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Research Article

Execution Investigation OF C.I. Motor Utilizing Biodiesel Fuel By Adjusting Infusion Timing And Infusion Tension

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Abstract-

The essential focal point of this paper is the improving of infusion tension and timing in pressure start motors. At the point when these two basic variables were changed, the motor's presentation was followed, and data was acquired to assess the results. The objective of the review was to improve the motor's presentation, eco-friendliness, and discharges attributes by deciding the fitting infusion tension and time. Various diagrams including pressure start motor burden and different execution qualities, including showed power, brake power, and explicit fuel utilization (I.P., B.P., and S.F.C.), have been made in light of information.

Then again, the course of fuel adjustment was utilized to blend biodiesel with petroleum product or different sorts of fuel. I decided to use jatropha seed since it can prosper in parched conditions or with negligible water. Diesel and the biodiesel created from jatropha are mixed for CI motors. Since B100 biodiesel is 100% biodiesel, testing a motor's presentation under fluctuating loads is utilized. The 2-stroke single-chamber C.I. motor has been tried utilizing B100 blended petroleum. In the first place, the motor works for 30 minutes with no heap applied to test the motor's genuine working state.On the one hand, certain blends have elevated degrees of SOx and NOx fumes gas discharges alongside high B.P. readings, while on the other, a few mixes have low degrees of SOx and NOx fumes gas emanations alongside low B.P. readings. Now that it is being grown economically, jatropha oil will turn out to be more affordable than diesel. Also, remember that customary fuel's stock is obliged for years to come as its expense will diminish.

1. Introduction

When a country faces a significant disruption or shortfall in its energy supply, which is typically accompanied by dramatically rising energy prices, it enters an energy crisis. This issue could substantially hinder a nation's economic and security components. The economy may suffer from the energy crisis in a number of ways. The energy crisis may also result in job losses and higher unemployment since enterprises may need to scale back or close due to higher energy expenses. Furthermore, since importing energy resources costs more money, a country that imports a lot of its energy may have a significant trade imbalance.

The International Energy Agency project research states that by 2030, demand must climb by at least 50%.Despite a 3% increase in consumption in 2011, a 1.6% annual growth will lead to a 51% increase in consumption by 2030. The consumption of vintage is rapidly rising in both China and India. The rapidly growing prices of crude oil and petroleum products on a global scale are having an effect on the economies of a number of nations since the supply cannot keep up with the demand. To respond to the dwindling oil supply, it is essential to transition to an alternative energy source.

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Table 1.1 displays sector-specific diesel consumption.

Sector	Diesel (Fuel Consumption in Percentage)
Road Transport	61-63%
Manufacturing industries	13-14%
Agriculture	10-11%
Railways	4-5%
Other Uses	6-7%

Table 1 show sector wise consumption of diesel

India is currently ranked 26th among the 34 countries that currently generate biodiesel in the globe. An experienced petroleum minister formally reported that the increase in demand for oil products caused India's imports of crude oil to increase by 23.4% in July of this year. In July, crude oil imports were 8.532 mm tonne, up from 6.943 mm tonne in the same month last year.

The United States consumes 26% of the world's oil despite only producing 9.4% of it. The ratio of reserves to output in the United States is 11.4 years, while it is 12.3 years for all of North America. The implication is that neither Canada nor Mexico have any oil. The Middle East has a reserve to production ratio of 90 years, which is higher than that of Africa. This suggests that the US will rely more on oil imports from those areas. It is hard to consider oil emancipation when keeping these numbers in mind. The majority of the world's oil is found in old oil areas. 3.1% of the world's oil is still supplied by Kuwait, a small nation with 75-year-old oil-producing regions. Kuwait a small country still supplies 3.1% of the world’s oil from 75 years old regions. Ghawar a 58 years old region still supplies 5.2% of the world’s oil. The North Sea region 55 years old is retarding their supply. Alaska Prudhoe Bay 60 years old is now near end.

According to Matthew Roy Simmons, the founder and retired administrator of "Simmons and Company International" in an oil field, Saudi Arabia was able to significantly increase output on a short-term basis in 2003, but probably not in 2006. Data on oil statistics typically include the R/P (Reserves to Production) ratio.

The expected characteristics of oils are listed in the American Oil Chemists' Society (AOCS) standards. In any case, the biodiesel sector in every country ultimately determines the qualities that the oils are supposed to have. For instance, in Argentina, the oils used to produce biodiesel typically:

- Density at 15^0C: 0.70-0.80 g/ml
- Moisture content: 450-550 PPM
- Peroxide index: 10 mEq/kg
- Acidity level: 0.1 mg KOH/g
- Non-saponifiable substances: >1%
- Kinematic viscosity at 40 ^{0}C: 2-4.3 cSt
- Cetane index minimum: 45-55

3.Experimental Setup

3.1 Generator Specification

B.P.	:	3 kW
MAXIMUM SPEED	:	1500 rpm
NUMBER OF CYLINDER	:	1
TYPE OF IGNITION	:	COMPRESSION IGNITION
METHOD OF STARTING	:	CRANK START
METHOD OF LOADING	:	ELECTRICAL LOADING
COMPRESSION RATIO	:	16.5:1
AIR INTANK	:	NATURALLY ASPIRATED
THERMAL MANAGEMENT	:	WATER COOLED

INTAKE VALVE OPEN	:	6^0 BEFORE TDC
INTAKE VALVE CLOSE	:	35^0 AFTER BDC
EXHAUST VALVE OPEN	:	45^0 BEFORE BDC
EXHAUST VALVE CLOSE	:	6^0 AFTER TDC

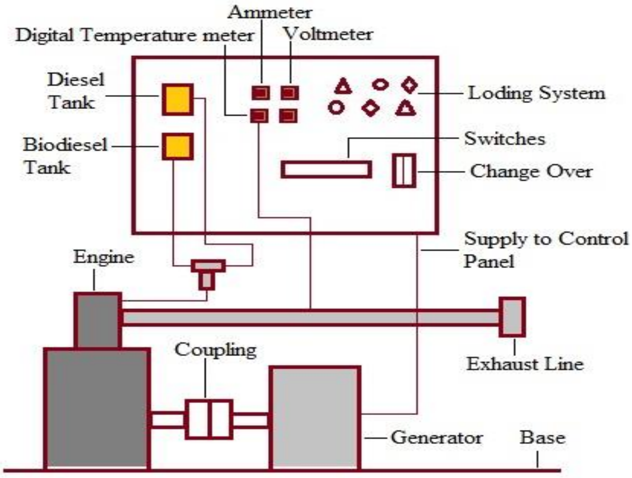

Figure 3 Schematic diagram of experiment setup

3.4 Formulae Used

- Brake power (B.P.) = (V*I) / (ηg *1000) kW
- Mass of fuel consumed (mf) = (10*ρ*3600) / (tf*1000) kg/hr.
- Specific fuel consumption (s.f.c.) = m_f / B.P. kg/kW-hr
- Brake thermal efficiency (ηbth) = (B.P*3600*100) / (mf*c.v.) %
- Gross calorific value (G.C.V.) = w*(T2-T1) / (weight of fuel in gm.) Cal. /gm.

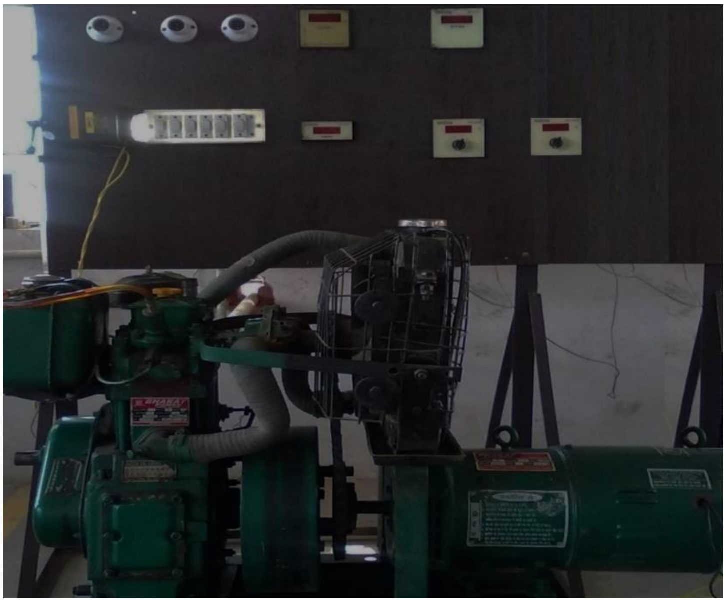

Figure 2 Experimental setup

4. Results and Discussion

4.1 Observations

Time for 10 ml fuel consumption from jar = tf ,(S)
Voltage = Volt, (V)
Current = Ampere, (I)
Exhaust Gas Temperature = E.G.T., (^{0}C)

4.1.1 for Normal Pressure and Normal Injection Timing On diesel fuel

Table 2 shows the speed versus load for CI engine with diesel fuel. For the end of the ignition, it has electricity 212 V and 1.8 A at 770 rpm while 252 V and 8.4 A at 698 rpm.

Load (kW)	Speed (RPM)	Voltage (V)	Ampere (I)	t_f (Sec)
0.25	770	212	1.8	77.2799
0.50	782	218	2.2	73.0949
0.75	767	227	2.7	68.8938
1.00	762	223	3.2	64.8053
1.25	741	231	3.9	58.6340
1.50	749	234	4.6	52.5738
Load (kW)	Speed (RPM)	Voltage (V)	Ampere (I)	t_f (Sec)
1.75	732	238	5.4	47.9916
2.00	714	236	6.3	42.8646
2.25	724	243	7.1	37.0369
2.50	706	249	7.8	31.9598
2.75	687	246	8.1	28.9082
3.00	698	252	8.4	25.8574

Table 2 On biodiesel fuel

Table 3 shows the speed versus load for CI engine with biodiesel fuel. For the end of the ignition, it has electricity 207 V and 1.5 A at 776 rpm while 225 V and 8.4 A at 697 rpm.

Load (kW)	Speed (RPM)	Voltage (V)	Ampere (I)	t_f (Sec)
0.25	776	207	1.5	47.1231
0.50	765	219	1.8	46.5767
0.75	770	214	2.1	48.0855
1.00	758	224	2.6	41.3727
1.25	749	228	3.1	36.8059
1.50	732	234	3.7	31.2807
1.75	741	231	4.4	23.5350
2.00	723	236	5.1	21.2152
2.25	705	242	6.6	16.8199
2.50	712	239	7.3	17.4727
2.75	688	252	7.8	16.1525
Load (kW)	Speed (RPM)	Voltage (V)	Ampere (I)	t_f (Sec)
3.00	697	225	8.4	14.1680

Table 3

4.1.2 for High Pressure and Normal Injection Timing

On diesel fuel

Table 4 shows the speed versus load for CI engine with diesel fuel. For the end of the ignition, it has electricity 207 V and 1.5 A at 776 rpm while 225 V and 8.4 A at 697 rpm.

Load (kW)	Speed (RPM)	Voltage (V)	Ampere (I)	t_f (Sec)
0.25	741	208	2.4	93.3705
0.50	724	212	3.2	80.5997
0.75	732	219	3.7	61.4777
1.00	712	215	4.7	44.8465
1.25	697	223	5.2	45.6743
1.50	705	224	5.3	51.2665
1.75	690	227	5.8	44.3702
2.00	668	216	6.9	36.8194
2.25	679	208	8.1	36.4421
2.50	652	209	9.4	33.8134
2.75	627	202	9.9	21.4801
3.00	638	203	10.8	15.9001

Table 4

On biodiesel fuel

Table 5 shows the speed versus load for CI engine with biodiesel fuel. For the end of the ignition, it has electricity 224 V and 1.3 A at 769 rpm while 189 V and 11.3 A at 664 rpm.

Load (kW)	Speed (RPM)	Voltage (V)	Ampere (I)	t_f (Sec)
0.25	769	224	1.3	94.6518
0.50	736	229	1.7	91.9734
0.75	742	221	2.8	87.4631
1.00	719	217	3.9	73.3304
1.25	709	214	4.5	69.8331
1.50	713	216	5.4	61.7122
1.75	695	208	6.3	53.4996
2.00	681	204	7.4	45.2989
2.25	691	207	8.8	36.9296
2.50	676	202	9.4	33.8893
2.75	642	197	10.4	26.1610
3.00	664	189	11.3	14.4576

Table 5

4.1.3 for High Pressure and Advance Injection Timing

On diesel fuel

Table 6 shows the speed versus load for CI engine with diesel fuel. For the end of the ignition, it has electricity 198 V and 1.3 A at 728 rpm while 192 V and 13.8 A at 638 rpm.

Load (kW)	Speed (RPM)	Voltage (V)	Ampere (I)	t_f (Sec)
0.25	728	198	1.3	108.3435
0.50	723	204	1.6	110.6758
0.75	716	209	2.4	84.7411
1.00	724	213	3.4	75.6188
1.25	712	216	4.6	64.0850
1.50	702	221	5.4	55.4759
1.75	695	215	6.7	47.3648
2.00	677	218	7.7	42.9241
2.25	682	204	8.5	39.0235
2.50	650	198	9.4	35.2992
2.75	664	203	11.4	27.3690
3.00	638	192	13.8	22.0053

Table 6

4.2 Results

4.2.1 Graphs For Different Parameters

4.2.1.1 Brake Power

Normal Pressure and Advanced Injection Timing

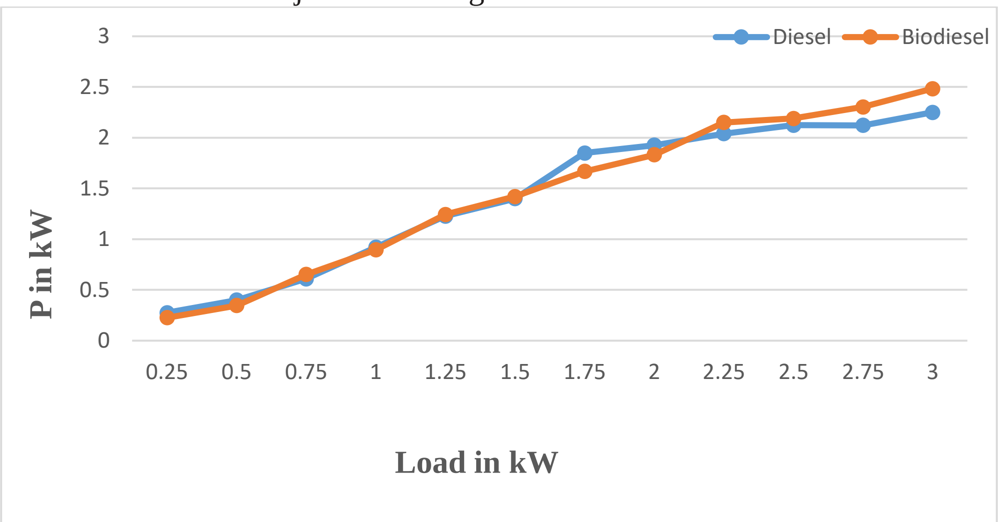

Figure 3 Graph between break power and load

4.2.1.2 Specific Fuel Consumption

Normal Pressure and Advanced Injection Timing

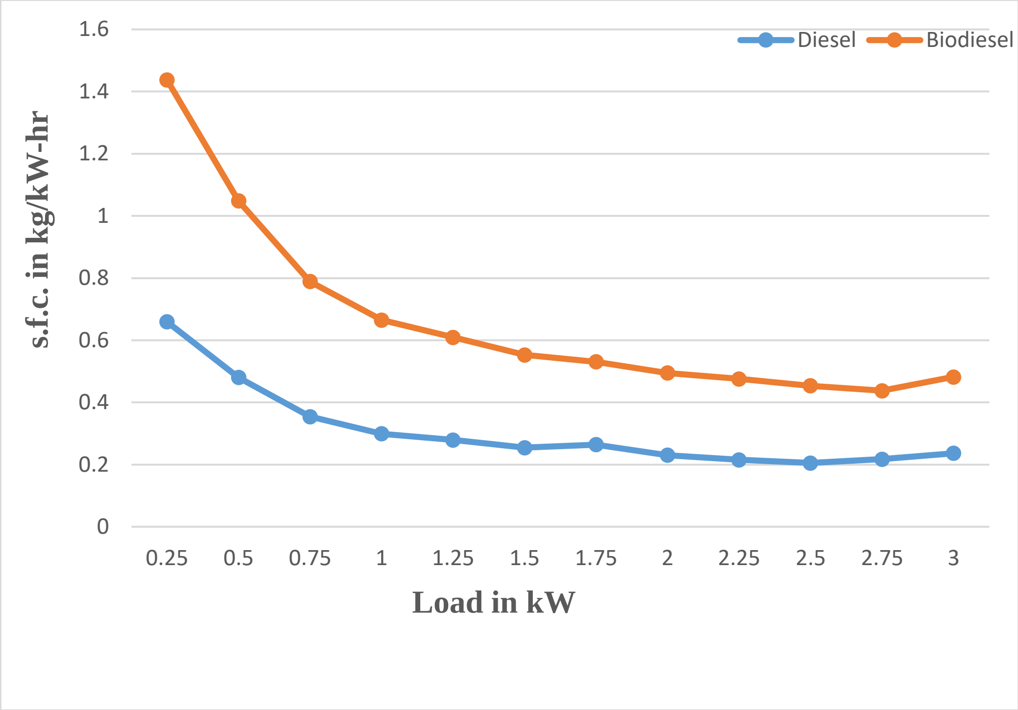

Figure 4 Graph between s.f.c. and load

4.2.1.3 Exhaust Gas Temperature

Normal Pressure and Advanced Injection Timing

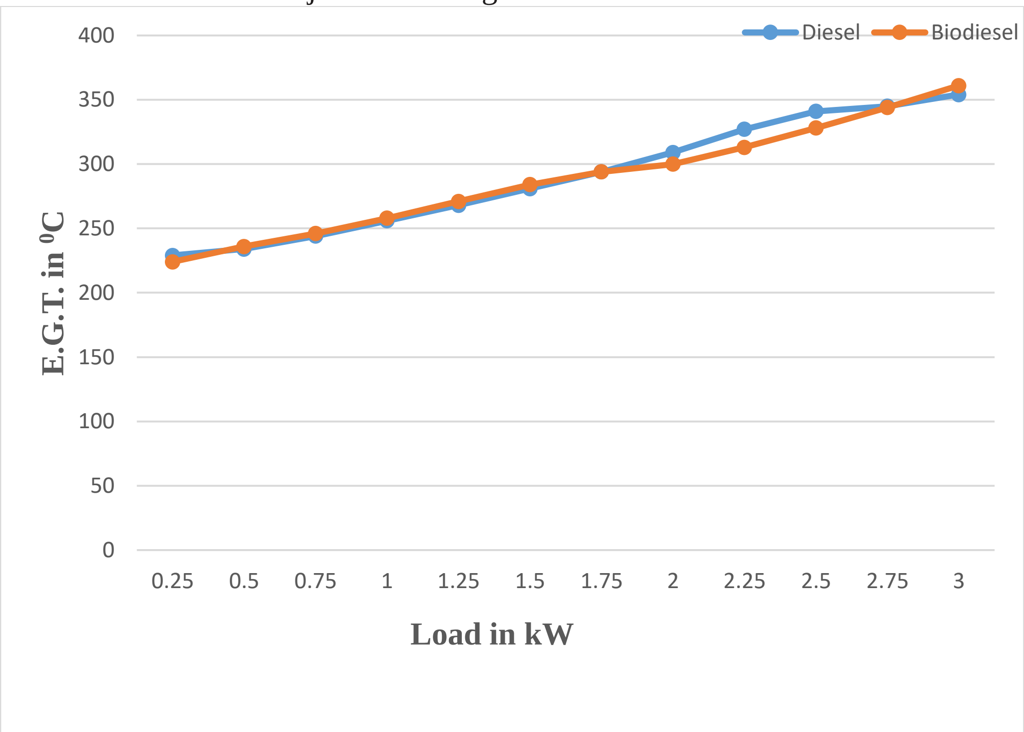

Figure 5 Graph between temperature and load

4.2.1.4 Thermal Efficiency

Normal Pressure and Advanced Injection Timing

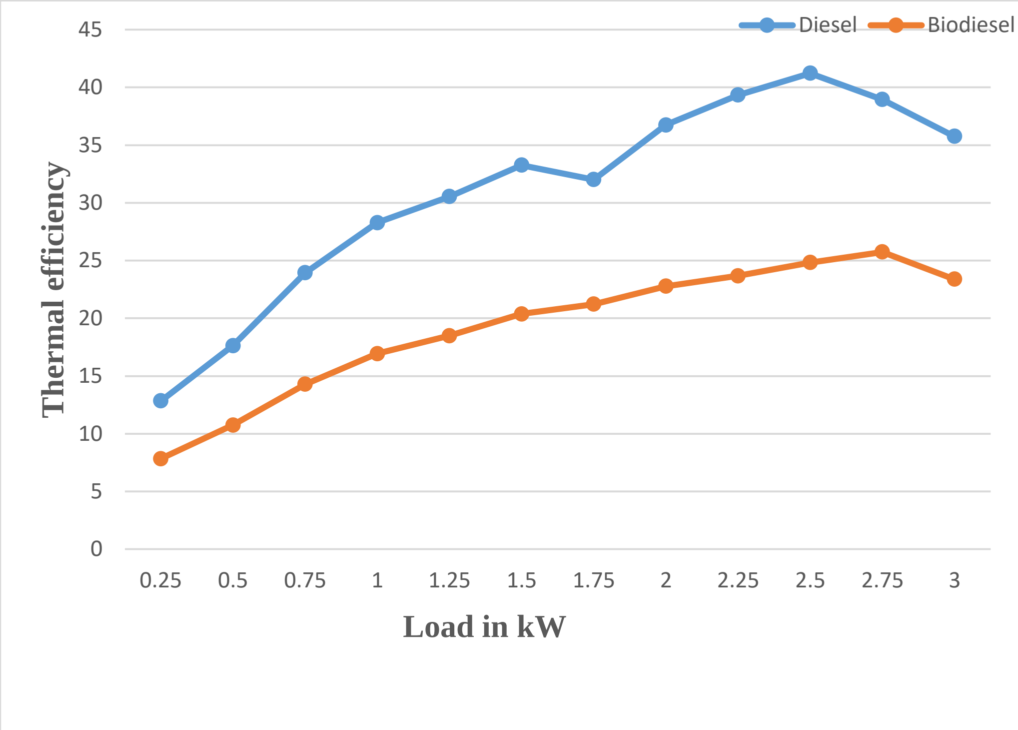

Figure6 Graph between thermal efficiency and load

5. Conclusions

Measurements are made of fuel consumption, exhaust gas temperature, engine load, and engine speed. The experiment's findings can be summarised as follows.

- Outcomes confirm that when the fuel is charged with biodiesel, the engine's performance are alike with petroleum diesel.
- At advance injection timing and normal injection pressure the thermal efficiency of engine enhanced.
- There was slight increase in the broken power of the engine under advance pressure.
- When the engine fueled the biodiesel, it would take time to get a steady state.
- Exhaust gas temperature (EGT) enhanced when the engine fuels the biodiesel.
- In the blends, B20 and B50 produced low CO emissions, compared to Diesel, in B50 a decrease of 34.21% compared to the maximum recorded diesel.

According to recent test results, biodiesel can be used in existing diesel engines with injection time and pressure adjustments. A reliable, engine-friendly, and environmentally responsible substitute for diesel oil is biodiesel fuel. from the social economy's vantage point. The usage of biodiesel as a partial diesel alternative can boost farmers' income. Additionally, this will aid in removing the uncertainties surrounding fuel supplies.

List of Abbreviations

S. No.	Abbreviations	Expanded Form
1.	B00	0% Biodiesel and 100% Diesel
2.	B10	10% Biodiesel and 90% Diesel
3.	B20	20% Biodiesel and 80% Diesel
4.	B30	30% Biodiesel and 70% Diesel
5.	B40	40% Biodiesel and 60% Diesel

6.	B50	50% Biodiesel and 50% Diesel
7.	B60	60% Biodiesel and 40% Diesel
8.	B70	70% Biodiesel and 30% Diesel
9.	B80	80% Biodiesel and 20% Diesel
10.	B90	90% Biodiesel and 10% Diesel
11.	B100	100 % Biodiesel and 0% Diesel
12.	I.E.A.	International Energy Agency
13.	I.C.	Internal Combustion
14.	C.I.	Compression Ignition
15.	I.P.	Indicated Power
16.	B.P.	Brake Power
17.	F.P.	Friction Power
18.	E.P.A.	Environment Protection Agency
19.	E.G.T.	Exhaust Gas Temperature
20.	G.C.V.	Gross Calorific Value
21.	s.f.c.	Specific Fuel Consumption
22.	m_f	Mass of Fuel Consumption
23.	ŋbth	Brake Thermal Efficiency
24.	ŋg	Efficiency of Generator
25.	I	Current
26.	A	Ampere
27.	V	Voltage
28.	ρ	Density
29.	ν	Viscosity
30.	η	Efficiency
31.	US	United State
32.	MT	Million Tonnes
33.	R/P	Reserves to Production
34.	EUR	Estimated Ultimately Recoverable
35.	PPAC	Petroleum Planning and Analysis Cell
36.	NC	Nonconventional
37.	R	Volumetric Ratio
38.	AOCS	American Oil Chemist's Society
39.	ASTD	American Society for Training & Development
40.	NBBSW	National Biodiesel Board's Standards and Warranties
41.	ASTM	American Society for Testing and Material
42.	FFA	Free Fatty Acid
43.	FAME	Fatty Acid Methyl Ester
44.	PPM	Part Per Million
45.	IDI	Indirect Injection
46.	TDC	Top Dead Centre
47.	HC	Hydrocarbon
48.	UNHC	Unburned Hydrocarbon
49.	t_f	Time for Fuel Consumption
50.	CO_X	Carbon Oxides
51.	O_3	Ozone
52.	CFCs	Chlorofluorocarbons
53.	NO_X	Nitrogen Oxides

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