

DESCRIPTION

of the industrial invention bearing the title:

“Formulation of a new diesel fuel suitable for diesel engines”

5

The thermal engines with diesel cycle operation have an approximately 30% better thermodynamics performance than the ones with Otto cycle either fuelled with gasoline or GPL. The best efficiency of a diesel engine can be improved and optimized by means of the use of fuels on purpose reformulated
10 with the aim to increase the thermodynamics performance that is the conversion to task and in terms of economic return.

The formulation subject of this invention, due to the presence of specific components properly proportioned inside the blend, improves the fuel ignition grade and thermic tone. The vegetable oils contained in the blend advantage
15 interagency between the various components and concur to the fuel consumption and polluting output reduction. The carbon dioxide (CO₂) is reduced by about 50% and the particulate matter (PT) is reduce by about 60%.

The idea to develop a technologically useful product suitable for a large diffusion should meet also the environmental demands. The fuel formulation subject of this
20 invention associates the engine-thermodynamic efficiency with the environmental requirement and the production, on a large scale, of the fuel shall be concordant with the environment as well as economically convenient.

Diesel engines have between 6% up to a 10% transformation decrement in mechanical work (depending on its conformation), either at low RPM due to a
25 low turbulence flow, or at high RPM due to the fuel short stay in the combustion chamber. The cause is surely due to the incomplete and faulty combustion of the fuel blend because the particles with high hydrogen content burn first (low burning), while the particles at higher vaporisation (high boiling) are thermochemical decomposed generating almost pure carbon creating a reduced
30 flammability that, in the zone with lower temperature, produces unburnt smut

forming and diffusion of yellow flame in the exhaust.

To remove originally the reasons of such critical situation it is necessary to improve the flame speed up to 120-150 meter/second in order to enhance as fast as possible the thermal energy and to homogenously reduce, as much as possible, the energy quantity that activates the overall reactions in the combustion chamber, avoiding the zones where the combustion is already delayed.

The engine manufacturers have faced the problem using motoring solutions and with the aid of various devices aimed to increase the turbulence using whirling bypass ducts and bumps on pistons. They have also used valves with deflectors and median ball with MAN system, and similar technologies.

The results are surely appreciated but they have not a general effect that can be obtained working on the fuel, that doubtless is the main cause of the problem, through the use of specific components in the blend able to reduce the causes of the before mentioned inconvenience.

The invention is defined in the appended claims.

Using in the formula diethyl carbonate we will have in the combustion chamber the suitable quantity of oxygen derived from the molecule pyrolysis as its presence in the diethyl carbonate is more than 40%. Being the oxygen a gas heavily reagent it had the atomic particularity to link itself within microseconds with the molecules with difficult combustion that are inside the blend and that are the origin of smokiness.

In the first group of components there is a specific mix of nitrates (nitromethane, amyl nitrate, 2-hexyl nitrate) and propanone $\text{CH}_3\text{-CO-CH}_3$, , acetaldehyde CH_3CHO , Cyclohexane C_6H_{12} , diethyl carbonate, which generates an extremely amplified and homogenous turbulent status inside all the combustion chambers parts obviating zones with delayed or incomplete combustion.

Jojoba oil (*Simmondsia chinensis*) that is inside the vegetal oil blend, counteracted at pH7 and degummed, has a high Cetane number that reacts in perfect synergy with diethyl carbonate and nitrates mix, and the other oils as a part of the vegetal

oil blend like camellia sasanqua (thea sasanqua), brassica carinata, jatropha curcas are perfectly compatible with the other components e consequently usable in the formula in significant quantities, approximately 30% in volume.

In order to obtain the fuel formula claimed by the present invention, one must follow these steps:

- Create the chemical mix of Group 1, mixing all the elements as stated in fig.

1

- Create the vegetal oil blend of Group 2, mixing all the elements as stated in fig. 1

- Add Group 1 and Group 2 blends to standard diesel fuel, in order to obtain the formulated fuel claimed by the present invention.

It's important to remark that the best results achieved regarding both reduction of polluting emissions and increasing engine thermodynamic efficiency can be obtained only mixing all elements as stated in fig. 1.

The real innovation of the claimed invention is this double-problem solving: adding the chemical elements of Group 1 we solve the problem of avoiding zones with delayed or incomplete combustion, improving the fuel ignition grade and thermic tone; adding the vegetal oil blend of Group 2 we grow the Cetane number higher than 50 and obtain the reduction of polluting emissions .

From trials carried out on several type of diesel engines we achieved that the best formula volumetric composition is obtained mixing in volume 40% of the two groups of components with standard diesel fuel so that the formulated fuel, subject of invention, has a Cetane number higher than 50 and the exhausted quantity of carbon dioxide (CO₂) in the environment is reduced by 50% compared with the one exhausted by the standard diesel fuel as the carbon dioxide (CO₂) coming out by the vegetal oil combustion is already detracted during the vegetal plants grow.

It should be emphasized that the diethyl carbonate, as the new molecule produced for the purpose through the synthesis process already covered by an industrial patent application, is resulted from renewable sources for about its 80%, while the vegetable oils are resulted 100% from renewable sources.

As a matter of fact, the fuel reduce by approximately 50% its polluting emissions. In addition, the oils used in the process are farmed on top soils not reserved to agricultural food crops obviating the specific problems related to the use of agrarian soils. Using appropriate extraction techniques the vegetal oils have an industrial manufacturing cost lower than crude oil.

As a result of the above process the fuel made with the formula subject of this invention answers the energetic demands (for a higher thermodynamic performance) as well as the green demands as it offers the reduction of carbon dioxide (CO₂) (about 50%) and particulate matter (about 60%) with the guarantee of a beneficial economic result due to reduction of fuel consumption and better performance in thermodynamic conversion rate.

The volumetric composition of the fuel formula, subject of this invention, is stated in the fig. 1

CLAIMS

1. A formulation of fuel for diesel engines composed of the following ingredients:

(i) group 1 components consisting essentially of nitromethane CH_3NO_2 , propanone $\text{CH}_3\text{-CO-CH}_3$, 2-hexyl nitrate, amyl nitrate $\text{CH}_3(\text{CH}_2)_4\text{ONO}_2$, acetaldehyde CH_3CHO , Cyclohexane C_6H_{12} , diethyl carbonate;

(ii) group 2 components consisting essentially of camellia sasanqua oil, brassica carinata oil, jojoba oil, jatropha curcas); and

(iii) standard diesel fuel

2. A formulation of fuel for diesel engines as claimed in claim 1, where the percentage by volume of group 1 and group 2 components is between 10% and 60%, preferably from 15% to 50%, more preferably at 40% of the fuel formula

3. A formulation of fuel for diesel engines as claimed in claim 1, where the percentage by volume of group 1 is 10% of the fuel formula, in the best formula volumetric composition.

4. A formulation of fuel for diesel engines as claimed in claim 1, where the percentage by volume of group 2 is 30% of the fuel formula, in the best formula volumetric composition.

5. A formulation of fuel for diesel engines as claimed in claim 1, wherein the percentage by volume of diethyl carbonate is between 1% and 12%, preferably between 4% and 8%, more preferably at 6% of the fuel formula.

6. A formulation of fuel for diesel engines as claimed in claim 1, wherein the percentage by volume of nitromethane CH_3NO_2 is between 0.2% and 1%, preferably at 0.5% of the fuel formula

7. A formulation of fuel for diesel engines as claimed in claim 1, wherein the percentage by volume of 2-hexyl nitrate is between 0.5% and 3%, preferably between 1% and 2%, more preferably at 1% of the fuel formula

8. A formulation of fuel for diesel engines as claimed in claim 1, wherein the percentage by volume of Jojoba oil (*Simmondsia chinensis*) is between 3% and 10%, preferably at 5% of the fuel formula.

9. A formulation of fuel for diesel engines as claimed in claim 1, wherein the percentage by volume of camellia sasanqua oil (thea sasanqua) is between 5% and 15%, preferably at 10% of the fuel formula.

10. A formulation of fuel for diesel engines as claimed in claim 1, wherein the percentage by volume of jatropha curcas oil is between 3% and 15%, preferably at 5% of the fuel formula.
11. A formulation of fuel for diesel engines as claimed in claim 1, wherein the percentage by volume of carinata oil is between 3% and 20%, preferably at 10% of the fuel formula.
12. A formulation of fuel for diesel engines as claimed in claim 1 that has a Cetane number higher than 50.
13. A formulation of fuel for diesel engines as claimed in claim 1 that offers the reduction of carbon dioxide (CO₂) emission (about 50%) and particulate matter (about 60%).