International Journal of Recent Trends in Engineering & Research
ISSN (ONLINE) : 2455 – 1457
IMPACT FACTOR : 4.101

ICNSCET19- International Conference on New Scientific Creations in Engineering and Technology

# Bio Fuel Preparation from Waste Refined Oil and Analysis in Diesel Engine

**P. Deivajothi[1], P.P.Govindaraju[2] and S.Sivaprakasam[3]**
[1]Department of Mechanical Engineering, Annamalai University
[2] Department of Mechanical Engineering, Government Polytechnic College Krishnagiri
[3] Department of Mechanical Engineering, Annamalai University

**Abstract—** Bio-fuel generation gives an option non-petroleum product without the need to upgrade current engineTechnology. This examination exhibits a test examination concerning the impacts of utilizing biodiesel kiloskar TV1 diesel engine execution and its exhaust. The biodiesel fills were delivered from Waste Refined oil utilizing the warm splitting procedure at that point tried on a relentless state motor test rig utilizing a 4 four chamber CI (pressure start) engine. It very well may be decline hurtful gas exhaust fundamentally while keeping up comparative execution yield and productivity. Generation advancement was accomplished with response time, response temperature, and rate of blending to boost biofuel yield. The present work is replacing conventional diesel fuel by thermal cracking from waste refined oil. The waste refined oil was prepared by thermal cracking process and blended with diesel fuel in proportions of B25, B50, B75 and B100. Performance combustion and emission were conducted on a single cylinder DI diesel engine the experimental result proved that the biodiesel blends increased brake thermal efficiency slightly increased and equal to that of the top sole fuel the emission test found that smoke slightly increased but NOx decreased significantly.

**Keywords—** Biodiesel, Diesel Engine, Emission, Vegetable oil,

## I. INTRODUCTION

The present vitality situation has invigorated dynamic research enthusiasm for non-oil, inexhaustible, and non-contaminating fuel. The world stores of essential vitality and crude materials are, clearly, restricted. As indicated by a gauge, the stores will keep going for a long time for coal, 41 years for oil, and 63 years for natural gas, under a nothing new situation. The gigantic development of total populace, expanded specialized advancement and way of life in the modern countries has prompted this multifaceted circumstance in the field for vitality supply the interest. The costs of raw petroleum continue rising and fluctuating regularly. The unrefined petroleum costs are at close record levels and are balancing out at about per barrel now. This likely could be the primary explanation for the developing mindfulness and enthusiasm for unusual bio vitality sources and fuel in different creating nations, which are endeavoring hard to counterbalance oil imposing business model.

Oil based goods have dependably been the favored transportation fills since they offer the best mix of vitality content, execution, accessibility, simplicity of dealing with and cost. Be that as it may, the ongoing increment in the cost of oil has provoked the business to see elective fills. National worries about vitality security, constant accessibility of oil, the 'top oil' banter, are exceedingly essential issues. Other than cost, when we talk about elective powers, the components we should

mull over are, sheltered and solid tasks of the motor, natural impacts, outflows from the motor and furthermore life-cycle impacts related with the creation and utilization of an elective fuel.

Diesel engine is imperative in the present current life. Be that as it may, they added to the barometrical contamination generously. An answer for lessening the ecological contamination and vitality deficiency can be imagined by a change in outlook from non-renewable energy source to sustainable power sources. Vegetable oil can be an essential option in contrast to diesel oil, since they are sustainable and can be mass-delivered effectively in provincial regions. The designer of diesel motor Rudolf diesel certainly had anticipated that the plant based oils world by broadly used to work diesel engine.

## II. EXPERIMENTAL SETUP

The test engine details are mention in Table 1. Fuel stream rate is acquired on the gravimetric premise. NOx is estimated with assistance of a gas analyzer. AVL smoke meter is utilized to quantify the smoke. AVL five-gas analyzer is utilized to gauge whatever is left of the exhaust gas. AVL combustion analyser is utilized to quantify the burning normal for the engine. A burette is utilized to gauge the fuel utilization for a predetermined time interim. Amid this interim of time, how much fuel the engine expends is estimated, with the assistance of the stopwatch. The test set up is demonstrated in figure 1. At that point the fuel utilization, EGT and Emission of NOx and smoke was estimated.

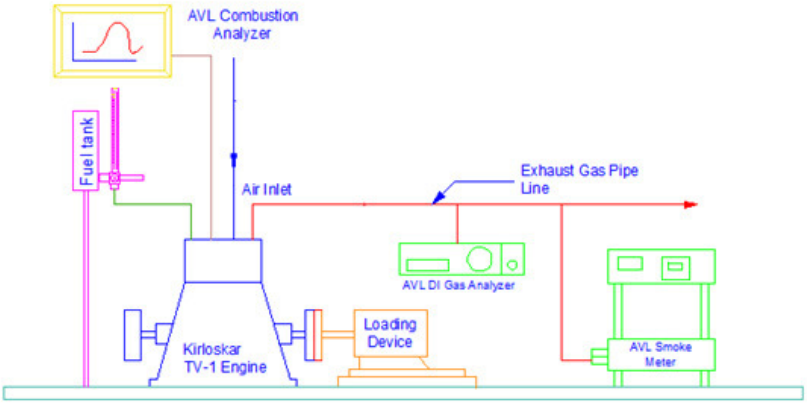



Figure 1 Experimental setup

Table 1 Specification of the Engine

| | | |
|---|---|---|
| Number of cylinder | : | One |
| Bore | : | 87.5 mm |
| Type | : | Vertical, Water cooled, Four stroke |
| Compression ratio | : | 17.5:1 |
| Stroke | : | 110 mm |
| Speed | : | 1500 rev/min |
| Maximum power | : | 5.2 kW |
| Injection timing | : | 23° before TDC |
| Dynamometer | : | Eddy current |
| Injection pressure | : | 220 $kgf/cm^2$ |

## III. RESULT AND DISCUSSION

### 3.1 PERFORMANCE PARAMETER

Figure 2 shows that the SFC with respect to brake power. It is seen that all blends of cracking oil shows higher specific fuel consumption that sole fuel of the engine. It is due to more viscosity and unfortunate volatility of the biodiesel as obtained in deprived spray and mixture structure and increases in fuel consumption B50 blend shows the minimum specific fuel consumption than other blends of biodiesel.

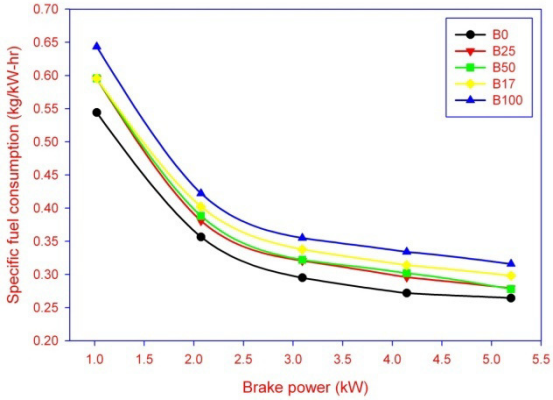



Fig 2 Specific fuel consumption against brake power

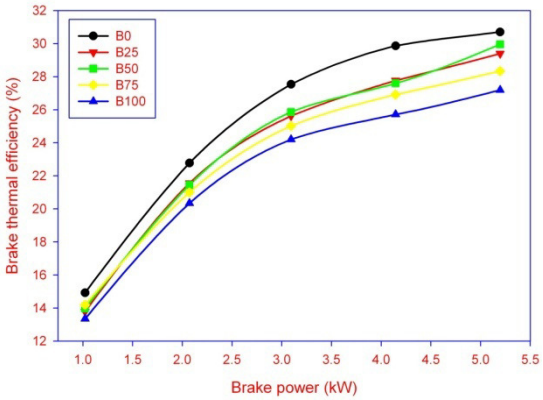



Fig 3 Brake thermal efficiency against brake power

Figure 3 shows that the brake thermal efficiency with respect to brake power of the engine. It is seen that all blends of biodiesel blend shows lower brake thermal efficiency when compared to sole fuel B25 and B50 biodiesel shows 29% brake thermal efficiency at maximum power. It is due to high viscosity of the biodiesel mangos seed oil blends to lower the brake thermal efficiency.

### 3.2 EMISSION PARAMETER

The variations of smoke density for different biodiesel blends is shown in figure 4 smoke density for biodiesel all the cases is increasing when compared to sole fuel B25 blends shows lower smoke density than other blends. The reason is cracking biodiesel having viscosity of sole fuel that leads to incomplete combustion take place during the combustion over maximum brake power of the engine, smoke density for diesel 45 HSU and biodiesel blend 55 HSU.

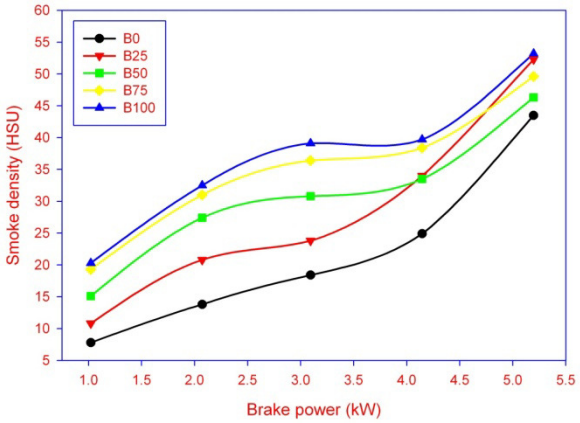



Fig 4 Smoke density against brake power

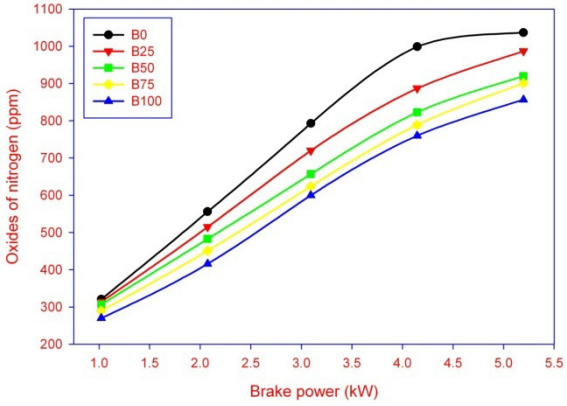


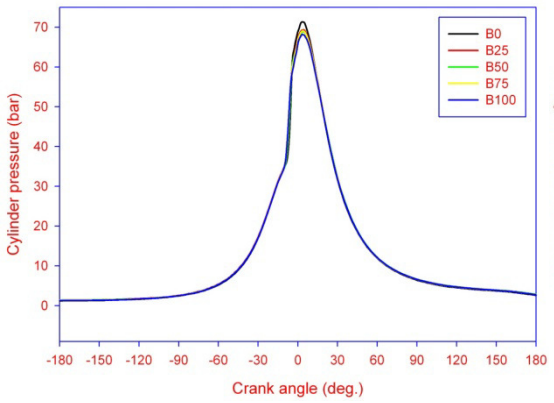

Fig 5 Oxides of nitrogen against brake power

The variety of the NOx discharge is appeared in figure 5 NOx framed because of high pressure temperature and accessibility of oxygen. It is seen that, the perfect biodiesel transmits lower NOx outflow when contrasted with different mixes. The NOx emanation for B100 biodiesel is 810 ppm at most extreme burden it is clear that heat discharge rate is diminishes for the every one of the mixes of the biodiesel squander refined oil. The decrease in NOx outflow with biodiesel squander refined oil is basically connected with the diminished premixed consuming rate following the postpone period.

### 3.3 COMBUSTION PARAMETERS

Figure 6 shows the variation of cylinder pressure with different percentage of biodiesel at maximum brake power of the engine. Thermal cracked vegetable oil results in lower peak pressure as compared to sole fuel. In a diesel engine the chamber weight relies upon the burning rate in the underlying stage which is turn is affected by the measure of fuel partaking in the uncontrolled ignition. The uncontrolled or the premixed burning stage is represented by the postpone period and the shower envelope of the infused fuel. The reason is high viscosity and lower volatility of biodiesel waste refined oil reducing the peak pressure of the engine. The maximum cylinder pressure for sole fuel is 67.69 bar and biodiesel blend is 66 bar.

The variations of heat release rate with biodiesel are shown in figure 7. It is noted that premixed burning rate is more for diesel than biodiesel blend. It can be seen that blends have lower heat release rate than sole fuel. Among the blends of biodiesel B25 has higher heat release rate than other blends. The reason is high viscosity of the biodiesel waste refined oil and reduction of air entrainment and fuel air mixing rate.



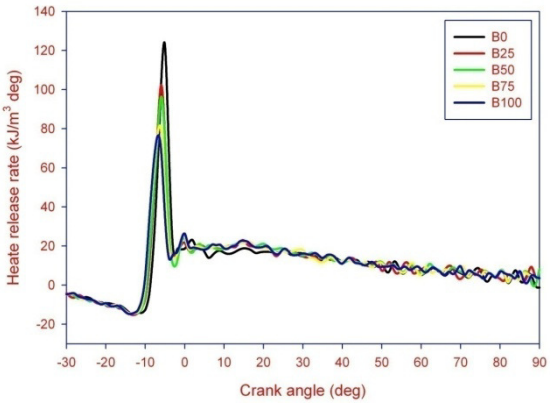




Fig 6 Cylinder pressure against crank angle Fig 7 Heat release rate against crank angle

## IV. CONCLUSION

Based on the experimental investigation following conclusions are arrived.

The brake thermal efficiency of the cracking of waste refined oil is lesser than that of diesel fuel smoke density is marginally higher for the waste refined oil. NOx emission is lower for cracking waste refined oil when compared to sole fuel cylinder pressure is lower for biodiesel. Heat release rate is lower for all the blends of the biodiesel.

- Brake thermal efficiency when compared to sole fuel B25 and B50 biodiesel shows 29%
- B50 blend shows the minimum specific fuel consumption than other blends of biodiesel
- B25 blends shows lower smoke density than other blends
- The NOx emission for B100 biodiesel is 810 ppm at maximum load
- B100 blends shows lower hydrocarbon emission than other blends
- The maximum cylinder pressure for sole fuel is 67.69 bar and biodiesel blend is 66 bar

- Among the blends of biodiesel B25 has higher heat release rate than other blends.

## REFERENCES

[1] Albuquerque, M.C.G., Machado, Y.L., Torres, A.E.B., Azevedo, D.C.S., Cavalcante Jr, C.L., Firmiano, L.R., Parente Jr, E.J.S., "properties of biodiesel oils formulated using different biomass sources and their blends" ,Renew. Energy, 34 , pp.857 – 860 (2009).

[2] Charles, M. B., R. Ryan, N. Ryan, and R. 0loruntoba. 2007. Public policy and biofuels: The way forward, *Energy Policy* 35(11):5737-5746.

[3] Dermirbas, A., "Progress and recent trends in biofuels" , Prog. Energy Combus. Sci., 33, pp. 1 – 18 (2007).

[4] Knothe, G., J. V. Gerpen, and J. krahl. 2005. *The Biodiesel Handbook.* American Oil Chemists' Society Press, Champaign, Illonois.

[5] Le thiHoai Nam, Tran QuangVInh, Nguyen ThiThanh Loan, Van Dinh Son Tho, Xiao-Yu Yang, BaoLian Su," Preparation of bio-fuel by the thermal cracking reaction of vegetable oil sludge", Fuel.90 , 1069-1075(2011).

[6] Matsumoto, N., D. Sano, and M. Elder. 2009. Biofuel initiatives in Japan: Strategies, policies, and future potential. *Applied Energy* 86 (Supplement 1) :S69-S76

[7] Ojha, K.; Pradhan, N.C. and Samanta, A.N., "kinetic of batch alkylation of phenol with tert-butyl alcohol over a catalyst synthesized from coal fly ash", Chem. Eng.J., 112,pp. 109-115 (2005).

[8] Ong, Y.K., Bhatia, S., "The current status and perspective of biofuel production via thermal cracking of edible and non-edible oil", Energy, 35, pp.111 – 119 (2010).

[9] Pristupa, A. 0., A. P. J. Mol, and P. 0osterveer. Stagnating liquid biofuel developments in Russia: Present status andfuture perspectives. *Energy Policy*In Press, Corrected Proof

[10] Vasudevan, P., S. Sharma, and A. Kumar. 2005. Liquid fuel from biomass: An overview. *Journal of scientific and industrial research* 64:822-831.

[11] Zhang, Y., M. A. Dube, D. D. McLean, and M. Kates. 2003. Biodiesel production from waste cooking oil: 1. Process design and technological assessment. *Bioresource Technology* 89(1):1-16.