PERFORMANCE ANALYSIS & EMISSIONS INVESTIGATION OF DEAD PLASTIC DERIVED OIL BLENDED WITH CRUDE OIL EXTRACTED DIESEL

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Abstract: In recent days the major problem faced in our country is the depleting quantity of conventional fuel, even the quantity of petroleum and crude oil has been utilized more, but there is a lesser production. Due to the increasing utilization of petrol and diesel has paved the way to think people for some alternative way of energy resources. Increase in plastic waste plays a major rising problem against the people of the world. Now current work focused about an issues and efforts are made to get optimum solution. By this dead plastic waste has been converted into plastic pyrolysis oil through pyrolysis process. Dead Plastic oil blended with diesel and it has been used in single cylinder, 4- stroke Variable Compression Ratio engine. Through blending process there is a reduction in the consumption of diesel fuel. The change in the blending ratio of dead plastic oil and diesel fuel has a direct impact on the engine performance as well as exhaust emission data. To understand the change in engine performance, different blends of dead plastic oil and diesel fuel were prepared and test were conducted by running these blends separately in VCR engine with various loads at compression ratios 16 and 17. Blends were prepared for 10%, 20%, 30%, 40% of Dead plastic oil with 90%, 80%, 70%, 60% diesel fuel respectively. Through graphical representation of different performance parameters the effect of engine performance of each blend were compared with diesel fuel.

Index Terms **- Dead plastic oil, Diesel fuel, Blend proportion, Compression ratio, performance, VCR engine**

I INTRODUCTION

With time passing by, the fossil fuel reserves are depleting at a faster rate, causing continuous increase in price of petroleum products all over the world. The high price of petroleum products is a big concern for Indian economy. India imports on an average 80% of total demand of crude oil. It is one of the main reasons of GDP expense. Therefore an alternative cheaper fuel is required to fulfill the needs of common man. Alternative source of fuel lies in plastic. In India 56 lakh tones of plastics are generated each year and only 60% of it is recycled. Safe method of disposing dead plastic has not yet been implemented here, and dumping of dead plastic underground is hazardous to the environment. But we can use it as an alternative source of fuel for gasoline and diesel. This will save the environment from hazardous effect as well as to boosting the Indian economy. In this project we investigated the potential use of Fuel extracted from dead plastic as biodiesel. Various experiments were conducted on Fuel extracted from dead plastic with various blends (P10, P20, P30 and P40) on Variable Compression Ratio (VCR) diesel engine with compression ratio 16 and 17. The results were recorded and compared with the conventional diesel fuel.

II LITERATURE REVIEW

This chapter reviews some of the previous work related to this research work in order to provide background for the subsequent chapters. This main objective is to provide an overview of past and ongoing scientific investigations and modelling related to plastic fuel used in internal combustion engines.

M Ruban, et al studied the properties of the waste plastic fuel is analyzed and compared with the fossil fuel diesel and found that almost it has similar properties to the diesel. The characteristics of the waste plastic fuel is obtained from various studied and summary of the results are the higher heat release rate in waste plastic oil compared with diesel fuel due to better combustion. The Nox increase 40% due to higher heat release rate and combustion and temperature. The CO emission increased 7% in waste plastic oil compared to diesel operation. Unburned hydrocarbon emission is higher by about 15%. Waste plastic fuel exhibits higher thermal efficiency up to 75%. Activated carbon using with this experiment fuel is clean and color is bright yellow. This fuel burns cleaner and burning time is also longer.

Based on the literature survey, it is observed that it is possible to convert waste plastic into liquid waste plastic oil (WPO). But no attempt has been made to use dead plastic oil as a complete alternate fuel in a VCR diesel engine under various operating conditions for its suitability as a fuel in a CI engine. A prototype setup was fabricated and the oil was obtained for the experimentation. The present work focuses on using DWPO as alternative fuel in a variable compression ratio diesel engine in the form of a blend and as a neat fuel at different load conditions.

III Dead Plastics into Fuel Conversion Process

Nowadays, sophisticated technologies are available for plastic waste management. Pyrolysis is one such technology used to produce useful products like industrial diesel, gaseous fuel, carbon black etc. Pyrolysis is the thermal degradation of waste in oxygen starved environment in which oxygen content is low for gasification to take place. Pyrolysis liquefaction is a non-combustible heat treatment that catalytically decomposes waste material by applying heat directly or indirectly to the waste material in an oxygen free environment. It is an endothermic reaction which requires an input of energy that is typically applied indirectly through the walls of occurs under pressure and at operating temperatures above 430˚C. The process is usually conducted in reactor. The gaseous products produced in pyrolysis process are condensed in water cooled condenser to convert to liquid oil. Pyrolysis is a developing industry to protect the environment and producing the fuel oil to produce alternate fuel oil.

Fig 1.1: Experimental setup for Pyrolysis process

S. No	Properties	DPO	Diesel
1	Density (kg/m²)	800	850
2	Calorific Value (kJ/kg)	43076.612	42000
3	Kinematic Viscosity at 400˚C (cst)	2.174	3.05
4	Flash Point℃	41	50
5	Fire Point℃	46	56
6	Carbon Residue (%)	0.02%wt	0.20% wt
7	Colour	Black	Orange
8	Cetane number	52	55
9	Ash Content (%)	1.04%wt	0.045
10	Specific Gravity at 40℃	0.7467	0.87

Table 1.1: Properties of Dead plastic oil (DPO)

IV EXPERIMENTAL SETUP

The setup consists of single cylinder, four stroke, water cooled, variable compression ratio engine is used with the specification given in Table 4.1. VCR (Variable Compression Ratio) Diesel engine connected to eddy current type dynamometer for loading. The compression ratio can be changed without altering the combustion chamber geometry by specially designed tilting cylinder block arrangement. Setup is provided with necessary instruments for combustion pressure and crank-angle measurements. Fig 4.1 shows the engine setup.

Table 4.1: Engine Specifications

Engine	Make Kirloskar Type, single cylinder, 4 stroke Diesel, water cooled, power 3.7 kW at 1500 rpm, stroke 110 mm, bore 80 mm, 661 cc, Modified to VCR engine CR range 12 to 18
Dynamometer	Type eddy current, water cooled, with loading unit
Fuel tank	Capacity 15 lit with glass fuel metering column
Load indicator	Digital, Range 0-50 Kg, Supply 230V AC
Software	“Engine soft LV” Engine performance analysis software

Fig 4.1: Schematic layout of the Engine test setup

V. RESULTS AND DISCUSSION

Performance parameters from the experiments performed at Compression Ratios 17 (CR=17) and 16 for the blend ratio i.e D100 (100% Diesel), P10D90 (10% Dead Plastic oil – 90% Diesel), P20D80 (20% Dead Plastic oil – 80% Diesel), P30D70 (30% Dead Plastic oil – 70% Diesel), P40D60 (40% Dead Plastic oil – 60% Diesel) are given below in Table 5.1, Table 5.2, Table 5.3, Table 5.4, Table 5.5, Table 5.6, Table 5.7, Table 5.8, Table 5.9, Table 5.10 respectively.

Table 5.1 Data of Engine performance with Diesel at CR 17

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	2.12	0.43	1.69	3.04	0.62	54.40	11.50	0.76	0.31	20.37
4	2.54	0.86	1.68	3.69	1.24	58.00	19.82	0.44	0.36	33.70
6	3.02	1.29	1.73	4.36	1.87	59.47	25.51	0.33	0.42	42.97
8	3.45	1.73	1.72	5.00	2.49	60.91	30.01	0.28	0.46	50.00
10	3.91	2.16	1.75	5.67	3.13	57.40	31.02	0.27	0.53	55.32
12	4.14	2.39	1.75	5.99	3.45	50.01	27.50	0.36	0.62	57.67

Table 5.2 Data of Engine performance with P10D90 at CR 17

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	2.37	0.42	1.95	3.54	0.63	64.98	11.51	0.75	0.31	17.71
4	2.80	0.84	1.95	4.19	1.26	64.18	19.32	0.44	0.37	30.10
6	3.21	1.26	1.95	4.85	1.90	61.03	23.90	0.36	0.45	39.16
8	3.61	1.66	1.95	5.51	2.53	66.13	30.40	0.28	0.46	45.96
10	4.01	2.06	1.95	6.20	3.18	64.15	32.92	0.26	0.53	51.31
12	4.22	2.27	1.95	6.54	3.51	63.86	34.29	0.25	0.56	53.70

Table 5.3 Data of Engine performance with P20D80 at CR 17

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	2.27	0.43	1.83	3.34	0.64	62.30	11.91	0.72	0.31	19.12
4	2.70	0.86	1.83	4.00	1.28	63.73	20.35	0.42	0.36	31.93
6	3.11	1.28	1.83	4.66	1.92	61.70	25.38	0.34	0.43	41.13
8	3.53	1.70	1.83	5.32	2.55	63.30	30.42	0.28	0.47	48.06
10	3.95	2.12	1.83	5.98	3.21	65.08	34.90	0.24	0.51	53.62
12	4.17	2.34	1.83	6.33	3.55	64.58	36.18	0.24	0.54	56.03

Table 5.4 Data of Engine performance with P30D70 at CR 17

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	2.11	0.43	1.68	3.17	0.65	60.16	12.23	0.70	0.29	20.33
4	2.53	0.85	1.68	3.84	1.30	62.22	20.89	0.41	0.34	33.57
6	2.94	1.26	1.68	4.51	1.93	59.47	25.51	0.33	0.41	42.90
8	3.35	1.67	1.68	5.16	2.58	60.91	30.41	0.28	0.46	49.92
10	3.75	2.07	1.68	5.83	3.22	63.44	35.06	0.24	0.50	55.27
12	3.94	2.26	1.68	6.17	3.54	61.73	35.44	0.24	0.53	57.42

Table 5.5 Data of Engine performance with P40D60 at CR 17

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	2.04	0.41	1.62	3.05	0.62	62.40	12.71	0.68	0.27	20.37
4	2.44	0.82	1.62	3.70	1.24	66.92	22.48	0.38	0.30	33.60
6	2.84	1.22	1.62	4.36	1.87	68.83	29.51	0.29	0.34	42.87
8	3.23	1.61	1.62	5.00	2.49	68.96	34.37	0.25	0.38	49.84
10	3.62	2.00	1.62	5.67	3.13	67.15	37.12	0.23	0.44	55.28
12	3.82	2.20	1.62	5.99	3.45	63.77	36.71	0.24	0.49	57.57

Table 5.6 Data of Engine performance with Diesel at CR 16

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	1.98	0.31	1.67	2.86	0.45	53.20	8.33	1.00	0.31	15.66
4	2.20	0.73	1.29	2.92	1.06	57.09	20.63	0.41	0.29	36.14
6	2.87	1.02	1.85	4.15	1.48	58.16	20.67	0.40	0.41	35.54
8	3.26	1.60	1.66	4.71	2.31	59.82	29.35	0.28	0.46	49.08
10	3.72	2.00	1.72	5.38	2.89	56.10	30.16	0.28	0.55	53.76
12	3.99	2.18	1.81	5.77	3.15	49.06	26.80	0.31	0.68	54.63

Table 5.7 Data of Engine performance with P10D90 at CR 16

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	2.27	0.31	1.96	3.29	0.45	63.89	8.73	0.96	0.30	13.67
4	2.59	0.73	1.86	3.75	1.06	63.28	18.02	0.47	0.34	28.21
6	3.11	1.17	1.94	4.50	1.69	60.20	22.60	0.37	0.43	37.54
8	3.51	1.53	1.98	5.08	2.21	65.13	28.30	0.30	0.45	43.45
10	3.92	1.97	1.95	5.67	2.84	63.16	31.69	0.26	0.52	50.18
12	4.11	2.15	1.95	5.94	3.11	62.75	32.90	0.25	0.55	52.44

Table 5.8 Data of Engine performance with P20D80 at CR 16

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	2.15	0.32	1.83	3.11	0.47	61.19	9.16	0.91	0.29	14.98
4	2.58	0.77	1.82	3.74	1.11	62.69	18.64	0.45	0.34	29.73
6	3.07	1.15	1.92	4.44	1.67	60.69	22.78	0.37	0.42	37.54
8	3.45	1.55	1.89	4.99	2.25	62.30	28.03	0.29	0.46	45.00
10	3.82	2.07	1.76	5.53	2.99	64.07	34.65	0.24	0.49	54.08
12	4.04	2.21	1.84	5.85	3.19	63.50	34.62	0.24	0.53	54.53

Table 5.9 Data of Engine performance with P30D70 at CR 16

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	2.01	0.31	1.69	2.90	0.45	59.13	9.20	0.91	0.28	15.55
4	2.41	0.73	1.69	3.49	1.05	61.11	18.37	0.45	0.33	30.06
6	2.82	1.15	1.67	4.08	1.67	58.40	23.88	0.35	0.40	40.89
8	3.20	1.53	1.68	4.63	2.21	59.83	28.51	0.29	0.45	47.64
10	3.62	1.92	1.70	5.24	2.78	62.40	33.14	0.25	0.48	53.11
12	3.83	2.13	1.70	5.53	3.07	60.62	33.70	0.25	0.53	55.58

Table 5.10 Data of Engine performance with P40D60 at CR 16

Load (kg)	IP (kW)	BP (kW)	FP (kW)	IMEP (bar)	BMEP (bar)	η_{ith} (%)	η_{bth} (%)	SFC (kg per kWh)	Fuel (kg/h)	η_{mech} (%)
2	1.99	0.31	1.68	2.87	0.45	61.27	9.59	0.87	0.27	15.65
4	2.31	0.72	1.59	3.34	1.04	65.82	20.59	0.41	0.29	31.28
6	2.73	1.11	1.62	3.94	1.60	67.76	27.55	0.30	0.34	40.66
8	3.10	1.53	1.57	4.49	2.22	67.84	33.51	0.25	0.38	49.39
10	3.52	1.99	1.53	5.09	2.87	66.07	37.34	0.22	0.44	56.51
12	3.71	2.09	1.62	5.36	3.02	62.65	35.29	0.24	0.49	56.32

5.1 Discussion of results

5.1.1 Fuel Consumption

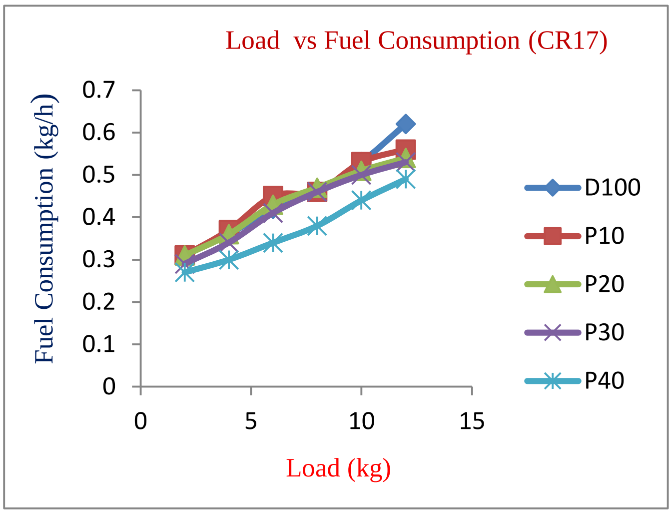


Fig 5.1: Load vs Fuel Consumption for various Blend Proportions at CR 17

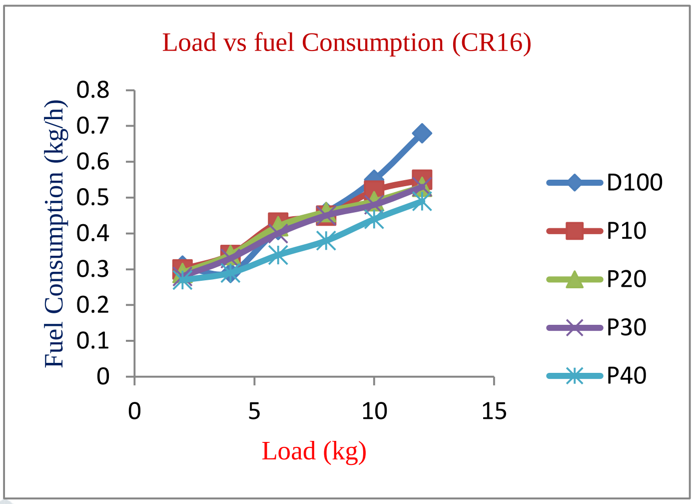


Fig 5.2: Load vs Fuel Consumption for various blend proportions at CR 16

From the Fig 5.1 & Fig 5.2 the variation of the Fuel Consumption with various loads for different blend proportions at CR17 and CR16 are shows that as load increases, fuel consumption increases. It is seen from the graph that fuel consumption in 20% Blend i.e. P20D80 Fuel is almost similar to Diesel fuel i.e. D100. For lower to medium loads, Fuel Consumption is increased for 20% blend than in 30% blend and the same repeats for all the blend proportions. 40% Blend proportion is minimum fuel consumption due to increasing the calorific value with increase in blend proportion of dead plastic fuel. Finally concluded that fuel consumption increases with decrease in blend proportions. In Fig 5.1 shows that the fuel consumption of dead plastic oil blended with diesel at different loads decreases when it is compared to Fig 11. By comparing this two experiments CR 17 gives a better result for fuel consumption.

5.1.2 Indicated Mean effective pressure (IMEP)

Fig 5.3 & Fig 5.4 shows the effect of load on the Indicated Mean Effective Pressure for various blend proportions of dead plastic oil in Diesel fuel at CR 17 and CR16. From the graphs IMEP increase with increase in load. Peak pressure in Diesel fuel is less when compared to all the blends of dead plastic fuel except P40D60 blend due to increase in blend proportion, IMEP decreases. Because of high calorific value heat release rate increases and peak pressure of the cylinder decreases. Focusing on performance of the IMEP of both CR 16 and CR 17 in Fig 5.3, Fig 5.4 shows that the P40D60 blend proportion at different loads of dead plastic oil with diesel of CR 17 is increased and at the same time at CR 16 decreased.

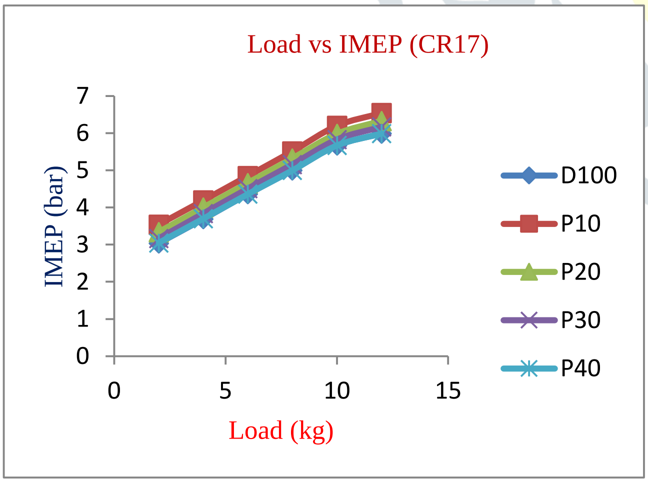


Fig 5.3: Load vs IMEP for various Blend Proportions at CR17

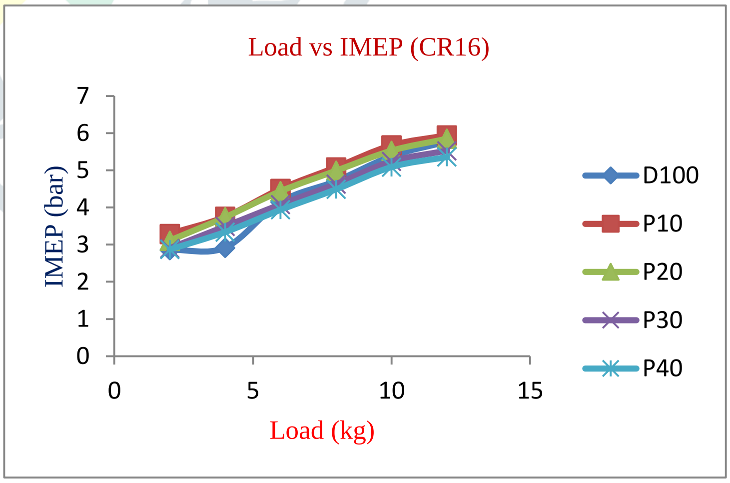
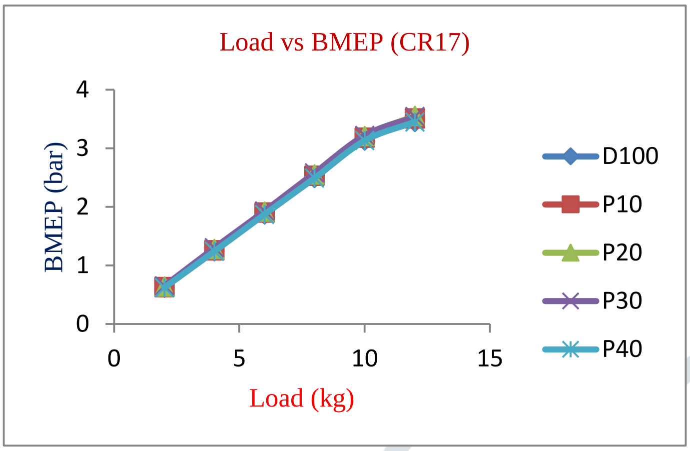


Fig 5.4: Load vs IMEP for various Blend proportions at CR 16

5.1.3 Brake Mean Effective Pressure (BMEP)

Fig 5.5 & Fig 5.6 shows the effect of load on the Brake Mean Effective Pressure for various blend proportions of dead plastic oil in Diesel fuel at CR17 and CR16. There is no variation in BMEP for different blends at lower to medium loads. At higher loads peak pressure is decreased for 50% blend proportion i.e. P40D60.



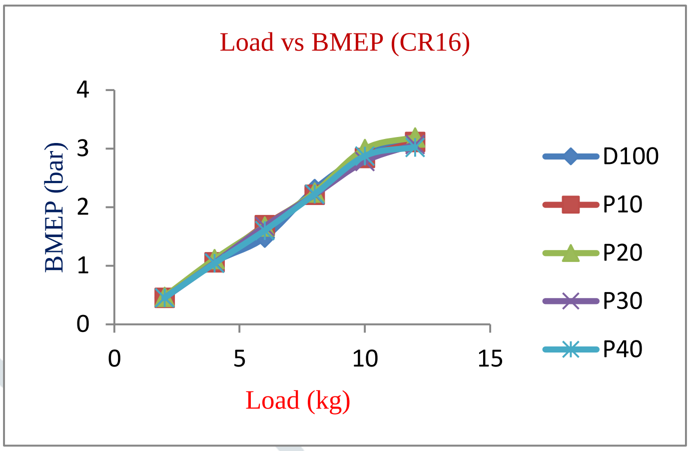
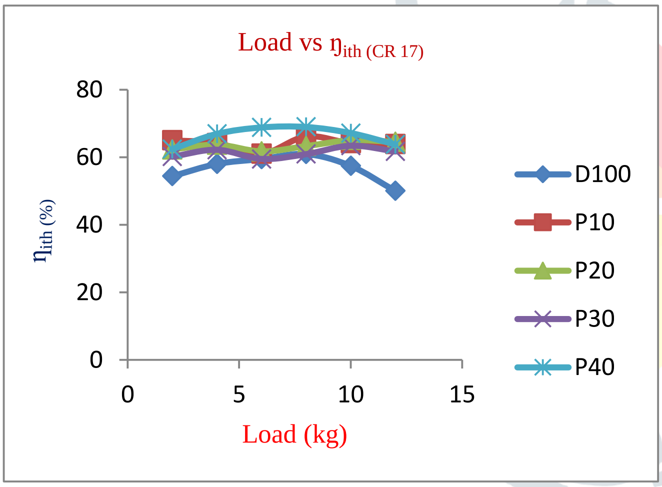


Fig 5.5: Load vs BMEP for various Blend proportions at CR 17

Fig 5.6: Load vs BMEP for various Blend Proportions at CR 16

5.1.4 Indicated Thermal Efficiency (η_{ith})



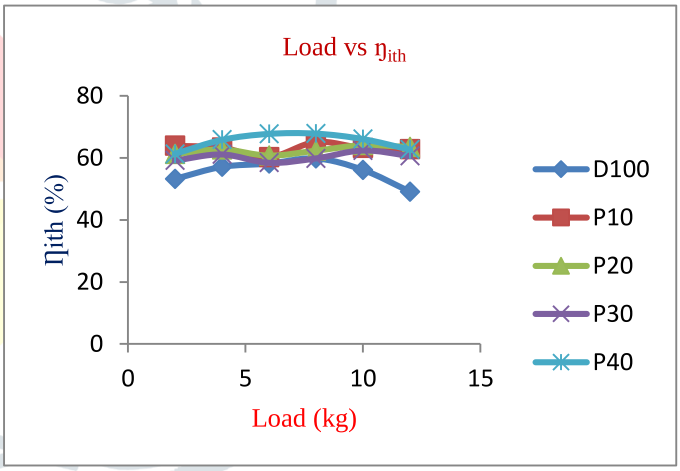
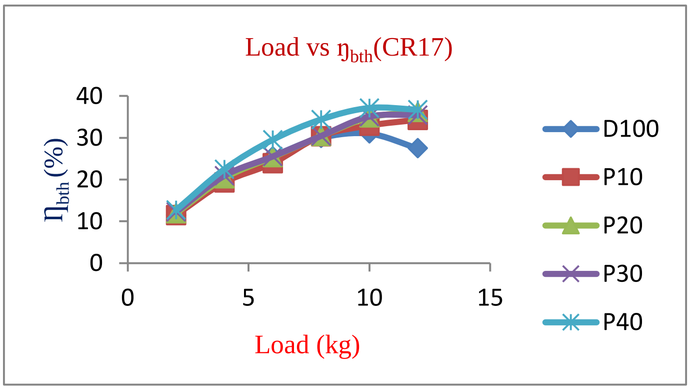


Fig 5.7: Load vs η_{ith} for various Blend proportions at CR17

Fig 5.8: Load vs η_{ith} for blend proportions at CR16

Fig 5.7 & Fig 5.8 shows the variation of indicated thermal efficiency with load for different blend proportions of dead plastic oil with diesel at CR 17 and CR16. From the graphs it is observed that indicated thermal efficiency of diesel fuel is decreases when compared to blended fuel because of less fuel consumption in blended fuel case. But when it is compared with CR 16, CR 17 gives higher thermal efficiency.

5.1.5 Brake Thermal Efficiency (η_{bth})



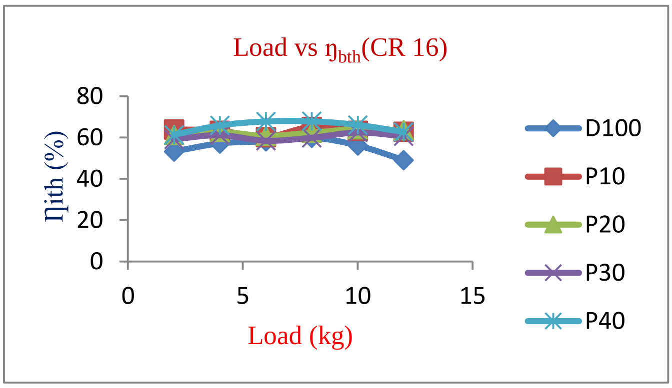
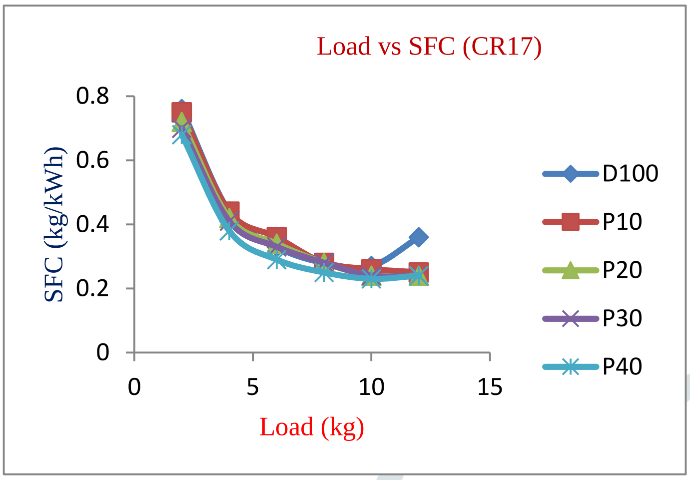


Fig 5.9: Load vs η_{bth} for various Blend proportions at CR17

Fig 5.10: Load vs η_{bth} for various Blend Proportions at CR 16

Fig 5.9 & Fig 5.10 shows the variation of brake thermal efficiency with load for different blend proportions of dead plastic oil with diesel at CR 17 and CR16. It is observed from the graphs that efficiency of P40D60 blend is high compared to diesel fuel. With increase in blend proportions, fuel consumption is decreases. So, Brake thermal efficiency is increasing with increase in blend proportion of dead plastic oil in diesel fuel. Brake thermal efficiency vs load for different blend proportions of dead plastic oil with diesel at CR 17 slightly increased when compared to CR 16.

5.1.6 Specific Fuel Consumption (SFC)



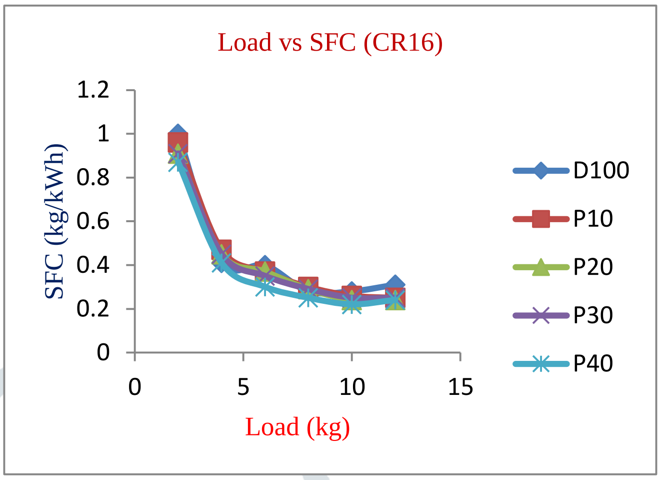
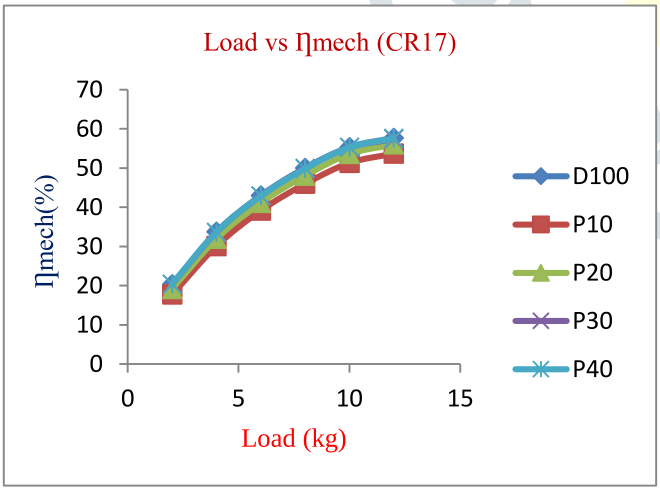


Fig 5.11: Load vs SFC for various Blend proportion at CR 17 **Fig 5.12: Load vs SFC for various Blend Proportions at CR16**

Fig 5.11 & Fig 5.12 shows the effect of load on SFC at different blend proportions of dead plastic oil in diesel at CR 17 and CR16. As load increases SFC decreases. It is observed from the graphs that SFC of Diesel Fuel is increased when compared to all blended fuels of dead plastic oil in diesel at various loads. Because of high calorific value of the dead plastic oil, fuel consumption decreases with increase in blend proportion of dead plastic oil, required heat is produced with less amount of fuel. Finally SFC decreases with increase in blend proportions.

5.1.7 Mechanical Efficiency (η_{mech})

Fig 5.13 & Fig 5.14 shows the effect of load on mechanical efficiency for different blend proportions at CR 17 and CR16. As the load increases mechanical efficiency increases. At lower loads mechanical efficiency is minimum and at full load condition it is increased to maximum. Efficiencies of P30D70 and P40D60 are nearly same when comparable to diesel fuel. It is observed from the graphs that, as blend proportion increases mechanical efficiency increases. But the result indicates a considerable improvement at CR 17 when comparison with CR 16.



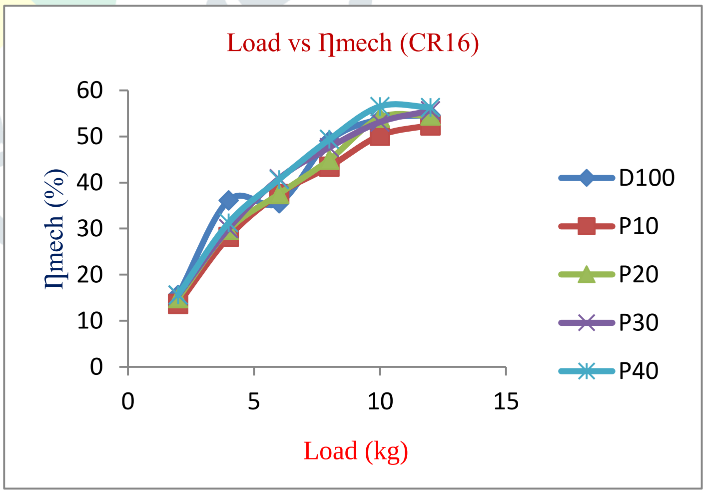


Fig 5.13 Load vs η_{mech} for various blend proportions at CR17 **Fig 5.14 Load vs η_{mech} for various blend proportions at CR16**

5.1.8 Hydrocarbon Emissions (HC)

Fig 5.15 & Fig 5.16 shows the HC emissions at various load conditions for different blend proportions of dead plastic oil in diesel fuel at CR 17 and CR 16. From the graphs it is observed that HC emissions of diesel fuel is lower when compared to all the blends of dead plastic fuel in diesel. HC emissions are increases with increase in blend proportions. Because of less volatility of plastic oil, HC content of the fuel is not distributed equally in the cylinder chamber and some fuel particles are remain unburned which creates high HC emissions. At CR 17 HC emissions are decreases compared to CR 16 due to increased compression ratio and less fuel consumption.

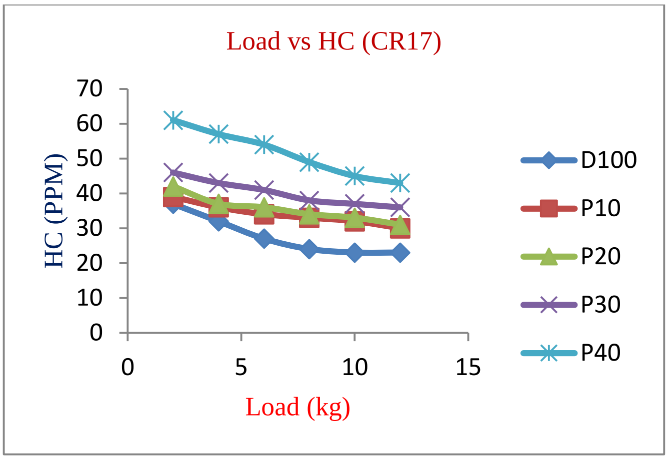


Fig 5.15 Load vs HC emissions for various blend Proportions at CR17

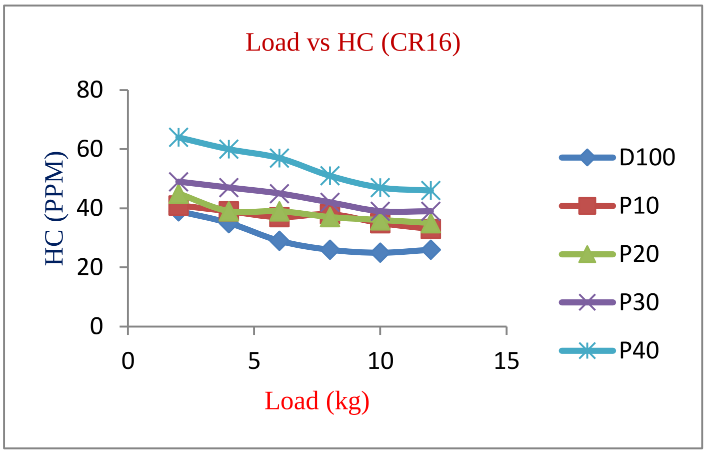


Fig 5.16 Load vs HC emissions for various blend proportions at CR16

5.1.9 CO_2 Emissions

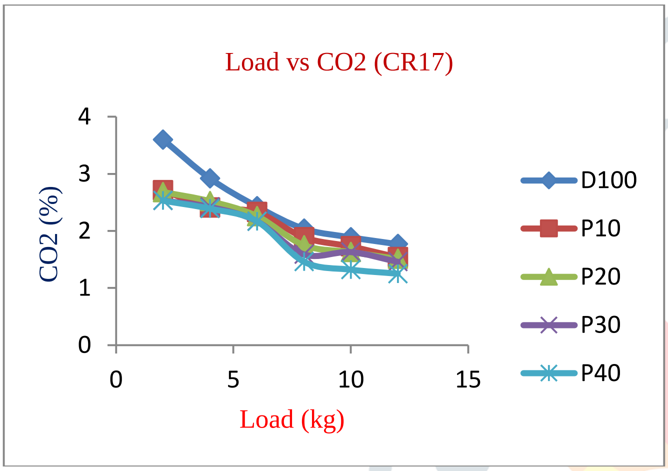


Fig 5.17 Load vs CO_2 Emissions for various blend proportions at CR17

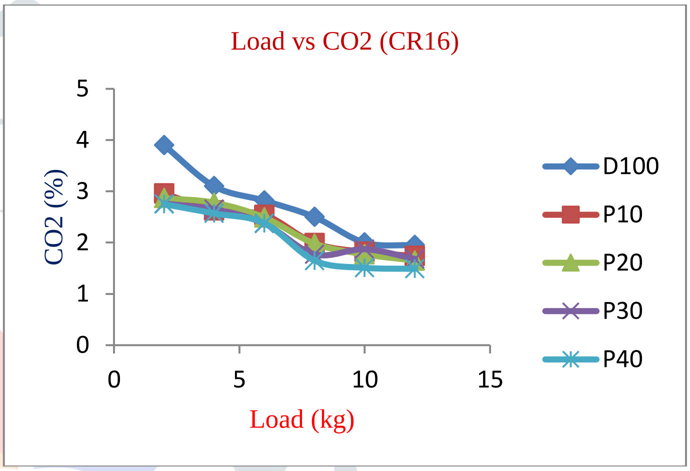


Fig 5.18 Load vs CO_2 Emissions for various blend proportions at CR16

5.1.10 NO_X Emissions

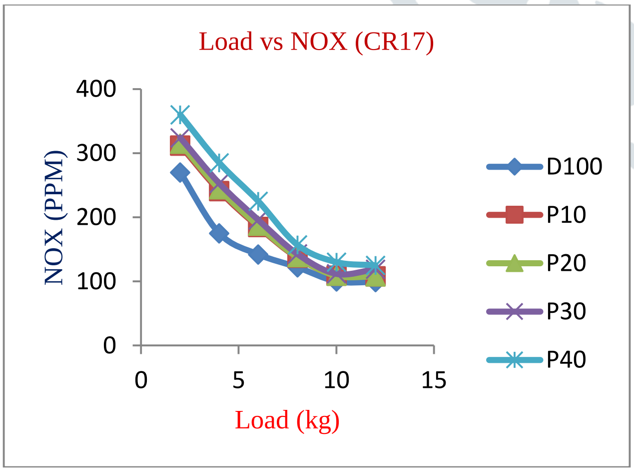


Fig **5.19 Load vs NO_x emissions for various blend proportions at CR17**

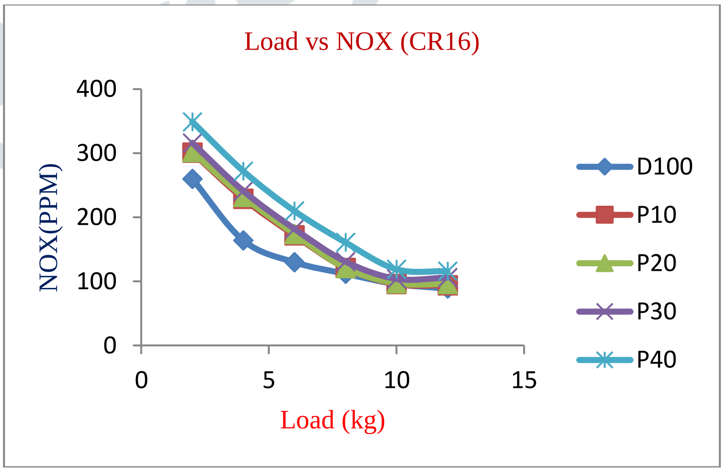


Fig 5.20 Load vs NO_x emissions for various blend proportions at CR16

Fig 5.17 & Fig 5.18 shows the effect of varying load on CO_2 emissions for different blend proportions of dead plastic fuel in diesel at CR17 and CR16. From the graphs, P40D60 shows minimum CO_2 emissions when compared to all the blends and diesel fuel. It is concluded that CO_2 emissions are decreased with increase in blend proportions due to time taken for combustion of blended fuel is more. Thus results less time for oxidation of CO with oxygen. CR 17 graph of CO_2 vs load indicates that due to the increase of compression ratio the level of CO_2 emissions decreases when it is compared to CR 16.

Fig 5.19 & Fig 5.20 shows the effect of load on NO_X emissions for different blend proportions of dead plastic oil in diesel at CR17and CR16. As load increases NO_X emissions are decreased. From the graph it is observed that P40D60 blend have more NO_X emissions when compared to all the blend proportions and diesel fuel. So, NO_X emissions are increases with increase in blend proportions of dead plastic oil in diesel. CR16 graph of NO_x vs load shows that the level of NO_x emissions are comparatively decreased with CR 17.

CONCLUSIONS

Focusing an experimental investigation regarding dead plastic oil blended with diesel has analyzed to give positive impact as an alternative source of fossil fuels. The following conclusions are drawn from this investigation.

By achieving maximum productivity with increase in blend proportion leads to the minimum fuel consumption, but at the same time there is much hike in exhaust emission after 30% blend proportion of dead plastic oil in diesel fuel. At higher compression ratio the brake thermal efficiency of blend P30D70 is slightly higher when compared to that of standard diesel. It is seen that Specific Fuel Consumption of blend P30D70 is lower than that of all other blends and diesel fuel. So it results in the better combustion and it directly increase in the energy content of the blend. The maximum Brake power acquired for P30D70 at higher load condition with CR17 is 2.26 kW. After 30% blend of dead plastic oil there is an increase in exhaust emissions which makes major value than increase in performance. HC emissions are increases with increasing in blend proportions of plastic oil with diesel. At the blend of P30D70 the CO_2 emission is similar to the standard diesel and it is very lower at CR 17. NO_x emission is slightly increased, on the other hand it is still comparable with that of standard diesel fuel. So considering performance and exhaust emission 30% blend of dead plastic oil can be the best alternative fuel blend for diesel engines not only for its performance characteristics but also for the environment aspects.

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