The need to replace diesel with an alternative fuel that has similar properties lead the automotive industry to use diesel/biodiesel blends. The main physicochemical properties of biodiesel are comparable to those of conventional mineral diesel fuels, thus it can be used as an alternative solution for diesel [1]. However, it is susceptible to oxidation causing corrosion to metal and elastomer parts. Hence, to improve the oxidation stability of the fuel, antioxidants can be used [2].

The purpose of this research was to study the oxidation stability of diesel/biodiesel blends with antioxidant additives using the method EN 16091) and the method PetroOXY (ASTM D7525- EN 15751) and the method PetroOXY (ASTM D7525-


Antioxidant I: \( R_1 = \text{OH}, R_2 = \text{H}, R_3 = \text{C}_4\text{H}_9 \)

Antioxidant II: \( R_1 = \text{OH}, R_2 = \text{H}, R_3 = \text{C}_{14}\text{H}_{29}. \)

Antioxidant III: 4-tert-butyl-2,5-bis (dioctylamino)-1- benzenol

Antioxidant Additives

The induction periods of the blends are presented extensively in the following figures.

Conclusions

As far as the biodiesel was concerned, it was observed that the aminic antioxidant (II) did not improve its oxidation stability. On the other hand, the two phenolic antioxidants I and III satisfied the specifications at the low concentrations of 50ppm and 100ppm respectively.

Moreover, during this study it was observed that both phenolic antioxidants improved the oxidation stability of all blends. However, the aminic antioxidant satisfied the specifications only for the blend of SR diesel/biodiesel B7. The B10 samples showed lower induction periods due to the increased ratio of biodiesel in the final sample, but overall similar behavior between the respective blends.

Finally, even so the SR diesel presented better oxidation stability than the HC diesel, the respective blends did not show similar behavior. More specifically, the sample of SR diesel/biodiesel B7 could not satisfy the specifications with the use of phenolic antioxidant II, whereas the HC diesel/biodiesel B7 needed only 100 ppm of the specific additive. Also, the SR diesel/biodiesel B7 treated with 200 ppm of the antioxidant additive did not meet the HC diesel/biodiesel B7 blend only 100ppm of the same additive.

Another interesting observation was that the only sample that satisfied the specifications for the aminic antioxidant was the SR diesel/biodiesel B7 at only 50ppm.

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References


