BIODIESEL PRODUCTION FROM ANIMAL WASTE FAT OIL AND ANALYSIS ON FOUR STROKE FOUR CYLINDER DIESEL ENGINE

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ABSTRACT: **World energy demand is expected to increase due to the expanding urbanization, better living standards and increasing population. At a time when society is becoming increasingly aware of the declining reserves of fossil fuels beside the environmental concerns, it has become apparent that biodiesel is destined to make a substantial contribution to the future energy demands of the domestic and industrial economies, so objective of this model is saving of conventional fuel and find out alternate fuel better fuel to reduce polluted emission from vehicles.**
Survey of the research paper for reduce the conventional fuel use in such polluted world and use biodiesel in place of that which is made up of non-edible oils plants and animal waste fats. The Animal fat oil used as a biodiesel and its production from waste animal fat oil by transesterification process .Without modification done in existing four stock four cylinder. Blend different ratio of biodiesel with diesel and also added ethanol as additives. Base reading of pure diesel, B25 with 75 biodiesel, B50 with 50% diesel, B25 with 10% of Ethanol and 65% of diesel in it, B100 for experiment purpose. For doing work on biodiesel fuel production and its performance in four stroke four cylinder diesel engine for better emission from engine.

Keywords: **Biodiesel, Diesel engine, Animal fat, Waste frying oil.**

INTRODUCTION:

In an internal combustion engine mixture of combustible gases an air takes place, if lighter liquid fuel in present known as petrol engine. And when heavier liquid fuel is used that is known as oil compression ignition or diesel engine. In an internal combustion engine overall efficiency is high as compare to External combustion engine. Initial cost is also lower as compare to External combustion engine, less space is required in Internal Combustion, where large space is required for External combustion engine. But in an External combustion of fuel we can use cheaper fuel as combustion, even solid fuel can be used, Due to fuel some additional equipment is used to start the engine.
Biodiesel is a renewable and alternative fuel used in diesel engine in little modification. Biodiesel environmentally friendly fuel, some low cost like waste oil cooking oil, animals fats are used to produce biodiesel. Due to increase in urbanization world energy demand is also increases. Our population also increases by looking all present problem biodiesel will be more demandable in future. Cooking oil is also good and can be available at very cheap cost after used of oil it will be poisonous for health so we can use this and our main purpose is to use non edible oil as compare to edible oil.

Production Process of Animal Fat Biodiesel:
The biodiesel from animal waste fat is taken out by the transesterification process, In which fat oil is called as triglyceride which is shown above figure that will be react with methanol in presents of catalyst we will get glycerol and methyl ester which is also called biodiesel. The catalyst in this reaction is for help the reaction it is not take part in reaction.
Take the waste animal fat from the butcher house about 5 kg , then collect in a open container heat it about 60°-70° C . After some hour the oil from the fat get separated and we should collect the oil in different container and at the last we will get half of oil as compare to fat. It will be look like figure shown below having white thick like ghee appearance after cooling of several hours.

Fig 1-Animal Fat Oil

After collecting that fat oil in beaker we have to heat it on Magnetic stirrer with hot plate about 80°-90° C for 1 hour, in such process all the moisture present in oil vapour up and we will get oil with no moisture container. Due to magnetic stirrer the solution will be continues mixing and provide uniform heating in beaker, The speed & the heat of stirrer we can control by given switch given there. After all the moisture removed from the oil we will get fine yellow colour oil which we can see below.

Fig 2- Heating On Magnetic Stirrer.

As it cool at 60° C we have to add methanol and potassium hydroxide in 20% & 3%, shake it for 4-5 minutes and place it in separating funnel and fixed it on stand and let it be separated for 24 hour after we will get two product from it one is glycerine and biodiesel take a biodiesel in separate container. In such a we will get pure bio diesel from the animal fat oil.

Fig 3-Biodiesel From Animal Fat

Table 1- comparison of different fuel property

SR. NO	Tested Parameter	Diesel	Biodiesel	B 25	B 50
1	Calorific Value(kcal/kg)	9978	8854	97052	9382
2	Kinematic Viscosity(cSt)	2.4	4098	2.97	3.88
3	Density @ 25° C(g/cc)	0.828	0.866	0.824	0.843
4	Ash Contain(w/w)	0.002	0.002	0.003%	0.003
5	Sulphur Contain(w/w)	0.002	0.002	0.004%	0.004
6	Flash Point (°C)	62	150	80	88
7	Water contain(w/w)	0.008	0.04	0.02%	0.02

Experiment Set Up:

Fig 4-Experiment Setup

Table 2: Engine Specification

Model	Tata 407
Type	High speed, water cooled, naturally aspirated, high pressure direct injection diesel engine with dry line.
No. of cylinder	4 in line
Bore(mm)	97
Stroke(mm)	100
Capacity(cc)	2956
Compression Ratio	17.1
Power(HP)	50(37.50 kw)
Idling speed(rpm)	600
Max. Operating speed(rpm)	3000
Engine Torque(Nm)	135 at 2500 rpm
Air filter	Oil bath type
Oil filter	Full flow paper type
Fuel filter	Single stage filtration
Fuel injection pump	Inline type
Fuel injection begins	15 degree BTDS

The experimental was carried out on four cylinder four stroke water cooled diesel engine with a bore 97 mm and stroke 100 mm. the engine is rated for 1500 rpm with a centrifugal governor to control the speed. The engine was connected with a electric dynamometer is used to measure the power output. The engine is instrumented to measure the parameter like fuel consumption, load speed of engine, cooling water temperature, inlet air and exhaust gas temperature.

The engine is four stroke engine four cylinder direct inject engine with a swept volume of 2956 cc. A kirloskar brand electrical dynamometer was used for engine loading. The setup has stand- alone type independent panel box consisting of air tank, fuel tank, manometer fuel measuring unit. Engine jacket cooling water inlet, outlet and calorimeter temperature is displaced on temperature indicator. Flow meter are provided for cooling water and calorimeter flow measurement.

Experimental Result

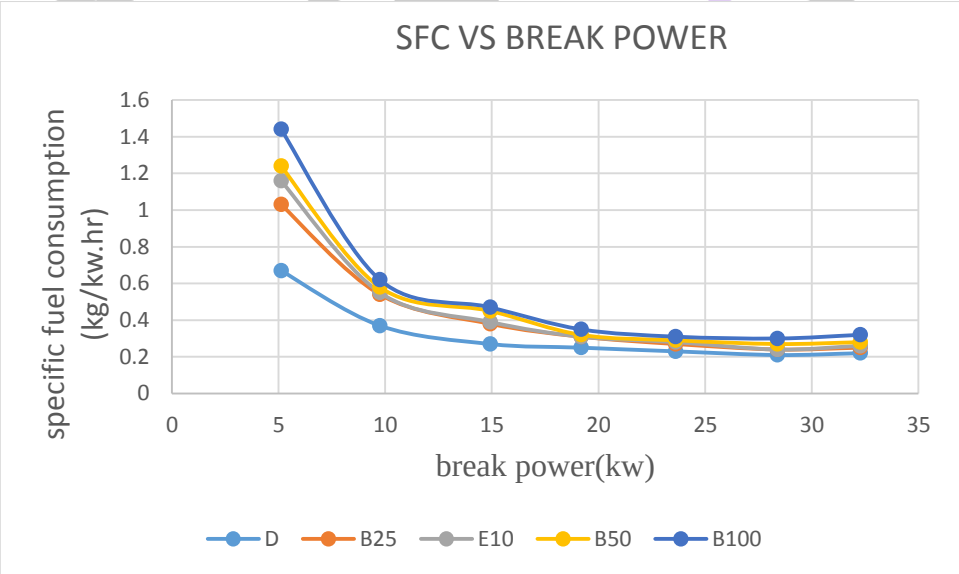

Fig 5- Specific Fuel Consumption Vs Brake Power

- Above graph is specific fuel consumption vs break power , In which for per KW power needed specific fuel which is higher in B25 , And as break power increases its SFC decreases in all cases. And in B100 it is highest specific fuel consumption.

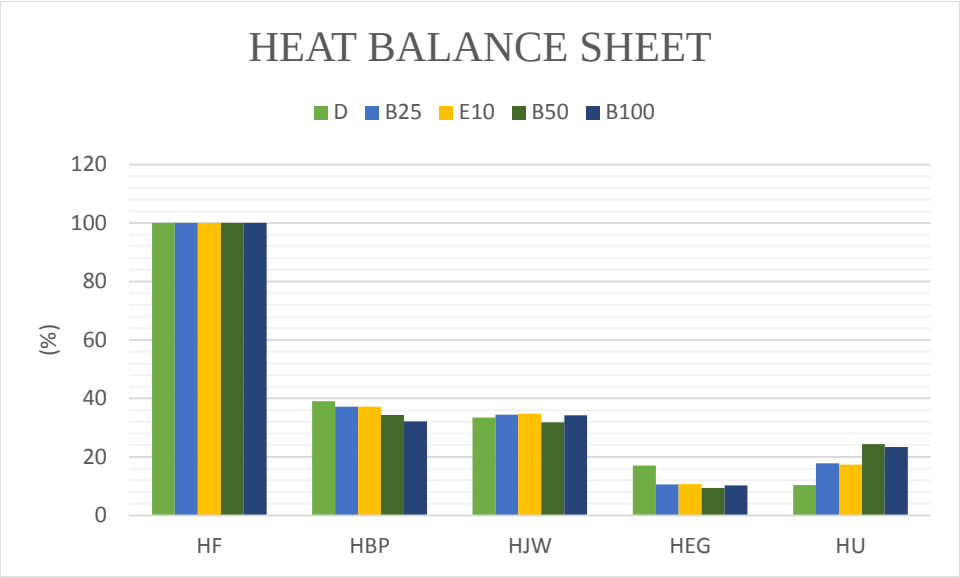

Fig 6- Heat balance Sheet Of Diesel &B 25

- The above graph is heat balance sheet for diesel and B25 , which is 100% at the starting then decrease nearer to 20%. Where red indicate B25 and blue indicate diesel. Heat equivalent to brake power is more as compare to heat carried by jacket cooling water for heat carried by exhaust gas is more less well in last other losses is higher then heat carried by exhaust gas.

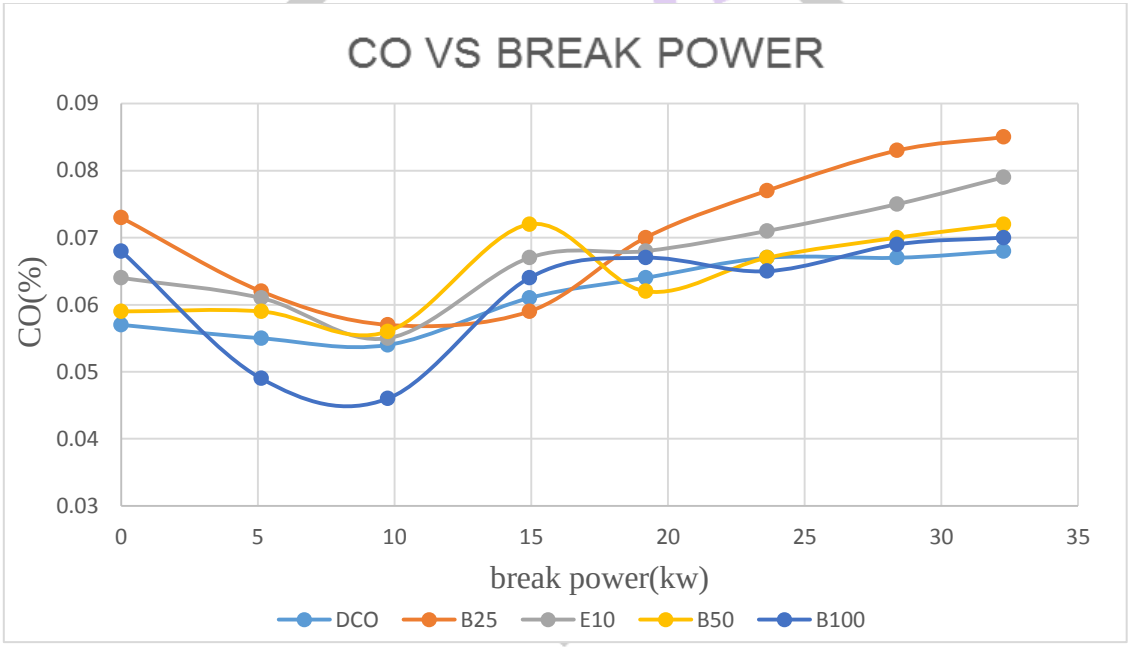

Fig 7- Co Vs Brake Power

- In above graph produced due to incomplete combustion of fuel in engine, diesel and biodiesel is most common both are slightly increases but co in B25 at ending shows more increase in graph. As the break power increases the co and B100 shows slightly less as compare diesel fuel.

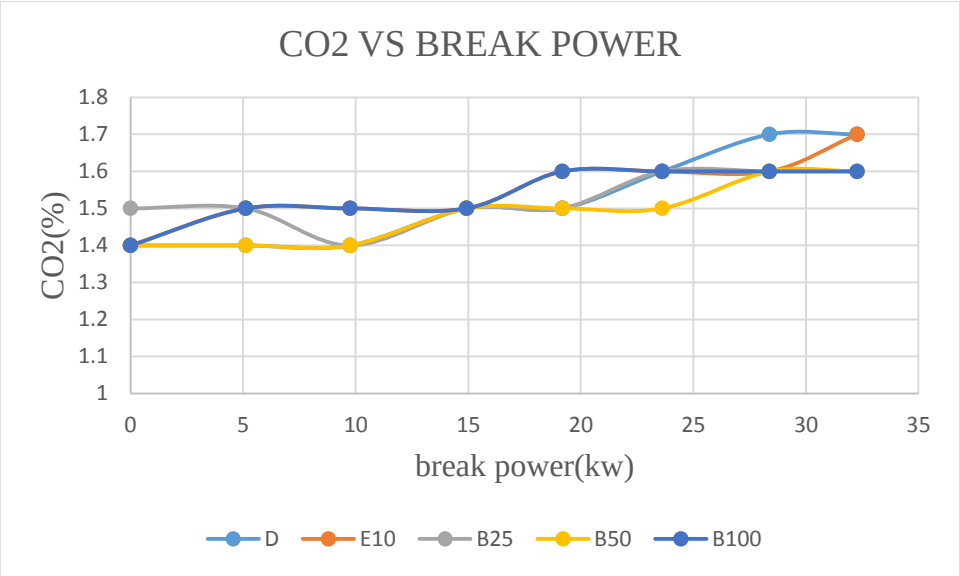

Fig 8- C02 Vs Brake Power

- The carbon dioxide increases in blended biodiesel due to complete combustion in engine and graph in continuous increases, that's due to more present of carbon particle in biodiesel. All the graph is increases as at initial B25 is high and at end diesel is high.

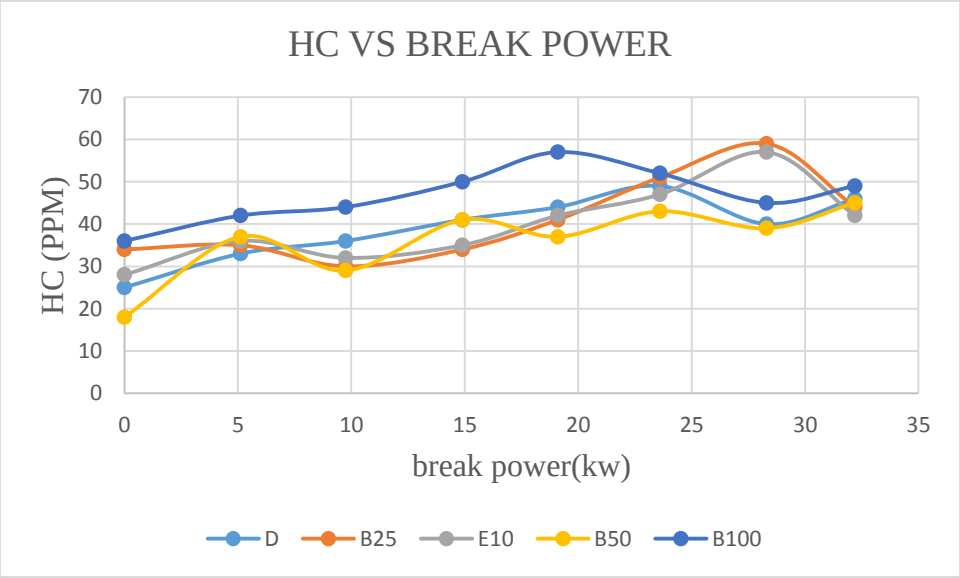

Fig 9- Hc Vs Brake Power

- In above graph it is hydrocarbon vs break power, Where B25 little bit nearer to diesel graph. All the graph shows continues increases as the break power increases but B100 shows more .Hc form due to non- complete combustion.

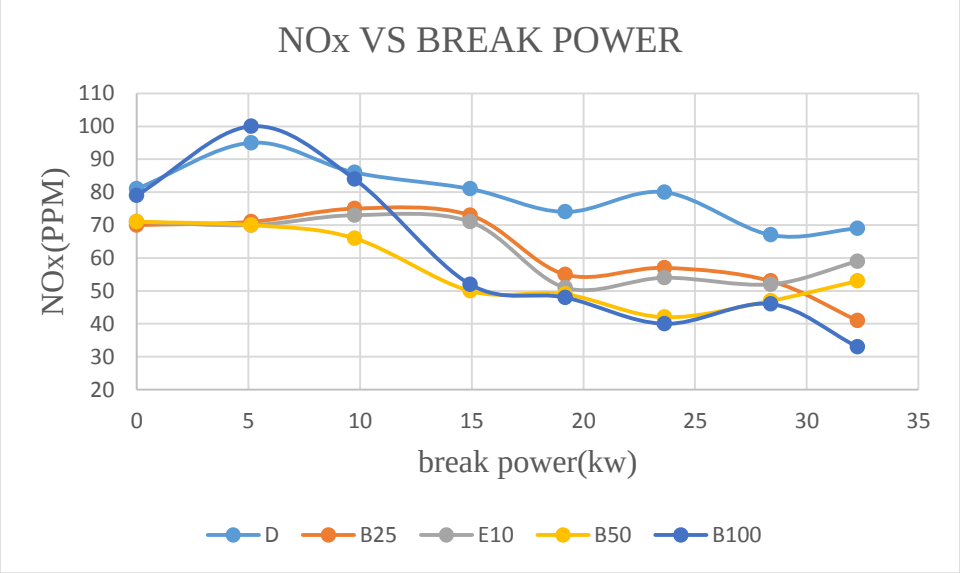

Fig 10- NOx Vs Brake Power

- The above graph is NOx vs break power where at starting shows high as compare to diesel and B100 all performance are down, As the break power increases the NOx production decreases. B100 graph is high due to oxygen contain in biodiesel and also have high temperature.

Conclusion:

Biodiesel fuel has been reported to provide a lot of potentials than fossil fuel for instance better quality gas exhaust generation which can lead to reduction in global warming effects and environmental hazards. The performance parameters of biodiesel proved to surpass that of diesel fuel and its application requires no engine modification. B25 reduce maximum exhaust emission as compare to diesel with slide decrease in engine performance, but increase in emission performance as we blend biodiesel with diesel at different ratio. Specific fuel consumption of different blend fuel is more as compare to conventional fuel, HC, NOx decreases as resultant, in CO B100 is low and all are high as compare to other.

So it conclude that performance of biodiesel is slide decrease but give good result in exhaust emission, And saving of conventional fuel.

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