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EXPERIMENTAL STUDY ABOUT FLASH AND FIRE POINT COMPARISON ON THREE COMBINATIONS OF WASTE TYRE OIL WITH DIESEL FOR ALTERNATE FUEL PROPERTIES IDENTIFICATION

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Abstract:

The current study investigates about flash and fire point comparison of three different combinations of waste tyre oil with diesel for alternate fuel prosperities identification in compression ignition engines. Waste tyre oil is gained through esterification process. 500 ml of diesel and tyre oil with three combinations taken for the experiment. These samples tested before and after esterification process. Then the corresponding flash and fire point values noted for this investigation.

Keywords: Flash and fire point, diesel and tyre oil, esterification process, waste tyre oil.

1.INTRODUCTION

In current situation alternate fuels play the major role in both SI and CI engines because of its demand. One the alternate fuel considered for this experimental investigation is waste tyre oil. This waste tire oil gained through pyrolysis method of waste tyre products which produce solid wastes also used as carbon black and black wires. Waste tyre oil used for this study is shown in figure 1.

FIGURE 1 Waste Tyre Oil

2.EXPERIMENTAL PROCEDURE

The step by step experimental procedures were mentioned in the figure 2 as a flow chart. First of all waste tyre products were collected, segregated with respect to sizes and cleaned completely. Then the oil gained through e pyrolysis process and the corresponding images were mentioned in figure 3. This waste tyre oil contains some impurities which are removed by filtration process. The waste tyre oil mixed with tyre oil with three different combinations as mentioned in table 1. Then the waste tyre oil imposed to esterification process as per the details mentioned in table 2 for improving their properties. Then the corresponding flash and fire point were measured with the help of closed cup apparatus for the investigation.

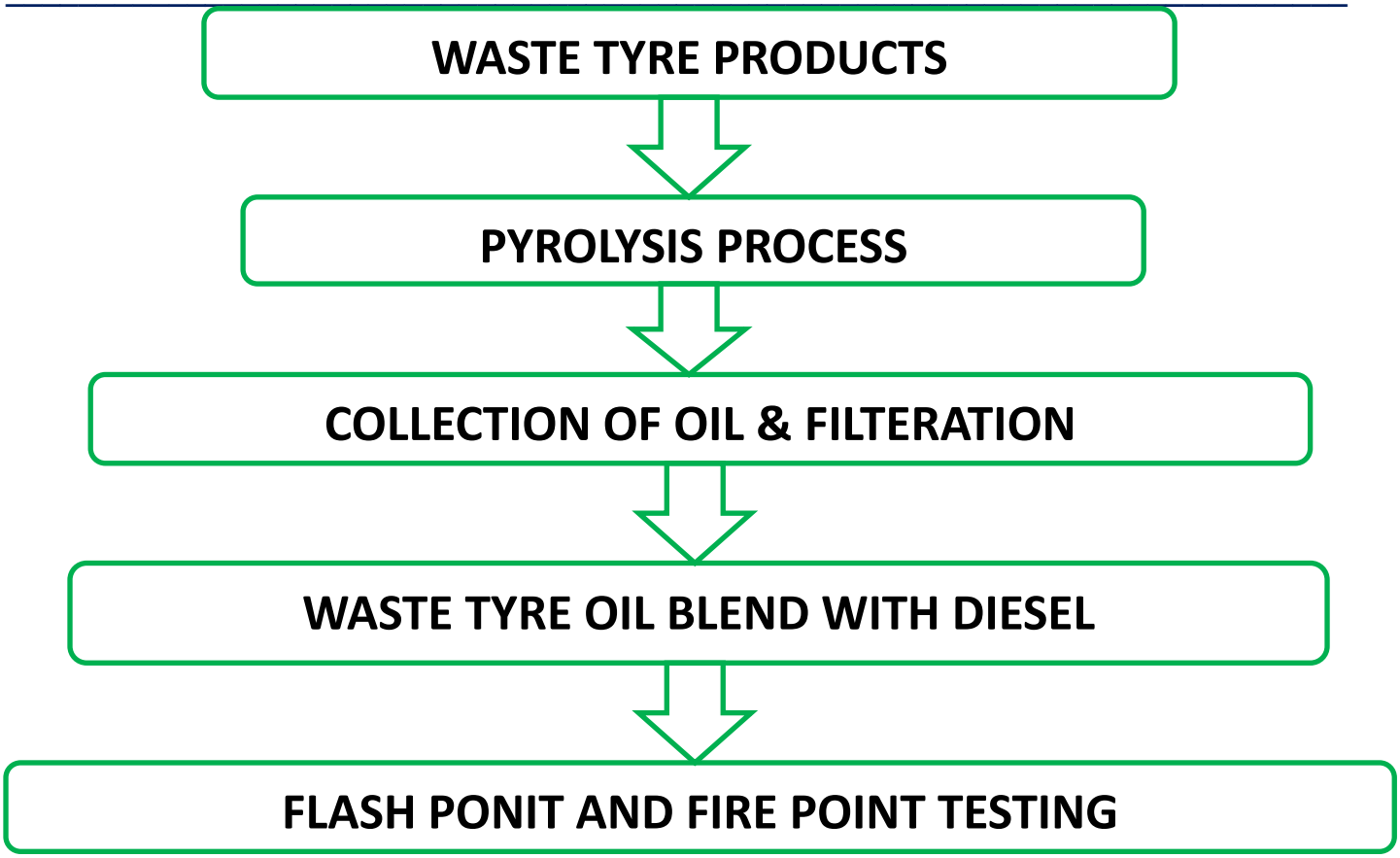

FIGURE 2 Experimental procedures.

(a) (b) (c)

FIGURE 3 Images of (a) Pyrolysis oil (waste tyre oil), (b) Filtration of waste tyre oil, (c) Waste tyre oil after filtration process.

TABLE 1 Combination Of Mixture

Diesel (ml)	Waste tyre oil (ml)	Total mixture (ml)
450	50	500
400	100	500
350	150	500

TABLE 2 Details Of Esterification

Diesel (ml)	Waste tyre oil (ml)	Ethanol (ml)	KOH (ml)
450	50	10	5
400	100	20	10
350	150	30	15

3.RESULT AND DISCUSSION

Experimentally the flash point and fire point values of before esterification were mentioned in table 3 clearly without any doubt. Similarly after esterification process of waste tire oil respective values were mentioned in the table 4 experimentally.

TABLE 3 Flash and fire point reading before esterification

Mixture name	Diesel (ml)	Waste tyre oil (ml)	Total mixture (ml)	Flash point (◦C)	Fire point (◦C)
M1	450	50	500	56	65
M2	400	100	500	51	60
M3	350	150	500	48	55

TABLE 4 Flash and fire point reading after esterification

Mixture name	Diesel (ml)	Waste tyre oil (ml)	Total mixture (ml)	Flash point (◦C)	Fire point (◦C)
M1	450	50	500	61	68
M2	400	100	500	58	63
M3	350	150	500	51	57

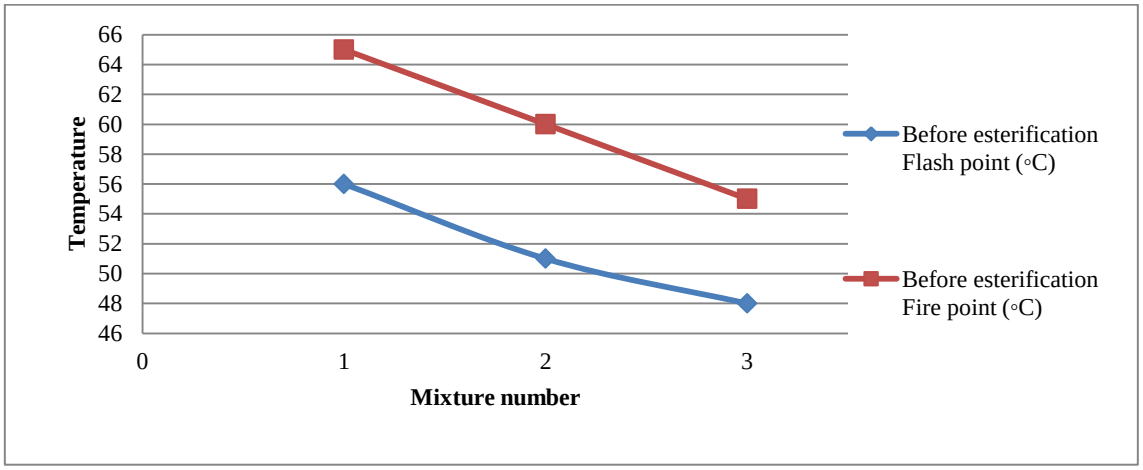

FIGURE 4 Flash and fire point of three mixtures before esterification

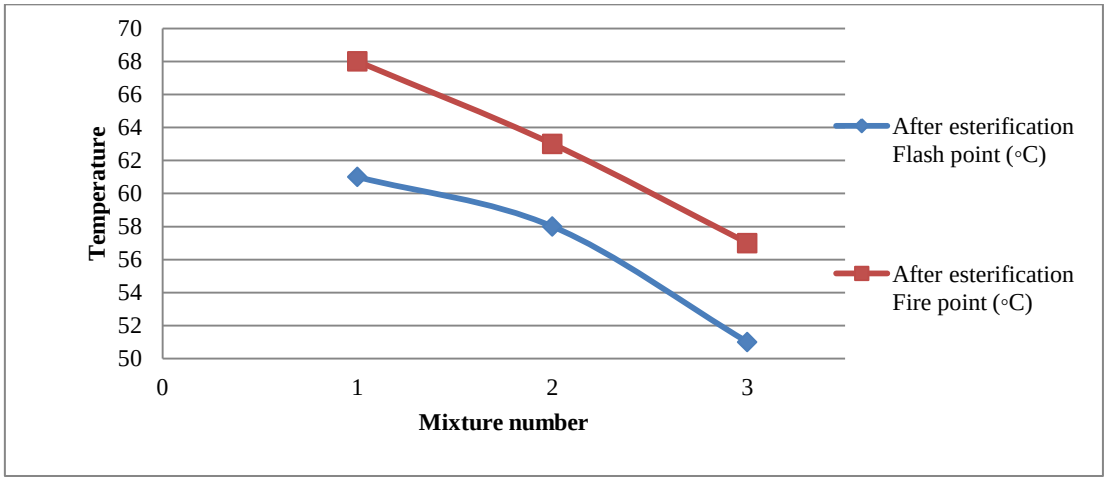

FIGURE 5 Flash and fire point of three mixtures after esterification

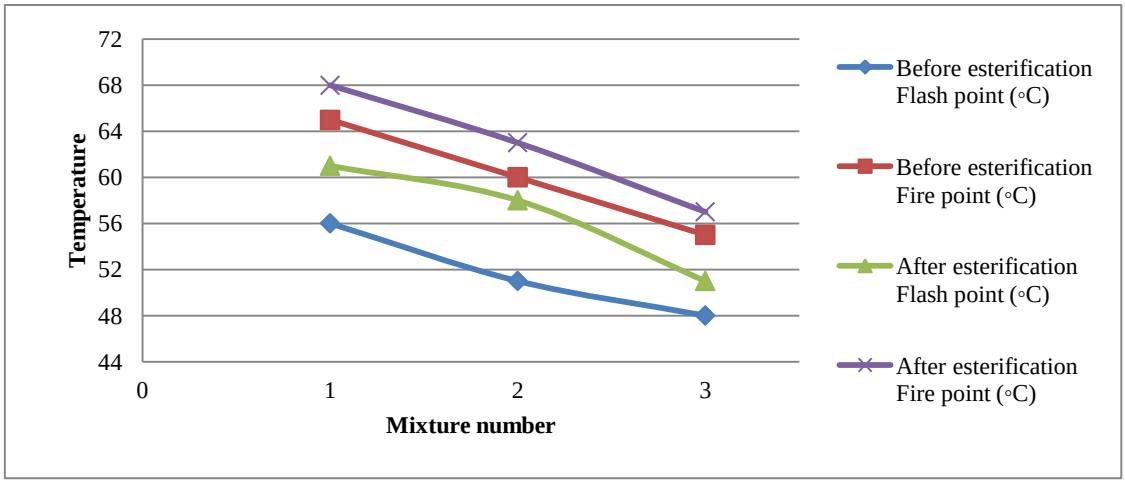

FIGURE 6 Before and after esterification flash and fire point for the three mixture combinations

From the figure 4 flash point and fire point values of three different mixtures of diesel and waste tyre oil before esterification mentioned clearly as a graphical representation. In the same way figure 5 showed the flash point and fire point of different mixtures of diesel and waste tyre oil after esterification. Combination of before and after esterification flash and fire point for the three mixture combinations were point out in figure 6. From the above diagram flash point and fire point of the mixture decrease when the waste tyre oil get increased in the mixture for the both before and after esterification process.

CONCLUSION

From this experimental study about flash and fire point comparison on three combinations of waste tyre oil with diesel for alternate fuel prosperities identification provides the following conclusions.

- Participation of waste tyre oil is inversely proportional to flash point of the mixture combination.
- Contribution of waste tyre oil is inversely proportional to fire point of the mixture combination.
- Both flash point and fire point of the mixture increased after esterification process.
- So subsequent to esterification process small amount of waste tyre involvement is preferred for the higher flash point and fire point requirements.