The influence of temperature in the gas emissions by using mixtures of diesel & olive seed oil as fuels.

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Abstract: - Air pollution is any gas or particulate that originates from both natural and anthropogenic sources. Anthropogenic sources mostly related to burning different kinds of fuel for energy. Moreover, the exhaust from burning fuels in automobiles, homes and industries. Fuel quality has very strongly influences in diesel engine emissions like HC, CO, NOx and particulate emissions. This is due to the fact that fuel emissions depend on the formation and the combustion of the mixture. At the present paper will be examined the behavior of gas emissions in a four stroke engine when changes the temperature of fuel. The temperatures of fuel that has been used for the experiment were 10^{o}C, 20^{o}C, 30^{o}C, 40^{o}C, 50^{o}C and 60^{o}C. In addition, it has been used the following mixtures of fuels: diesel-5% olive seed oil, diesel-10% olive seed oil, diesel-20% olive seed oil, diesel-30% olive seed oil, diesel-40% olive seed oil, diesel-50% olive seed oil. For the above temperatures, it has been measured the gas emissions of carbon monoxide (CO), hydrocarbons (HC), nitrogen monoxide (NO), mainly emissions (smoke) and also it has been examined the fuel consumption.

Key-Words: - Gas emissions, Olive seed oil

1.INTRODUCTION

Air pollution is a major global problem as it has serious consequences for the health of human being, plants and property. It is made up of many gases and particles that reduce the quality of air. There are many types of air pollution, including smog, acid rain, the greenhouse effect and holes in the ozone layer. Besides natural sources there are many anthropogenic sources that contribute to the air pollution. It is common knowledge that internal combustion engines and all types of industries, contribute significantly to the emissions of air pollutants. Additionally, various agricultural activities require the extensive use of diesel or petrol engines that produce vast quantities of CO and HC. It's a fact that it has not been taken under consideration seriously the environmental consequences of the combustion engines use in agriculture. Therefore, there is a big need for alternative sources to be developed in order to cover energy demands without harming the environment. Renewable fuels such as ethanol can be considered as alternative to conventional fuels[1].

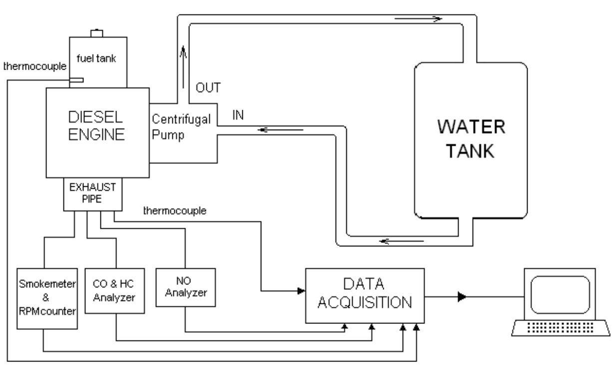
Natural sources related to dust from natural source, usually large areas of land with little or no vegetation, the smoke and carbon monoxide from wildfires, volcanic activity etc. The main causes by air pollution related deaths include aggravated asthma, bronchitis, emphysema, lung and heart diseases to human beings. There are several many types of air pollutant [1,2]. These include smog, acid rain, the greenhouse effect and holes in the ozone layer. The atmospheric conditions such as the wind, rain, stability affect the transportation of the air pollutant [3,4]. Furthermore, depending on the geographical location temperature, wind and weather factors, pollution is dispersed differently [5.6]. For instance, the wind and rain may effectively dilute pollution to relatively safe concentrations despite a fairly high rate of emissions. In contrast when atmospheric conditions are stable relatively low emissions can cause buildup of pollution to hazardous levels. The quality of fuel affects diesel engine emissions (HC, CO, NOx and particulate emissions) very strongly. The fuel that is used in diesel engines is a mixture of hydrocarbons and its boiling temperature is approximately 170 ^{o}C to 360^{o}C [4]. Diesel fuel emissions composition and characteristics depend on mixture formation and combustion. In order to compare the quality of fuels the following criteria are tested: ketene rating, density, viscosity, boiling characteristics, aromatics content and sylph content. For environmental compatibility, the fuel must have low density, low content of aromatic compounds, low sylph content and high ketene rating [6,7,8]. The question that arises is how a four-stroke diesel engine behaves on the side of pollutants and operation, when it uses diesel –olive seed oil mixtures as fuel in different temperatures.

2.EXPERIMENTAL SET-UP

Specifically it has been used fuel mixture: diesel-5% olive seed oil (Pyrin5%), diesel-10% olive seed oil (Pyrin10%), diesel-20% olive seed oil (Pyrin20%), diesel-30% olive seed oil (Pyrin30%), diesel-40% olive seed oil (Pyrin40%), diesel-50% olive seed oil (Pyrin50%), at different temperatures: 20^oC, 30^oC, 40^oC in a four-stroke diesel engine named Ruggerini type RD-80, volume 377cc, and power 8.2hp/3000rpm, who was connected with a pump of water centrifugal. Measurements were made when the engine was function on 1000, 1500, and 2000rpm.

During the experiments, it has been counted:

- The percent of (%) (CO)
- To ppm(parts per million) HC
- To ppm(parts per million) NO
- The percent of smoke
- Fuel consumption



Picture1. Experimental layout

The measurement of rounds/min of the engine was made by a portable tachometer (Digital photo/contact tachometer) named LTLutron DT-2236. Smoke was measured by a specifically measurement device named SMOKE MODULE EXHAUST GAS ANALYSER MOD 9010/M, which has been connected to a PC unit. The CO and HC emissions have been measured by HORIBA Analyzer MEXA-324 GE. The NO emissions were measured by a Single GAS Analyser SGA92-NO.

3.EXPERIMENTAL RESULTS

The experimental results are shown at the following figures:

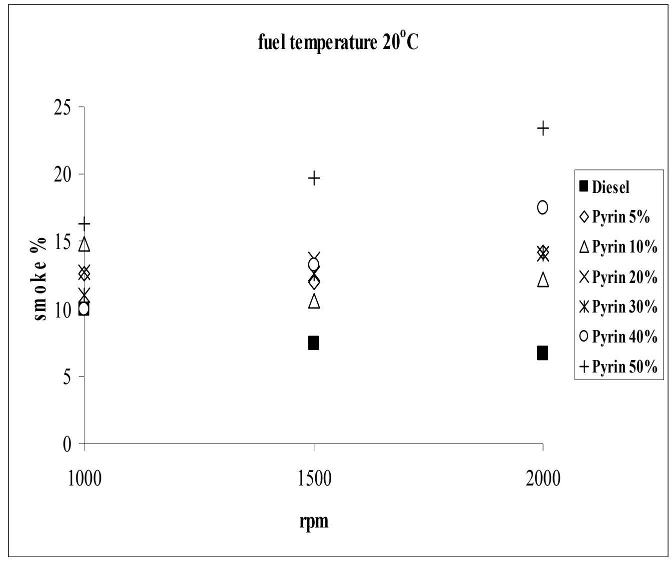


Figure 1. The %smoke average value variation on different rpm regarding to the diesel-seed oil mixtures on 20^oC fuel temperature.

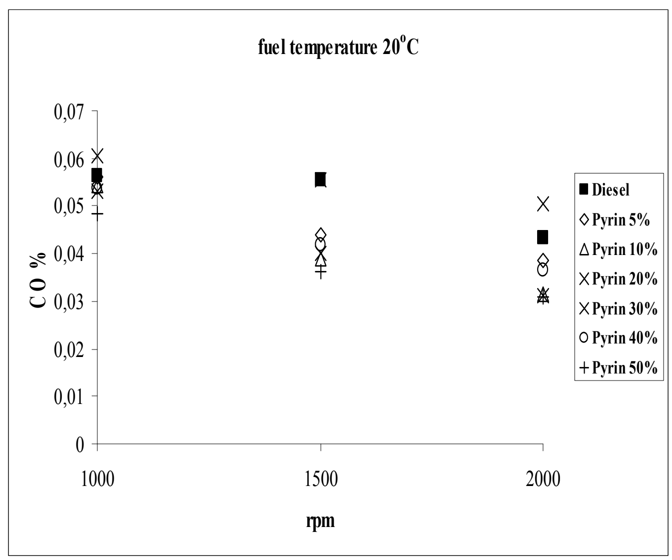


Figure 2. The CO average value variation on different rpm regarding to the diesel-seed oil mixtures on 20^oC fuel temperature.

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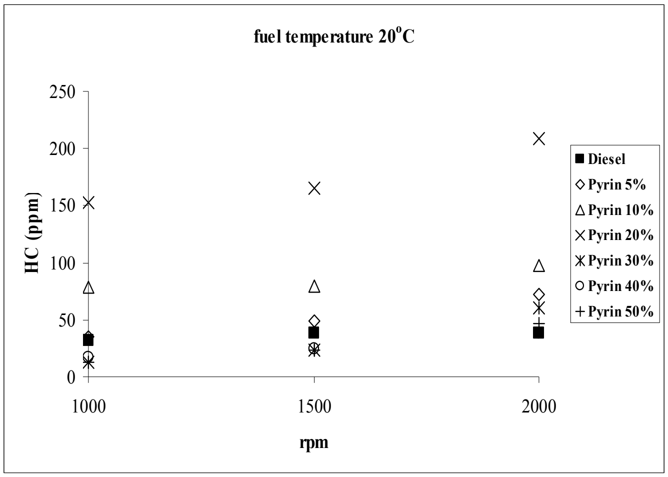

Figure 3. The HC average value variation on different rpm regarding to the diesel-seed oil mixtures on 20°C fuel temperature.

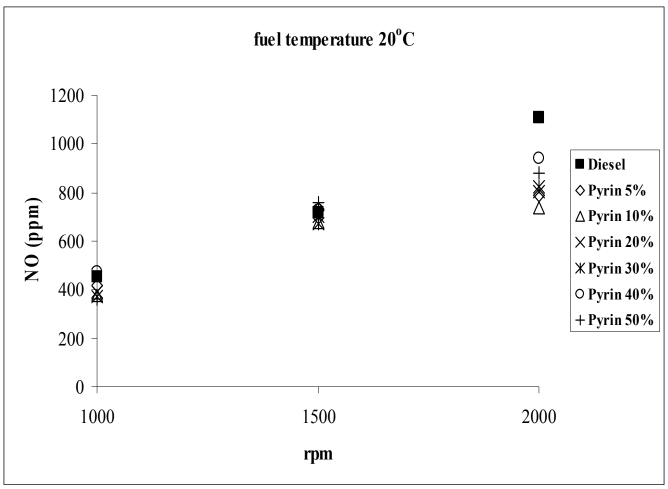

Figure 4. The NO average value variation on different rpm regarding to the diesel-seed oil mixtures on 20°C fuel temperature.

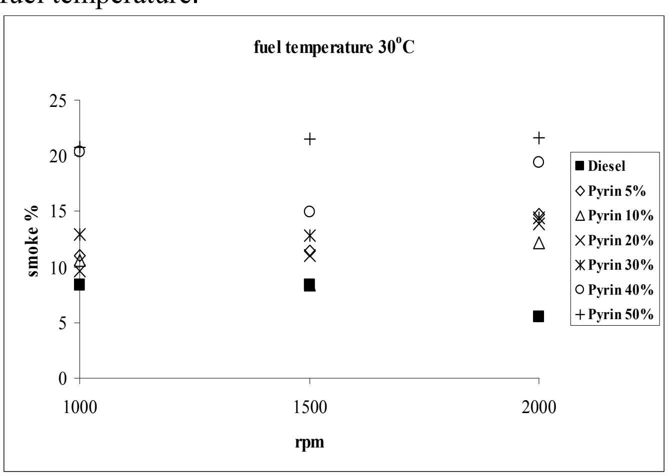

Figure 5. The %smoke average value variation on different rpm regarding to the diesel-seed oil mixtures on 30°C fuel temperature.

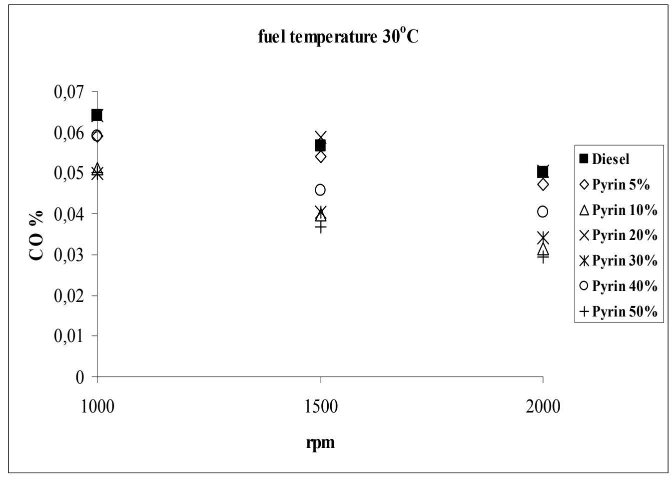

Figure 6. The CO average value variation on different rpm regarding to the diesel-seed oil mixtures on 30°C fuel temperature.

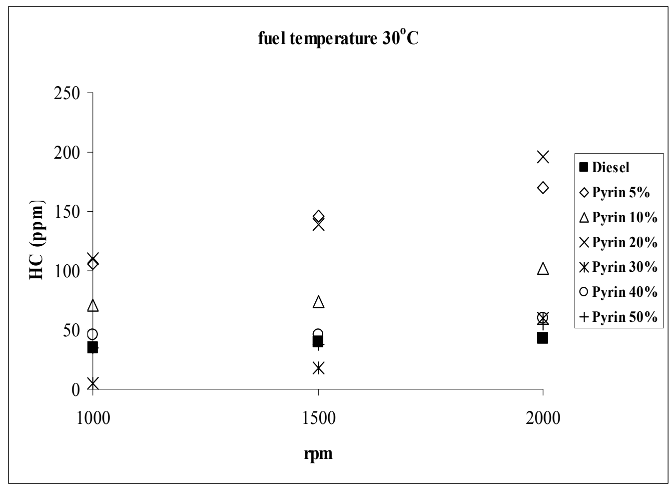

Figure 7. The HC average value variation on different rpm regarding to the diesel-seed oil mixtures on 30 °C fuel temperature.

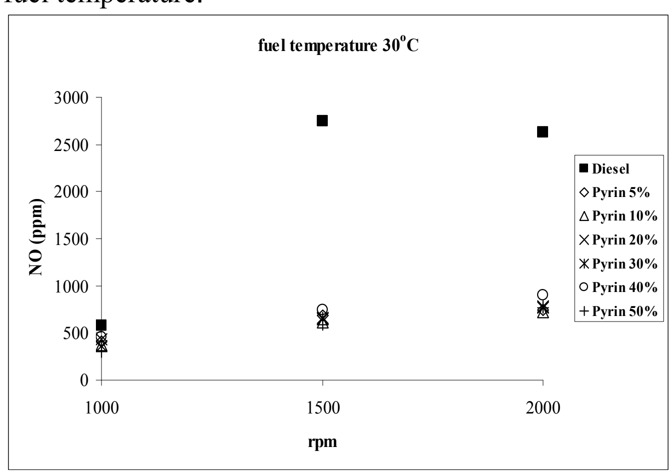

Figure 8. The NO average value variation on different rpm regarding to the diesel-seed oil mixtures on 30 °C fuel temperature.

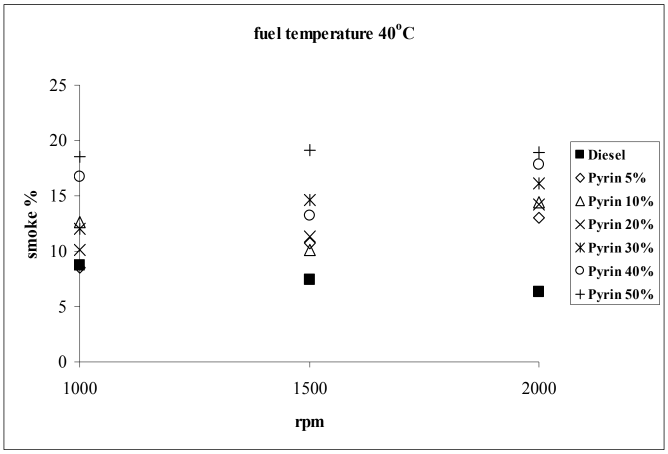

Figure 9. The % smoke average value variation on different rpm regarding to the diesel-seed oil mixtures on 40°C fuel temperature.

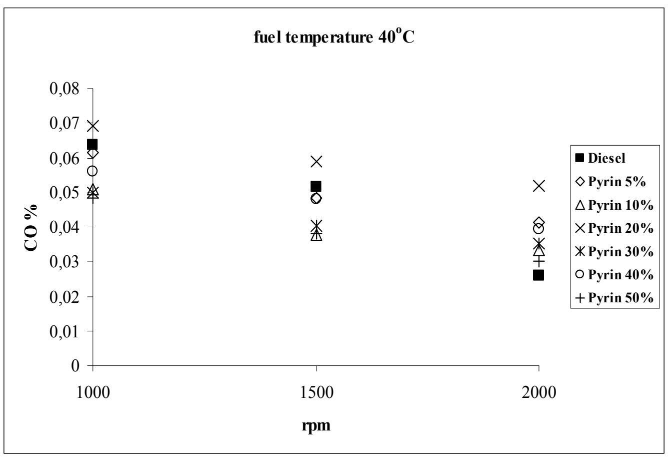

Figure 10. The CO average value variation on different rpm regarding to the diesel-seed oil mixtures on 40°C fuel temperature.

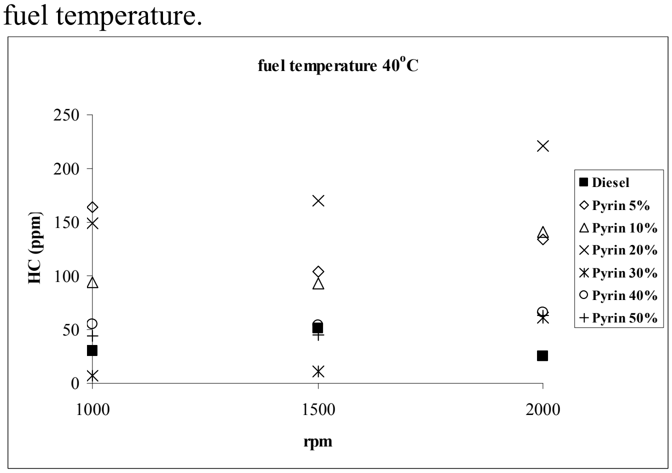

Figure 11. The HC average value variation on different rpm regarding to the diesel-seed oil mixtures on 40°C fuel temperature.

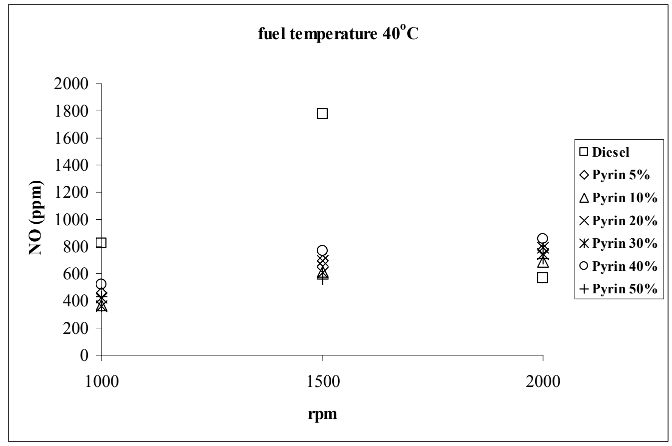

Figure 12. The NO average value variation on different rpm regarding to the diesel-seed oil mixtures on 40°C fuel temperature.

The diesel-seed oil mixtures have different viscosity due to different content of seed oil. If ´´η´´ stands for viscosity, then we have[9]:

$$\eta_{pyrin5\%} < \eta_{pyrin10\%} < \ldots\ldots < \eta_{pyrin40\%} < \eta_{pyrin50\%}$$

Also, the viscosity varies with the temperature and we have[9]:

$$\eta_{pyrin5\%(10^{o}C)} > \eta_{pyrin5\%(20^{o}C)} > \ldots\ldots > \eta_{pyrin5\%(60^{o}C)}$$

. .
. .
. .

$$\eta_{pyrin50\%(10^{o}C)} > \eta_{pyrin50\%(20^{o}C)} > \ldots\ldots > \eta_{pyrin50\%(60^{o}C)}$$

A far as the consumption is concerned, it has been observed small changes with the change of temperature, but because the difference is small it does not require mentioning.

The change of temperature of fuel in the various mixtures, it has the following results:

Smoke:

- Pyrin 5%: Appears the best behavior in the cases of 1500rpm/30°C and 2000rpm/30°C. This likely happens because the engine in the case of 1000rpm/30°C is in the start and it is cold.

- Pyrin 20%: presents better behavior in the case of 30^{o}C in all rpm.
- Pyrin 30%: it noticed that the best behavior is in the case of 20^{o}C in all rpm.
- Pyrin 40%: is observed that the best behavior is in the case of 20^{o}C in all rpm.
- Pyrin 50%: is observed that the best behavior is in the case of 1500rpm/50^{o}C.

CO:

- Pyrin 50%: is observed the better behavior in the case 2000rpm/40^{o}C.

HC:

- Pyrin 20%: the worst behavior is presented in the case where the temperature of fuel is 40^{o}C.
- Pyrin 40%: the worst behavior is presented in the cases of 1500rpm/ 20^{o}C and 2000rpm/ 20^{o}C.

NO:

- Pyrin 10%: appears the best behavior in the case where the temperature of fuel is 40^{o}C in all rpm.
- Pyrin 20%: is observed the best behavior in the cases 1500rpm/30^{o}C, 2000 rpm/30^{o}C.
- Pyrin 50%: It has been observed that the best behavior presented in the case of 1000rpm/30^{o}C. While the worst behavior presented in the cases of 1500rpm/20^{o}C, 2000rpm/20^{o}C.

4.CONCLUSION

Summarizing all the above, it can be said that the temperature of fuel influences the viscosity of the fuel and also the gas emissions. Each one influences in a different way, without can no one determine that in a specific temperature will be observed the same change in all gas emissions (smoke, CO, HC, NO). Also it should be taken into consideration that the fuels that were used, were diesel-seed oil mixtures with different contents and different viscosity in the same temperature. In any case, it is important to be mentioned that the fuel temperature influences the concentration of gas emissions.

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