Does a possibility exist to optimize the fatty acid composition of FAME's in order to decrease the concentration of NO_x and PM in the exhaust gas composition?

Maes Rafael[1], Potters Geert[1], Lenaerts Silvia[2] and Contino Francesco[3]

[1] Department of Sciences, Antwerp Maritime Academy, Noordkasteel oost 6, 2030 Antwerpen, Belgium
E-mail: raf.maes@hzs.be
[2] Bioengineering, Antwerp University, Groenenborgerlaan 171, 2020 Antwerpen, Belgium
[3] Department of Mechanical Engineering, Brussels Free University, Pleinlaan 2,1050 Elsene, Belgium

As our natural resources of oil and gas are limited, we need to look for other means to produce energy. Moreover, the way we use our energy resources is equally unsustainable in view of pollution. Alternative energy sources are not only needed to avoid too much pollution but are a responsibility to a sustainable future. Two of the most widespread alternative energy sources are wind and solar energy. However, they are not bound to play a major role in maritime transport in the foreseeable future: while there is a start in using hybrid and electric cars, transport by sea is still fueled by mineral oil products. An alternative resource could be biodiesel. To have a sustainable biodiesel production however, we cannot use plants grown on arable land because the world population is in even greater need to fulfill its basic needs of food. One major solution for this is using the sea in which to grow seaweed or algae for the production of oils to process into a truly sustainable biodiesel.

The most common fatty acids found in vegetable oils are palmitic acid, stearic acid, oleic acid, linoleic acid and linolenic acid, which can be turned into methyl-esters (FAME). Each FAME has its own combustion characteristic from which automatically follows that they all produce NO_x and PM in a different way during combustion. The major objective of this research is therefore to create an optimized mixture of these FAMEs to minimize NO_x and PM production.

The effect of different biodiesels, RME and FAME0, was tested on a one cilinder diesel generator without turbo mechanism. There was a significant influence in producing NO_x and PM due to the different composition of FAME's in the biodiesel. We tested by means of effectsizeanalysis at 5% confidencelevel and found following results. The table below gives the results of the influence on the production of NO, NO_2 an PM of the different types of FAME where Czn is methyl palmitate, Can is methyl stearate, Cae is methyl oleate, Cat is methyl linoleate and Cad is methyl linolenate. Lowering the content of the elements with a positive effect size and increasing the content of the elements with a negative effect size provide a start for further determining an optimal fatty acid composition.

FAME0	Czn	Can	Cae	Cat	Cad
NO	NA	NA	NA	NA	NA
NO2	NA	NA	-0,028	-0,124	-0,24
PM	0,037	0,057	-0,074	-0,222	-0,604
RME					
NO	NA	NA	0,352	NA	0,837
NO2	NA	-0,243	0,047	NA	0,11
PM	-0,068	NA	0,153	NA	0,387

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