INVESTIGATION OF VARIOUS CHARACTERISTICS OF NANO PARTICLES AND ITS BLENDS WITH DIESEL FUEL

[1]Prof. Nivedita, [2] Singh Ajaykumar Rajaram, [3]Vishal Kumar Kumhar, [4]Manoj balaso Kapurkar,[5]Gaurav joshi

[1]Guide, [2]Student, [3]Student, [4]Student, [5]Student
Department of Mechanical Engineering,
Alard College of Engineering and Management, Pune, India.

Abstract:- In our present work we will be using the diesel and bio-fuel (karanja) with different metal and metal oxide nano-particles (magnesium oxide, titanium oxide) and carbon nanotubes (SWCNT) to prepare a noval hydrid fuel blends experimental investigation will be carried out on a single cylinder four stroke diesel engine to find the various characteristics like emission, combustion and efficiency the comparative analysis will also be carried out on the data base available after the performance The implementation of nano-particles in various application tremendously rise due to its unique characteristics in enhancing the effectiveness of final products the main purpose of this study is to investigate the effects of adding 50, 100 and 150 ppm carbon nanotubes in biodiesel blend (B10) on the performance, combustion characteristics and emissions of single cylinder diesel engine. 2

Keywords: Single walled carbon nanotube

1. INTRODUCTION

Diesel engine plays a vital role in power generation, transportation, and industrial activities. The main advantages of the diesel engine over the gasoline spark ignition engine include its durability, reduced fuel consumption and lower emission of carbon monoxide and unburned hydrocarbon. Due to higher efficiency, diesel engines are of high interest in light duty vehicles. The transport sectors contribute to environmental pollution largely and out of these pollutants CO is prime pollutant followed by hydrocarbons emission. In India, transport sector emanates an approximate 261 tons of CO_2, of which 94.5% is subscribe by road transport. The transport sector is accountable for 60% staging of greenhouse gases.

2. OBJECTIVES

- To select of the nanoparticles based on availability.
- To use CI engine of Four-stroke which can use diesel as fuel and bio-fuel as additives for the performance test.
- To blend of the Nano-particles in known proportion and making a hybrid fuel. Testing the hybrid fuel. Doing the analysis of the performance, combustion and emission.

To do the comparative test and analysis to find which one is the best hybrid fuel for ci-engine.

3. METHODOLOGY

The methodology used in Investigation of various characteristics of Nano particles and its blends with diesel fuel is as follows:

- Research paper Reading & study the general aspect Of topic Analysis on the solutions available to clean water hyacinth.
- To do the comparative study of various biodiesel Selection of standard parts.
- Selection of bio-fuel & availability of resource.
- Bio-fuel production-trans esterification
- Performance & testing on I.C engine
- Result and conclusion

4. WORKING PROCEDURE

SWCNT

At the first stage we are performed on a single walled carbon nanotubes + diesel + biofuel in the 'Alard College of   Engineering', We created a new fuel called as D80B20SWCNT10.
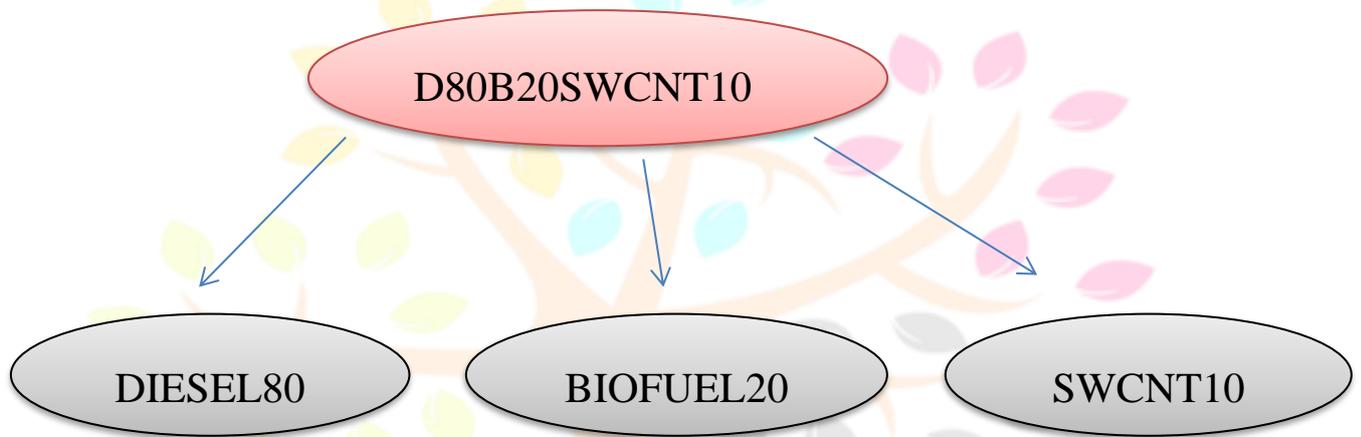

Fig no:- 4.1

5. RESULT AND DISCUSSION

5.1.1 PERFORMANCE PARAMETERS OF DIESEL

SL. No.	Load (kg)	Brake Power B.P (kW)	Indicated Power I.P (kW)	Mechanical Efficiency (%)	Specific Fuel consumption (Kg/kWhr)	Brake Thermal Efficiency (%)	Indicated Thermal efficiency (%)	Pm (KPa)
1	0	0	1.4	0	0	0	31.8	197.9
2	1	0.343	1.743	19.6	1.084	7.52	38.2	246.46
3	2	0.686	2.086	32.88	0.516	15.7	48.0	294.96
4	3	1.03	2.43	42.38	0.366	22.2	52.4	343.60
5	4	1.37	2.77	49.45	0.307	26.5	53.6	391.60

Table no:- 5.1.1

The performance parameter of diesel is absorbed by varying the load condition from 0 to 4 hence (B.P, I.P, η_m, S.F.C, η_{Bth}, $\eta_{I.P}$ and P_m) parameters have changed with change in load.

5.1.2 Performance parameters of B10

SL. No.	Load (Kg)	Brake Power (B.P) kW	Indicated Power (I.P) kW	Mechanical Efficiency (%)	Specific Fuel consumption (Kg/kWhr)	Brake Thermal Efficiency (%)	Indicated Thermal efficiency (%)	Pm (KPa)
1	0	0	2.2	0	0	0	71.19	311.08
2	1	0.343	2.543	13.488	0.86	9.63	71.43	359.58
3	2	0.686	2.886	23.769	0.457	18.105	76.17	408.08
4	3	1.03	3.23	31.888	0.349	23.7	74.338	456.722
5	4	1.37	3.57	38.38	0.29	28.37	73.94	504.798

Table no:- 5.1.2

The performance parameter of B10 is absorbed by varying the load condition from 0 to 4 hence (B.P, I.P, ηm, S.F.C, ηBth, ηI.P, and Pm) parameters have changed with change in load.

5.1.3 Performance parameters of B20

SL. No.	Load (Kg)	Brake Power (B.P) kW	Indicated Power (I.P) kW	Mechanical Efficiency (%)	Specific Fuel consumption (Kg/kWhr)	Brake Thermal Efficiency (%)	Indicated Thermal efficiency (%)	Pm (KPa)
1	0	0	2.25	0	0	0	75.25	318.15
2	1	0.343	2.593	12.21	0.8536	9.85	74.51	366.65
3	2	0.686	2.936	23.37	0.474	17.69	75.55	415.15
4	3	1.03	3.28	31.4	0.355	23.73	75.58	463.79
5	4	1.37	3.62	37.85	0.296	28.42	75.10	511.87

Table no:- 5.1.3

The performance parameter of B20 is absorbed by varying the load condition from 0 to 4 hence (B.P, I.P, ηm, S.F.C, ηBth, ηI.P, and Pm) parameters have changed with change in load.

5.1.4 Performance parameters of B30

SL. No.	Load (Kg)	Brake Power (B.P) kW	Indicated Power (I.P) Kw	Mechanical Efficiency (%)	Specific Fuel consumption (Kg/kWhr)	Brake Thermal Efficiency (%)	Indicated Thermal efficiency (%)	Pm (KPa)
1	0	0	2.3	0	0	0	73.72	325.22
2	1	0.343	2.643	12.98	0.912	9.39	72.41	373.72
3	2	0.686	2.986	22.97	0.523	16.38	71.28	422.22
4	3	1.03	3.33	30.93	0.38	22.459	72.6	470.86
5	4	1.37	3.67	37.33	0.317	27.07	72.53	518.94

The performance parameter of B30 is absorbed by varying the load condition from 0 to 4 hence (B.P, I.P, ηm, S.F.C, ηBth, ηI.P, and Pm) parameters have changed with change in load.

5.1.4 Performance parameters of B40

SL. No.	Load (Kg)	Brake Power (B.P) kW	Indicated Power (I.P) kW	Mechanical Efficiency (%)	Specific Fuel consumption (Kg/kWhr)	Brake Thermal Efficiency (%)	Indicated Thermal efficiency (%)	Pm (KPa)
1	0	0	2.4	0	0	0	81.74	339.36
2	1	0.343	2.743	12.5	0.889	9.805	78.39	387.86
3	2	0.686	3.086	22.23	0.503	17.34	77.988	436.36
4	3	1.03	3.43	30.03	0.375	23.27	77.479	485.0
5	4	1.37	3.77	36.34	0.311	28.04	77.159	533.078

The performance parameter of B40 is absorbed by varying the load condition from 0 to 4 hence (B.P, I.P, ηm, S.F.C, ηBth, ηI.P, and Pm) parameters have changed with change in load.

5.2 GRAPHS

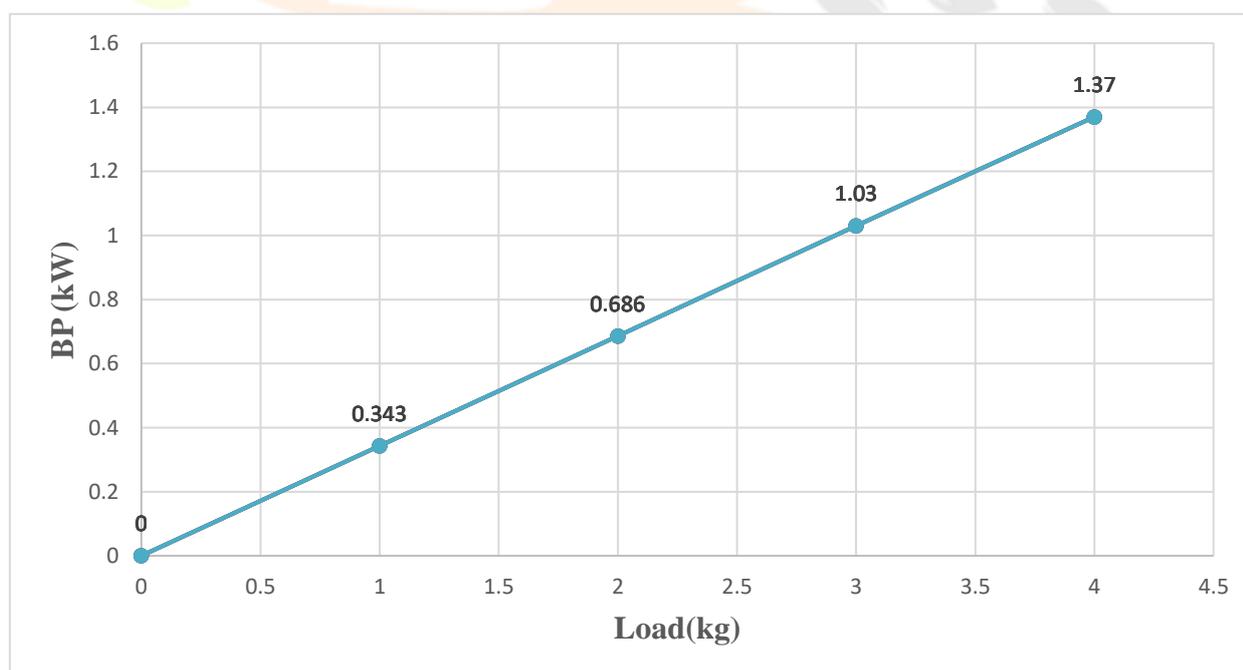### 5.2.1 Break load Vs Break power at various break loads.

Fig no:- 5.2.1

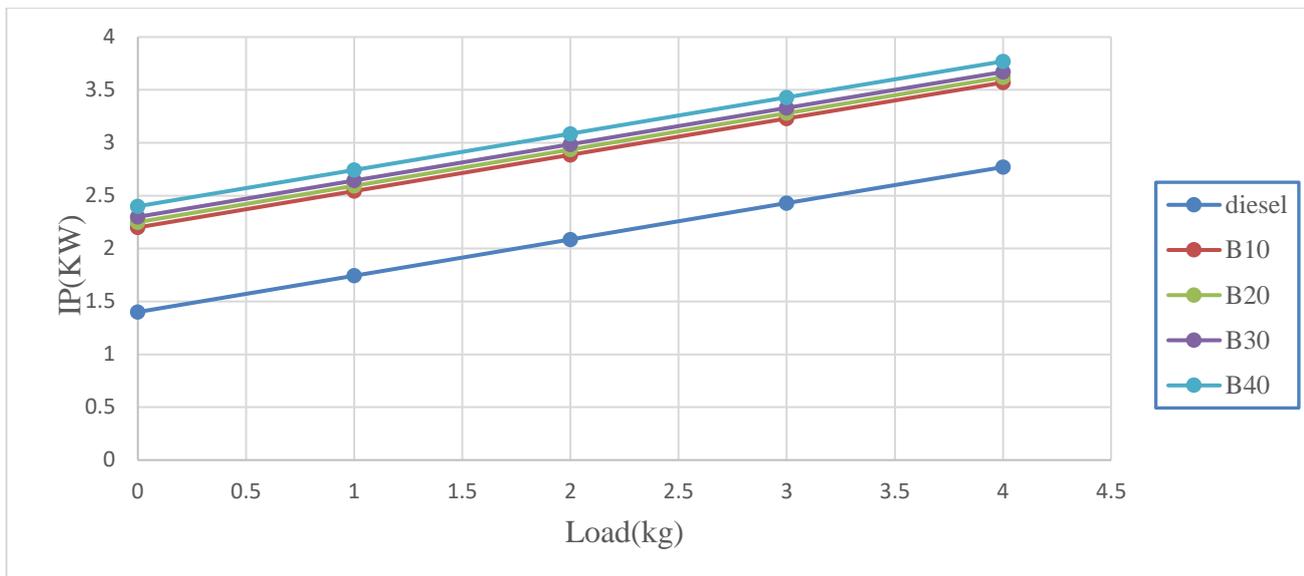**5.2.2 Break load Vs Indicated power at various break loads**

Fig no:- 5.2.2

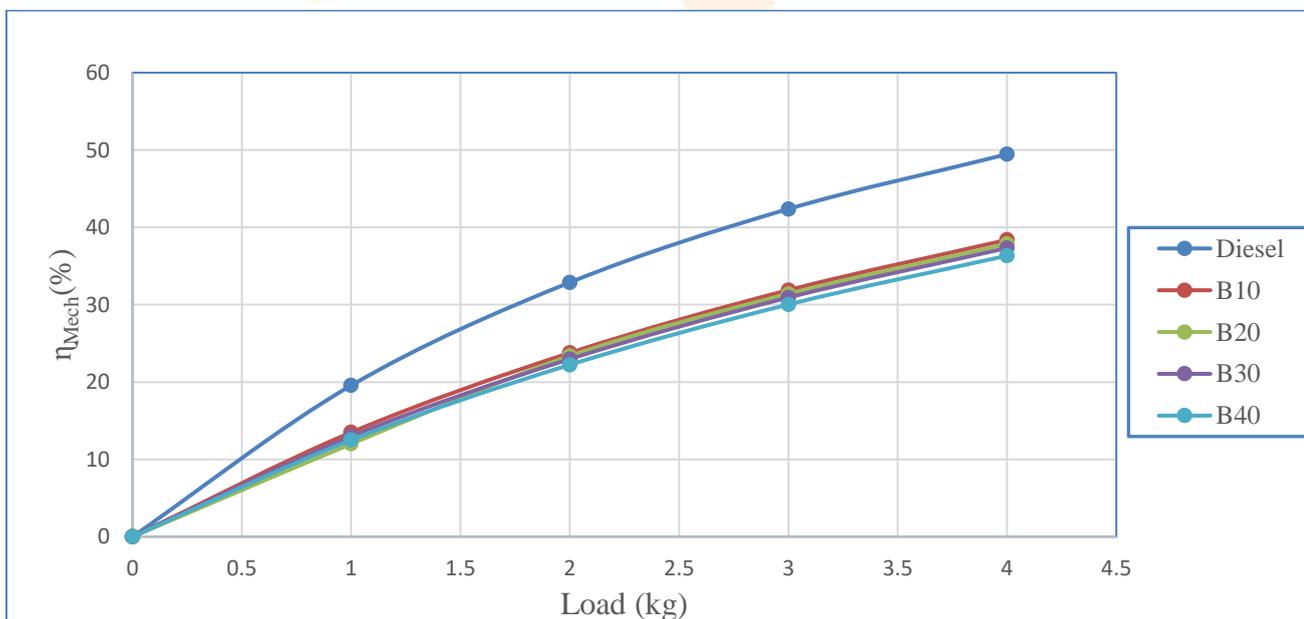**5.2.3 Break load Vs Mechanical Efficiency at various break loads**

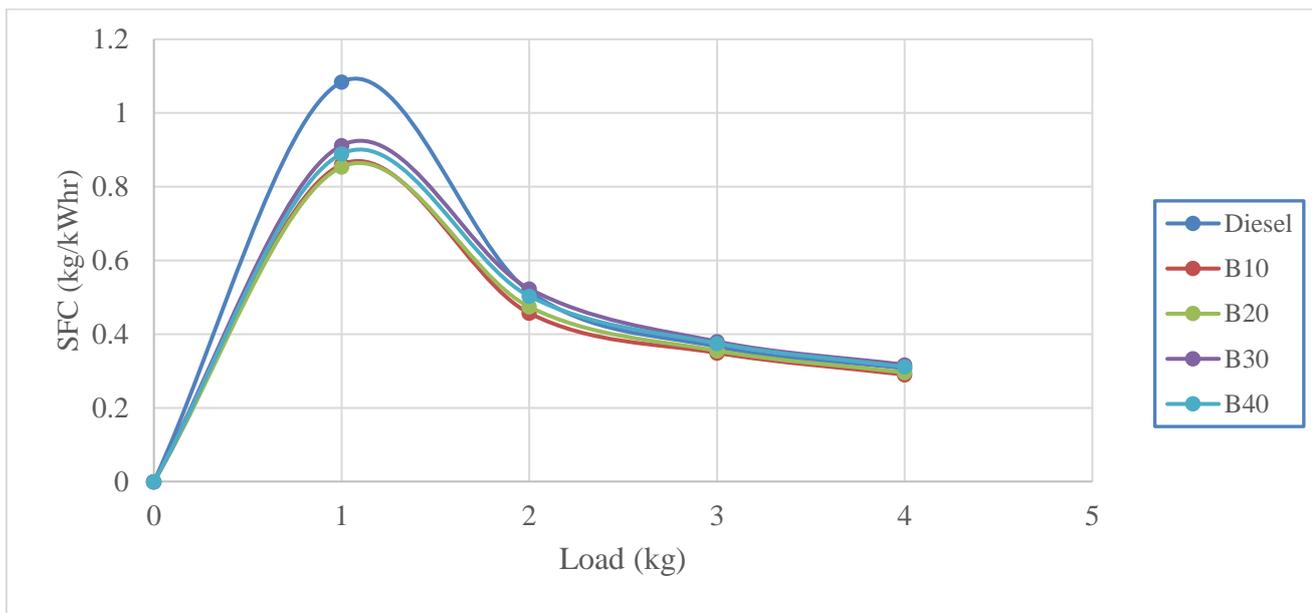Fig no:- 5.2.3

5.2.4 Break load Vs Specific fuel consumption

Fig no:- 5.2.4

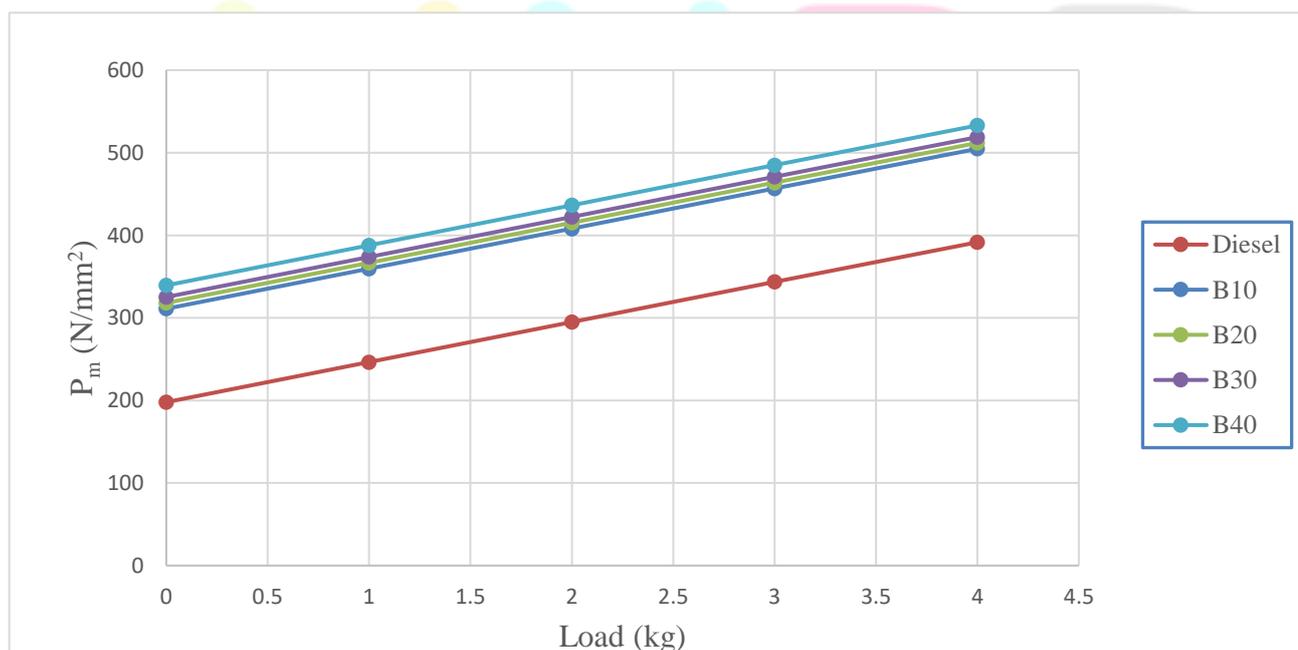**5.2.5 Break load Vs Mean effective pressure**

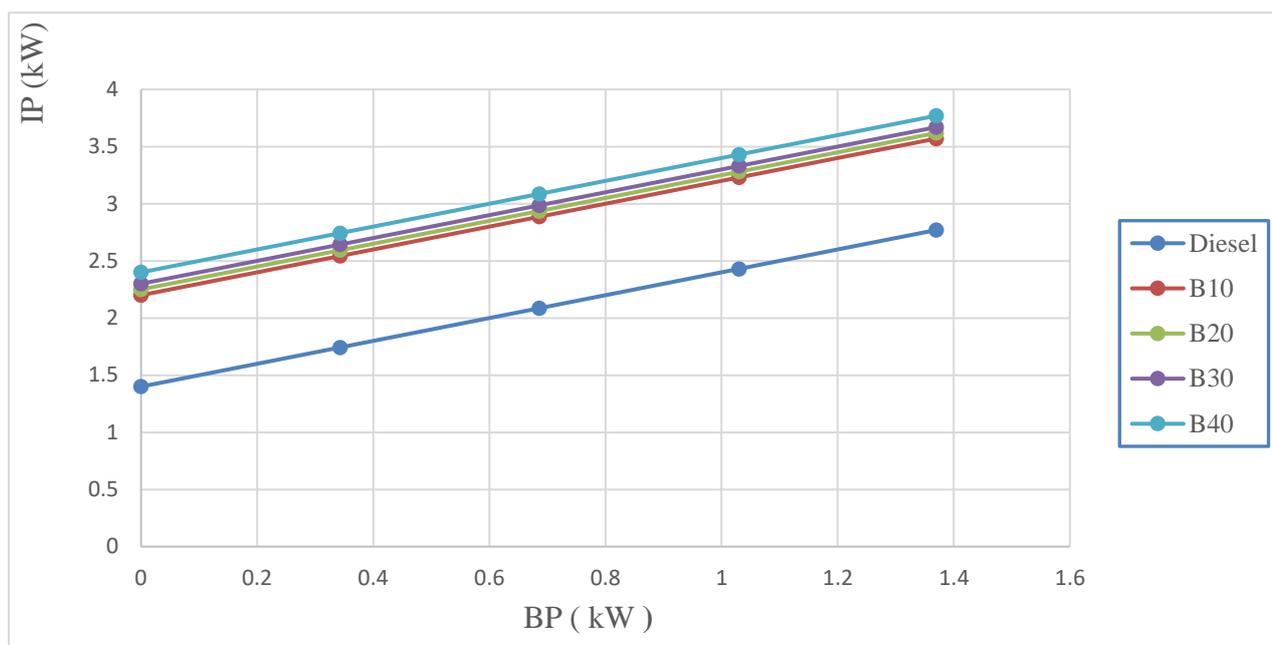Fig no:- 5.2.5

5.2.6 Break power Vs Indicated power.

Fig no:- 5.2.6

6.1 CONCLUSION

THIS HAVE BOUGHT THE SINGLE WALLED CARBON NANOTUBE DID BLENDING OF FUEL. BIODIESEL MADE IN THE LABORATORY WITH ULTRA-SONICATOR AND MAGNETIC STIRRER BLEND WITH SWCNT ARE AND DESIRES FUEL MIXTURE IS OBTAINED FOR WORKING PURPOSE. THE EFFICIENCY CHARACTERISTICS OF THE SAID FUEL ARE FOUND OUT BY TESTING THE FUEL COMPOSITION ON TEST RIG (CI ENGINE). IT IS FOUND THAT FUEL CONSUMPTION IS HIGH IN SOME CASES AND THE EFFICIENCY OF THE FUEL FOUND TO BE LITTLE HIGHER IN COMPARISON WITH DIESEL.

6.2 FUTURE SCOPE

NANOPARTICLES WITH DIFFERENT SIZES CAN BE USED TO DETERMINE EFFECT OF PARTICLE SIZE ON ENGINE PERFORMANCE AND EMISSION. EXPERIMENT WITH NANOPARTICLES IN CI ENGINE CAN BE CONTACTED AT DIFFERENT COMPRESSION RATIO TO IDENTIFY ITS EFFECTIVENESS SAFETY CRITERIA FOR PUBLIC CONCERN DURING PRODUCTION AND ITS USES ARE RARELY ATTEMPTED, SO WORK CAN BE DONE IN THAT DIRECTION. CONVENTIONAL FUEL CAN BE REPLACED IN FUTURE BY BIOFUEL. EMISSION FROM THE FUEL CAN BE MINIMIZED BY HAVING SOME ALTERNATIVES MIXED WITH THE CONVENTIONAL FUEL.

REFERENCES

- Ahmed I. EL-Seesy, Ali K. Abdel-Rahman, Mahmoud Bady, and S. Ookawara "The Influence of Multi-Walled Carbon Nanotubes Additives into Non-Edible Biodiesel-Diesel Fuel Blend on Diesel Engine Performance and Emissions" 'Elsevier' (2016)
- A.M. Abdallah, A.A. Abdel-Rahman, A.E. Elwardany, "Analysis of the impact of different nanoparticle metal oxides as fuel additives in compression ignition engine performance" 'Elsevier'(2020)
- M. A. Adzmi, A. Abdullah, Z. Abdullah and A. G. Mrwan "Effect of Al2O3 and SiO2 Metal Oxide Nanoparticles Blended with POME on Combustion, Performance and Emissions Characteristics of a Diesel Engine" 'International Journal of Automotive and Mechanical Engineering' (2019)
- R A Alenezi, A M Norkhizan, H A Rani, M I Maulana and M Yasar "An Experimental Investigation of a Diesel EngineUsing Carbon Nanotubes Blended with Biodiesel" 'IOP Publishing'(2019)
- C. Vijayakumar, A. Murugesan, D. Subramaniam, and N. Panneerselvam "An Experimental Investigation of Diesel Engine Fuelled with MgO Nano Additive Biodiesel - Diesel Blends" 'Bulletin of Scientific Research' (2019

- C. Syed Aalam, C.G. Saravanan "Performance enhancement of common rail diesel engine using nano-pafticles blended biodiesel" 'Intemational Research Journal of Engineering and Technology' (2015)
- Ümit Ağbulut, Mustafa Karagöz, Suat Sarıdemir, Ahmet Öztürk "Impact of various metal-oxide based nanoparticles and biodiesel blends on the combustion, performance, emission, vibration and noise characteristics of a CI engine" 'Elsevier'(2020)
- G. Ninawe & M. Tariq "Influence of carbon nanotubes as additive in diesel-biodiesel blends in CI engine – an experimental investigation" 'International Journal of Sustainable Engineering' (2020)
- Setyo Pambudi, Agus Triono, Mochamad Asrofi, Iid Mufaidah, Yeni Variyana, R. A.Ilyas "metal oxides as soluble nano catalyst on biodiesel" 'Journal of Applied Agricultural Science and Technology' (2021)
- M. Vinayagam, S. Suresh Kumar, M.M. Ravikumar, S. Mahendiran & T. Raja "Feasibility and emission study on employing MgO nanoparticle as oxygenated additive in neat biodiesel" 'International Journal of Ambient Energy' (2019)
- Harish Venu and Venkataramanan Madhavan "Effect of nano additives (titanium and zirconium oxides) and diethyl ether on biodiesel-ethanol fuelled CI engine" 'springer' (2015)
- Tayfun özgür, Erdi tosun, Ceyla özgür, Gökhan tüccar, Kadir aydm "performance, emission and efficiency analysis of a diesel engine operated with diesel and diesel-ethanol (e20) blend" 'matter: international journal of science and technology' (2017)
- K. Nantha Gopal R. Thundil Karupparaj "Effect of pongamia biodiesel on emission and combustion characteristics of DI compression ignition engine" 'Ain Shams Engineering Journal' (2014)