ENGINE PERFORMANCE FOR B20 BLEND ON ADVANCEMENT OF INJECTION TIMING & INJECTION PRESSURE

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Abstract – This dissertation presents the optimization of injection timing and injection pressure of CI engine. By modifying the two engine parameters (injection timing & injection pressure) the engine performance has been determined. The several charts have been plotted between engine Load and various engine performance parameters such as B.P, I.P, & S.F.C.

By advancing and retarding the injection timing of fuel and by increasing and decreasing the injection pressure various data have been obtained. By observing all data obtained by the engine modification, an optimize situation injection timing and injection pressure has been set

1. INTRODUCTION

Energy Crisis

The energy crisis is a situation in which the nation suffers from a disruption of energy supplies accompanied by rapidly increasing energy cost that threatens economic and national security. The threat to economic security is represented by the possibility of declining economic growth, increasing inflation, rising unemployment, and losing billions of dollars in investment. The threat to national security is represented by the inability of the US government to exercise various policy options especially in regard to countries with substantial oil reserves. For example, the recent disruption of Venezuelan oil supplies may limit the US policy options towards Iraq.

Looking at the two energy crisis of 1973 and 1979, we find some common elements between the two. Both events:-

1. Started with political turmoil in some of the oil producing countries.
2. Were associated with low oil stocks.
3. Were associated with high import concentration from a small number of suppliers.
4. Were associated in declining US petroleum products.
5. Were associated with high dependency on oil imports.
6. Were associated with low level of oil industry spending.
7. Led to speculation.
8. Caused an economic downturn.
9. Limited US policy options in the Middle East.

The IEA (International Energy Agency) projects at least a 50% increase in demand by 2030. The growth in consumption was 3% in 2011, but yearly increase of only 1.6% would lead to a 51% growth in consumption by 2030. China and India are both rapidly increasing their consumption of oil. The supply is not sufficient to meet the demand and the continuous increase in global prices of crude petroleum is affecting the economy of a lot of countries.

EXPERIMENTAL SETUP -

Generator Specification

EFFICIENCY	:	40%
SPEED	:	1500 rpm
NO. OF CYLINDER	:	1
TYPE OF IGNITION	:	COMPRESSION
IGNITION METHOD OF LOADING	:	ELECTRICAL
LOADING METHOD OF STARTING	:	CRANK START

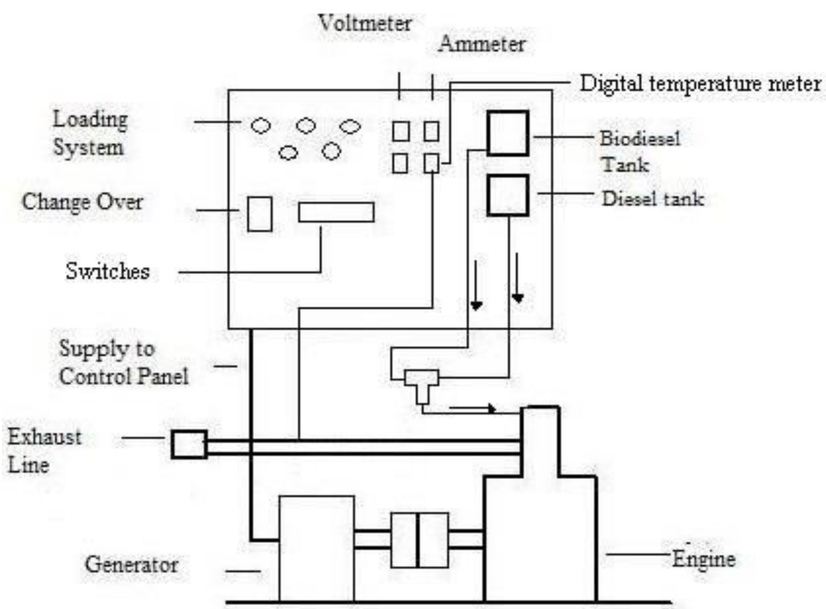

Figure.3 (Schematic diagram of experimental setup)

LOADING SYSTEM

The test rig is coupled to D.C. compound generator and loaded by electric bulb. The fuel supplied from main fuel tank through a measuring jar. To measure the fuel consumption of the engine fill the jar by opening the cock marked tank into the manifold block, by starting a stop clock measure the time taken to consume 40ml of fuel.

B.P. = $(V*I)/(\eta g*1000)$ kW V= Voltage in volt
I= Current in amp.
ηg = Efficiency of generator

Fuel Measurement

The fuel supplied from the main fuel tank through a measuring burette with 3 way manifold system. To measure the fuel consumption of the engine fill the burette by opening the cork Marked "tank" in the manifold block, by starting a stop clock measure the time taken to consume 10 ml of fuel.

Mass of fuel (m_f) = (10*density of fuel*3600)/ (1000*time) Kg\hr Density of

diesel = 838 Kg\m' Density of biodiesel = 865 Kg\m3

Formulae Used

Brake power (B.P.)	= (V*I) / (ηg *1000) kW
Mass of fuel consumed (m_f)	= (10*ρ*3600) / (tf*1000) kg/hr.
Specific fuel consumption (s.f.c.)	= mf / B.P. kg/kW-hr
Brake thermal efficiency (ηbth)	= (B.P*3600*100) / (m_f*c.v.) %
Gross calorific value (G.C.V.)	= w*(t_2-t_1) / (wt. of fuel in gm.) cal/gm

Figure. 4 (Experimental setup)

RESULTS

FOR HIGH PRESSURE AND ADVANCE TIMINGS (DIESEL)

Load(kW)	RPM	V(volt)	I(amp.)	t_f(sec)
0.5	724	203	1.7	39.75
1.0	720	212	3.6	31.73
1.5	709	219	5.7	23.06
2.0	685	216	7.5	19.96
2.5	670	206	9.5	15.43
3.0	641	190	13.2	11.05

Table-1

FOR BIODIESEL

Load(kW)	RPM	V(volt)	I(amp.)	t_f(sec)
0.5	723	202	`1.8	31.46
1.0	718	214	3.6	30.81
1.5	710	222	5.7	26.09
2.0	690	214	7.5	21.18
2.5	685	210	9.7	19.57
3.0	670	198	11.8	16.78

Table-2

CALCULATIONS

1. Brake power

B.P = (V*I) / (ηg*1000) kW

B.P. at 0.5 kW load = (218*2.7) / (0.4*1000) kW

= 0.7857 kW

Similarly,

B.P. at 1 kW load = 0.8880 kW

B.P. at 1.5 kW load = 1.3658 kW

B.P. at 2.0 kW load = 1.8522 kW

B.P. at 2.5 kW load = 2.3235 kW

B.P. at 3.0 kW load = 2.5952 kW

2. Mass fuel consumption

$m_f = (10*\rho*3600) / (tf*1000)$ kg/hr

m_f at 0.5 kW load = (10*0.838*3600) / (73.3459*1000) kg/hr

= 0.41151 kg/hr

Similarly,

m_f at 1.0 kW load = 0.45596 kg/hr m_f at 1.5 kW load = 0.60227 kg/hr
m_f at 2.0 kW load = 0.72719 kg/hr m_f at 2.5 kW load = 0.951947 kg/hr
m_f at 3.0 kW load = 1.22257 kg/hr

3. Specific fuel consumption

s.f.c. = (m_f) / (B.P.) Kg/kW-hr

s.f.c. at 0.5 kW load = (0.41131)/(0.735) Kg/kW-hr

= 0.5996 Kg/kW-hr

Similarly,

s.f.c. at 1.0 kW load = 0.5253 Kg/kW-hr

s.f.c. at 1.5 kW load = 0.4400 Kg/KW-hr

s.f.c. at 2.0 kW load = 0.3926 Kg/KW-hr

4. Mass fuel consumption

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s.f.c. at 2.5 kW load = 0.4090 Kg/KW-hr

s.f.c. at 3.0 kW load = 0.4814 Kg/KW-hr

7. Brake Thermal Efficiency

ηbth = (B.P*3600*100) / (m_f*c.v.) %

ηbth at 0.5 kW load = (0.7357*3600*100) /(0.4113*38545)

= 15.70 %

Similarly,

ηbth at 1.0 kW load = 18.78 % ηbth at 1.5 kW load = 21.52 % ηbth at 2.0 kW load = 23.90 % ηbth at 2.5 kW load = 22.13 % ηbth at 3.0 kW load = 19.8 %

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Advanced Injection timing and High pressure

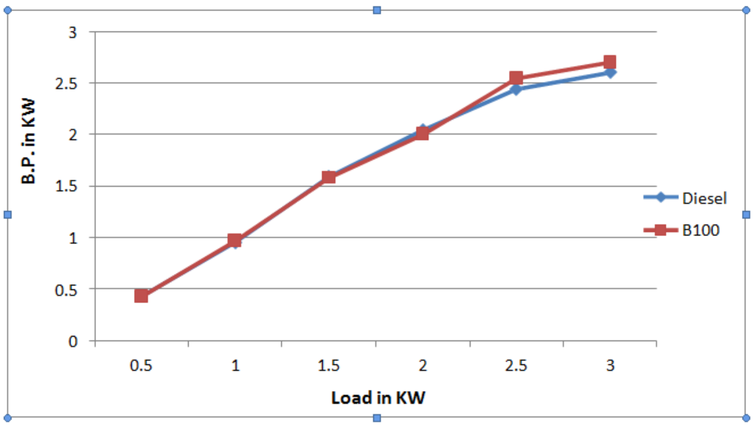

Figure 8 Graph between break power and load.

CONCLUSIONS

Experimental trials are conducted to evaluate the performance of biodiesels compared to diesel on single cylinder, water cooled, and C.I. engine. The measurements of engine speeds, engine loads, exhaust gas temperatures and fuel consumptions are taken. The result from the test can be summarizing as follows.

- At normal injection timing and high pressure the B.P power of engine is almost same for both cases.
- At advance injection timing and normal pressure the B.P power of engine is almost same for both cases.
- At advance injection timing and high pressure the B.P power of the engine is almost same for both cases.
- At normal injection timing and high pressure the specific fuel consumption is almost same for both cases.
- At advance injection timing and normal pressure the specific fuel consumption is almost same for both cases.
- At advance injection timing and high pressure the specific fuel consumption is almost same for both cases.
- At advance injection timing and high pressure the E.G.T of engine is almost same for both cases

- At advance injection timing and high pressure the thermal efficiency of engine is smooth and same for both cases.

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