserted into the engine exhaust pipe. The exhaust gas filters the particles of the suite and dust through a metal mesh screen, after which it can pass through a fine fiber element, filtering out the entire gas for any foreign particles.To resist moisture from reaching the exhaust gas analyzer, the cold traps are given. Cleaning and cooling of imported goods. The Values are shown on screen and maintained by filter arrangement when the gas reaches the direct measurement of the sensor. The emission tests were conducted on a dry basis. List of the gases with their exhaust values are given in the below Gas analyzer specifications Table III

TABLE- III: Name Gas Analyzer Specifications (Type Avl Digas 444)

EXHAUST GAS	MEASUREMENT RANGE
CO	0–10 vol.%
HC	0–20,000 ppm
CO_2	0–20 vol.%
O_2	0–22 vol.%
NO_x	0–5000 ppm

V. SMOKE METER

The standard smoke darkness quantification measure is the AVL 437 Smoke Density meter shown in the fig.5. Darkness of smoke means reducing the light's brightness between the origination and the recipient. Motor exhaust is injected into an antechamber with non-smart interior surfaces. Depending on the light type and the photocells used in the apparatus, the adequate limit of the light intake path is resolved. The length of 0.430 ± 0.0005 is impressive. By using the dark light traps, the photocell reflections or the scattering of light from the diffuse light within the chamber are reduced to a base. The temperature varies from 2800 ° K to 3250 ° K.

Fig. 5. AVL Smoke Density meter.

Specifications of the smoke meter is shown in the Table IVand in Table V shows the Variations in the carbon monoxide in Load.

Table- IV: Specifications Of The Smoke Meter

MAKE	AVL 437C SMOKE METER
TYPE	IP 52
ACCURACY AND REPRODUCIBILITY	1 % FULL SCALE READING
MEASURING RANGE	0 TO 100 OPACITY IN %, 0 TO 99.99 ABSORPTION M-1
MEASUREMENT CHAMBER	EFFECTIVE LENGTH 0.430 M ± 0.005M
HEATING TIME	220 V APPROXIMATELY 20 MIN.
LIGHT SOURCE	HALOGEN BULB 12 V/5W
MAXIMUM SMOKE TEMPERATURE	250 °C
POWER SUPPLY	190 -240 V AC, 50 HZ, 2.5 A
DIMENSIONS	570 MM X 500 MM X1250 MM

Table- V: Variations In The Carbon Monoxide In Load

BP	HOLE 1	HOLE 2	EGR
0	0.02	0.04	0.03
3	0.03	0.05	0.03
6	0.02	0.04	0.02
9	0.02	0.04	0.02

From Table VI-X shows the variations in CO2,Hc,Nox,O2,smoke density.

Table- VI: Variations In The Carbon Dioxide In Load

BP	HOLE 1	HOLE 2	EGR
0	0.6	0.6	0.6
3	1	1.1	0.8
6	1.3	1.4	1
9	1.6	1.7	1.4

Table- VII: Variations In The Hc

BP	HOLE 1	HOLE 2	EGR
0	1	7	1
3	1	6	1
6	3	3	1
9	2	4	1

Table- VIII: Variations In The Nox

BP	HOLE 1	HOLE 2	EGR
0	29	18	23
3	77	62	37
6	151	144	55
9	2.24	226	65

Table- IX: Variations In The O2

BP	HOLE 1	HOLE 2	EGR
0	20.05	20.18	20.04
3	19.75	19.52	19.83
6	19.27	19.15	19.43
9	18.81	19	19

Table- X: Variations In The Smoke Density

BP	HOLE 1	HOLE 2
0	2.2	4.7
3	5.8	15.6
6	17.1	25.4
9	33	40.8

VI. RESULT AND DISCUSSION

From this graph gives that variation of the CO emission of different load. When the load has increased HC emission also increased. For maximum load for B20 – 0.04%, when compared to EGR,hole2,hole1 and produce less CO emission. Figure 6 to 9 shows the load versus NOx, HC, CO,CO2.

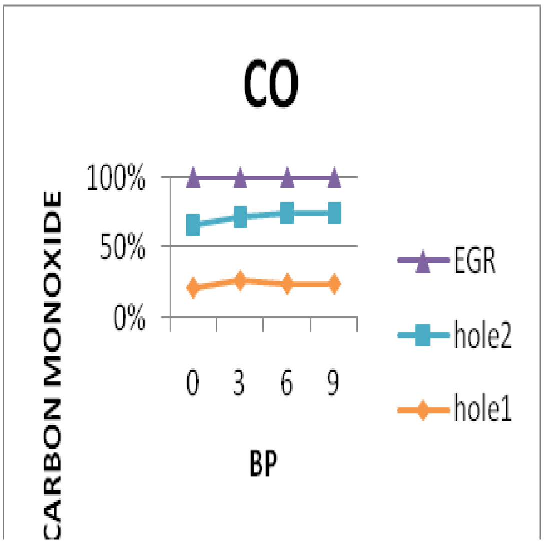

Fig. 6.Variations in the carbon monoxide in load.

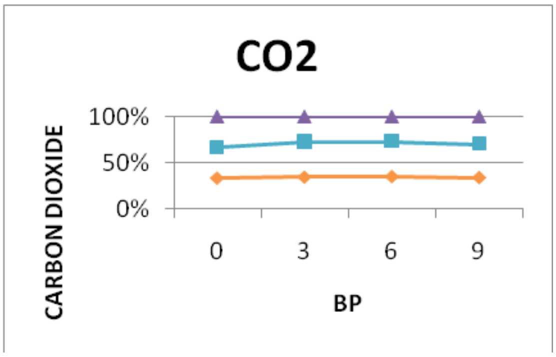

Fig. 7.Variations in the carbon dioxide in load.

From this graph gives that variation of the HC emission of different load. When the load increases HC emission also increased. For maximum load B20–4ppm. When compared to EGR,hole1,hole2 and produce less HC emission.

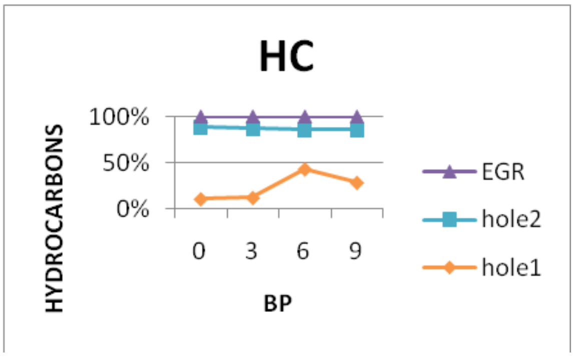

Fig. 8.Variations in the HC

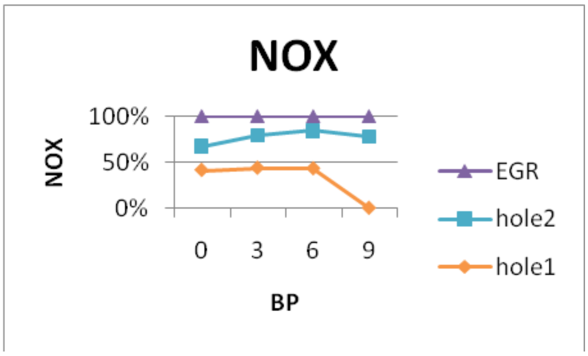

Fig. 9.Variations in the Nox.

From this graph we can analyses the NOx emission variation with load. For maximum load for diesel 320 ppm, B20 - 280 ppm. When compared to ER,hole1,hole2 and B20 bio fuel less NOx emission.

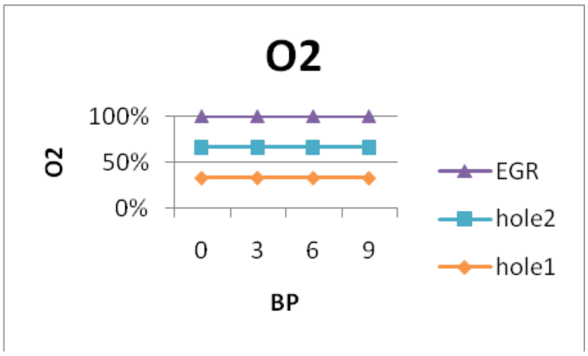

Fig. 10. Variations in the o2.

Fig.10.shows the variations in O2.From this graph gives that variation of the O2 emission of different load. When the load increases O2 emission also remains constant.

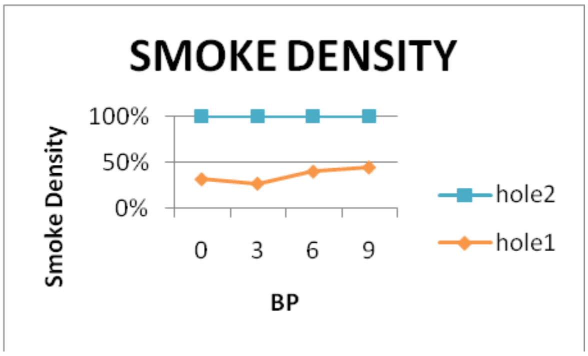

Fig. 11. Variations in Smoke density.

The deviation of smoke density with load is shown in above graph fig.11. The load increase when smoke density will be increased. For maximum load for B20 when compared to diesel produce less smoke opacity.

VII. CONCLUSION

Following are our conclusions that summarize the experimental results presented in this paper

- Results show that lower brake thermal efficiency for Cyanobacteria (Green Algae), mainly due to its high viscosity and poor atomization in competing with diesel.
- Specific gas using up, carbon monoxide and carbon dioxide and smoke opacity of cyanobacteria is higher than that of due to its high viscous nature,low exhaustion & density.
- Smoke emissions for diesel engine are always less than that of varying blends and at varying loads.

Nitric oxide emission of Cyanobacteria (Green Algae) is lower than that of diesel, this is mainly due to lower combination temperature and incomplete combustion.

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