WHY BIOFUELS

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ABSTRACT

It was clear that we are in global fimancial meltdown, and it was proclaimed, in the past two decades, as well and in the current and next one, the main guide in the development of automotive and engines tehmologies is, and will be, reducing of energy consumption, reducing pollutant emissions, especially NOx and PM emissions, and CO_2 emissions and use alernative fuels.

Production of alternative fuels from diferent agricultural feedstock has rised enormous interest during the last decade.

Alternative fuels are an opportunity for people to leave oil before it leaves them, ie. to slow down the exploitation of mineral resources, for whose exploitation of the main problem is today`s drilling technology ie. ultradeep wells, and not the reduction in reserves as it is proclaimed.

Alternative fuels, particularly from lignocelluloze ie. second generation biofuels are a great opportunity for the world economy and a great opportunity for increased employment. It is estimated that every 1% share of biofuels in total consumption of fossil fuels to create 45, 000 to 75,000 new jobs, primarily in rural areas. This is a great opportunity for developing countries, whose economy is based on agriculture ie. they are, for many goverments, as a means to contribute to the diversication of energy supply and sustain agricultural incomes by creating new outlets for several agricultural products, notably cereals, vegetable oils and sugar plants. Biofuels have a high potential for reducing emissions of pollutants, and they are biodegradable and do not pollute water and soil.

It is estimated that around 120 $x10^{15}$ W of light energy that reaches the Earth from the Sun is only about 7.2 x 10^{15} W ie. 6% used for biomass production. Given that the total consumption of energy for human needs in the world is around 15 $x10^{12}$ W, and, this means that the total production of bioenergy is five times then the total consumption. The main issue today, and in the future, is how to efficiently convert bioenergy from biomass into biofuel production.

From this aspect it is depicted why biofuels and the effect of bidiesel - blended diesel fuel on exhaust emission diesel engine.

Keywords: *Biofuels, Biomass, Diesel Engine, Diesel-Biodiesel Blend*

1. INTRODUCTION

Now we are in global financial meltdown. It is clear we have entered an era where cheap energy no longer exists. Global energy crisis can be solved only by a wave of innovations. Sole innovation industry can improve all aspects of human life. New innovations in all industrial branches, automotive industry in particular, will represent the basic source of productivity progress and competition can result only from hard work in scientific research laboratories employing scientists of integrity who will not serve any business lobby. However, in the hard times, the right people always rise to the top and find the right solutions with dwindling resources. The process of reaching those tough times solutions is crazed, but the results are always praised.

It is absolutely clear that we are in global financial meltdown, and the reduction of energy consumption and the protection of environment – exhaust emissions reduction, i.e. cleaner air, will be one of the main tasks of automotive industry in the next decades of 21^{st} century.

The transportation sector is major consumer of mineral oils. In this sector, diesel engines which have become dominant drive for heavy-duty vehicles and agricultural mechanizations, consume approximately 30% fuels, or about 11 million barrels/day worldwide and the growth of 2.5% per annum is expected to continue until 2020.

The greatest problem in automotive design is not drastically to reduces the exhaust emission or the fuel consumption in isolation, but rather to achieve both-improve the fuel consumption and cut the exhaust pollutant emission to almost zero.

Diesel automobile particulate emissions are claimed to cause human cancer. It is true that diesel engine particulate behave as flying objects in large areas, they are very hygroscopic, very sticky and penetrate deep into lungs because they are smaller than bronchioles (PM5= 0.005 mm). However, we do not often hear discussions about massive PM emissions emanating from the wear of asphalt and road base, tires, brakes and clutches. It is rather odd that petrol engine particulate emissions are not sanctioned as if petrol has not been derived from crude oil, and we all know that petrol engines are much more numerous than diesel ones.

Until 2005 concentration of hard particles in the air was limited to 150 $\mu g/m^3$ (EU) and since 1st January, 2005 the limit was set to 40 $\mu g/m^3$. Common sense can tell us that something is not right. How come that something that was not so hazardous, that medicine point of view, by the 31st December, 2004, had become most dangerous on the next day just by regulation changes? From the 1st January, 2010 European legislation anticipates reduction of average annual limit values for air quality to PM_{10} =25 $\mu g/m^3$ and NO_2 = 40 $\mu g/m^3$.

Therefore one gets an impression that all this is the result of a planned action by certain business interests in order to create fear, through media, and form a favorable atmosphere for national governments to bring discriminating regulations. So nowadays an automobile is declared to be nature's enemy No.1 although this is pure discrimination without any justification. On the other hand no society or individuals are willing to deprive themselves of automobile services. Since no adequate replacement for its power unit is to be seen in a foreseeable future, the development of an automobile will continue by evolution because revolutionary ideas will be prevented by business lobbies just as it is the case with pharmaceutical industry, or case in the official medicine which claim that the heart disease are consequence of higher cholesterol into blood. Because of that the medicine advised using vegetable oil instead of animal fats. That statements are incorrect i.e. it is terrible mistake [1].

The growth in the number of vehicles worldwide (Figure 1) has led to in increase global fuel consumptions (Figure 2) and air pollution and lower percentage CO_2 emission from the transport sector.

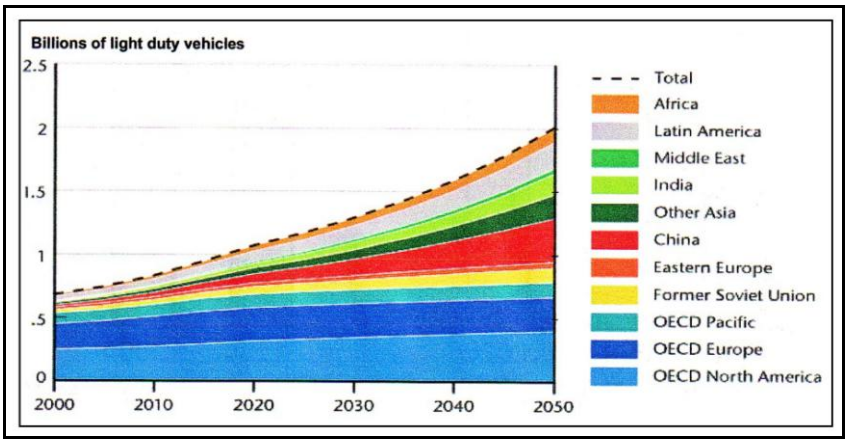

Figure 1. Future growth projected in motorization [2]

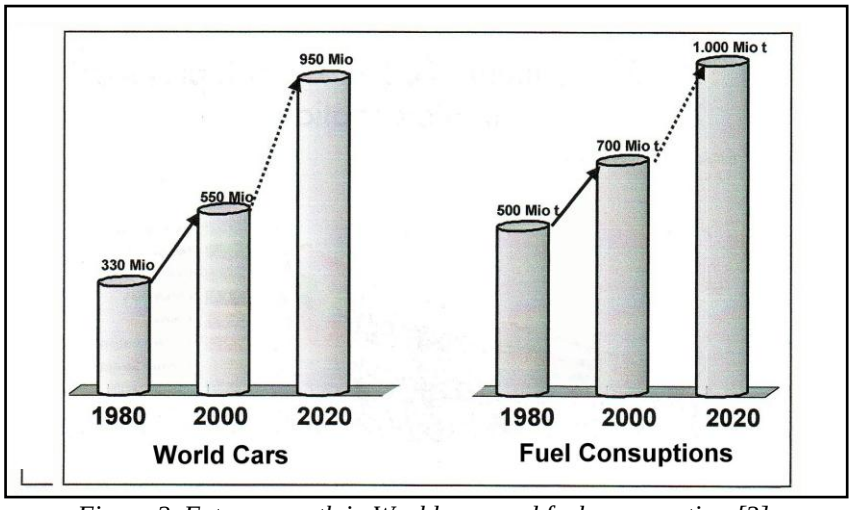

Figure 2. Future growth in World cars and fuel consumption [3]

For more five decades, especially in the last two it is emphasised that oil reserves are running low. It is relatively accurate if viewed in terms of getting that today's technology drilling, and in reality from the point of emergence seems incorrect. The theory (learning) that oil is formed in a geological period of deposition of the fossil remains for us it seems to be disputed. It is very likely that oil is continuously created deep in the earth's womb which is about 3000 km below the earth's crust, where there are C and H at high pressure to form hydrocarbons. Technological problems today are deep wells. For now go to a depth of 13 km, and thick crust is about 100 km. If the drilling depth up to that mantle with wells, ie. ultradeep, it would contain oil always.

The impossibility of performing ultradeep wells throws emphasis on alternative fuels which are obtained from food and feed crops (biofuels first genneration-1G) and biomass (biofuels second genneration-2G) [4].

In the first years of the last decade many countryies (USA, EU, Brasil, several countries in Asia) have very ambitious polich targets for biofuels. But the boom in the agricultural prices and the foloving food crisis in 2007-2008 have several depreciated the public image of biofuels because of their potential negative impact on world food security in a contect of land scarcity. First generation biofuels produced from traditional foodcrops are increasigly criticized for their adviser impact on world food security because they can divert land from food and feed, as well as land forest uses. As a result of it is turn to a quick development of second generation biofuels produced from various sources of biomass which do not directly compete with food and feed crops and, are expected to be more efficient in transforming biomass into bioenergy. However it should note the negative impact of remuving agricultural and foresty residues on the micrological and physical properties of soil. It is very important that biofuels unlike fossil fuels, they are not subject to geographical location- such as oil zone, and human factors-such as wear, but they are subject of of the green plants that cover the land surface of the Earth.The green plants mitigation water vapor and carbon dioxide.

While increasing traffic is an implication for the growth of a region's economy it also implies major challenges for industry, politics and society. First, in many densely populated areas the transport infrastructure is now reaching the absolute limits of its capacity and performance. Second, the shortness of non-renewable researches like mineral oil makes it essential to budget carefully. Third, road transport traffic is responsible for a lower percentage of the worlds CO_2 and pollutant emissions. Claims that the car is responsible for climate change due to CO_2 emission are unfounded, and political demands that reduce automotive CO_2 emission, there is justification only in terms of fuel consumption i.e. rational primary energy consumption.

Do you have launched and continuously spreading news about the catastrophic dangers of climate change due to global warming, as a consequence of human activities, facts, possible facts or fabrication depends on who chooses what to believe. In a campaign designed to market and political studies are included in all media, eco-lobbyists, politicians (e.g. Tony Blair, Al Gore), many scientific institutions, and the so-called. independent intellectuals and scholars, who in their own interests causing major damage but no only science and social progress in general, and the IPCC [5], as an advisory body of the United Nations, which is the main pillar of activity in the prevention of these conceived and launched catastrophic consequences of global warming as a consequence of anthropogenic activities increase in CO2 emissions. Hypotheses about the disastrous spread of risk by alarmism have no scientific basis, and are identical to intimidation of the people of bird's and swine's pandemic influenza, which creates a powerful pharmacy industry and their lobbyist's [6].

Many researchers [7-10] indicate a significant increase in the rhetoric of IPCC since the advent of Al Gore's film and book [11], which alarmism warn of the catastrophic consequences of warming due to anthropogenic increase of CO2 concentration. Critics [7-10] Al Gor`s alarmists alerts believe that they are biased, misleading, exaggerated, speculative, and totally wrong, and his reference to "moral obligation" called "moralist", which aims and attitudes of the IPCC to develop strong inter-state agreements that clearly define the global industrial development in the world of energy sources, without worrying that nearly 1.6 billion people in the world has no electricity, and another billion for poverty can not buy cars, but because everyone had a moral savior in fear of catastrophe anticipated as a result of climate warming caused by increasing concentrations of CO2 from human activities. Many believe that the IPCC was the main lobbyist alarmism warning Kyoto Protocol signatories to the agreement will cost trillions of dollars for its fulfillment, and if all signatory countries meet the conditions, the temperature would be lowered to 0.020^{o} C. That means, when the Kyoto stopped all traffic would not be fulfilled. It was more expensive than the various regional approaches to a global agreement. For that reason, A. Ilarionov the Kyoto Protocol, which called kyotoizm says that it is one of the most aggressive imposed destructive ideologies since the collapse of communism and fascism.

The growing global fuel consumption, the explosive growth in price of crude oil, ``limited`` sources and negative effect on environment by pollution and greenhouse effect has imposed increasingly use alternative sources globally, especially from lignocelluloses biomass. It is estimated that around 120 $x10^{15}$ W of light energy that reaches the Earth from the Sun is only about 7.2 x 10^{15} W ie. 6% used for biomass production. Given that the total consumption of energy for human needs in the world is around 15 $x10^{12}$ W, and, this means that the total productionof bioenergy is five times then the total consumption. The main issue today, and in the future, is how to efficiently convert bioenergy from biomass into biofuel production. Biomass means the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, as well as biodegradable fraction of industrial and municipal waste.

Two ways of transforming lignocelluloses biomass can be used: 1.biochemical and 2. thermochemical processes[12]

The use of biofuels in diesel engine could reduce the two major crises, namely the fossil fuel depletion and environmental pollution.

Biodiesel (1-G) can be obtained from a variety of renewable sources such as vegetable oils and animal fats. Vegetable oils from crops as rape, sunflower, soybean, peanut, coconut, palm, karanja, cotton, mustard, jatropha, linseed, and coster have been evaluated in many parts of the world in comparison with other non-edible oils [12].
It should be say that the present average efficiency of changing bioenergy into the energy of biofuels is less than 20%. It means that the problem is how to improve conversion efficiency from the solar energy to biofuel energy.
As far for biodiesel production it can assume that currently the world every year produce about 15 billion L of biodiesel, that is it far from the human needs, because there are about 620 M diesel cars around the world (consumption 6 l/100 km), and that the world's total output of vegetable oil was about 170 billion liter. It means that all production of vegetable oil would be used for biodiesel it would not be enough to run the total around the world. It means that the human needs to develop oil crops, and breed new oil crops. Some cereals are good candidates, such as barely and oats, because they are high yielding, and they are can grow in many place where the growth of rape seed is limited. On the other hand palm oil is confined to tropical area, while soy bean and sun flower can occupy a very large area of high quality land.
Use of biodiesel is catching up all over the world especially in developed countries. At present, USA uses more than 50 million gallons and European countries use > 350 million gallons of biodiese annually-mixed with fossil diesel.
The energy content of biodiesel (100%) is 10-12% lower then conventional diesel. This leads to roughly 2% lower energy content in B20 blend biodiesel in mineral diesel. In general, B20 will cost $ 0.20 to $ 0.40 per gallon more than mineral diesel.
There is interest in direct use of vegetable oils as straight or row vegetable oils (SVO or RWO), or of waste oils from cooking and other processes. Some researches [13-15] strongly indicates that the use of SVO will lead to reduce engine life. This reduced engine life is caused by the build up of carbon deposits inside the engine, as well as negative impacts of SVO on the engine lubricant. Both carbon deposits and excessive buildup of SVO in the lubricant are caused by the very high boiling point and viscosity of SVO relative to the required boiling range for diesel fuel. The carbon buildup doesn't necessarily happen quickly, but instead over a long period. Long-term operation results in operational and durability problems. The blends of vegetable oil with conventional diesel may mitigate the problems to some degree, but do not eliminate them entirely. Studies show that carbon build up continues over time resulting in higher engine maintenance costs and/or shorter engine life.
It would appear that research and development should also focus on transformation of lignocelluloses residues and waste from various sources in order to reduce collection and storage costs.
Figure 3 shows how the tendency to form carbon deposits increases with blending of a vegetable oil into a diesel fuel [14].

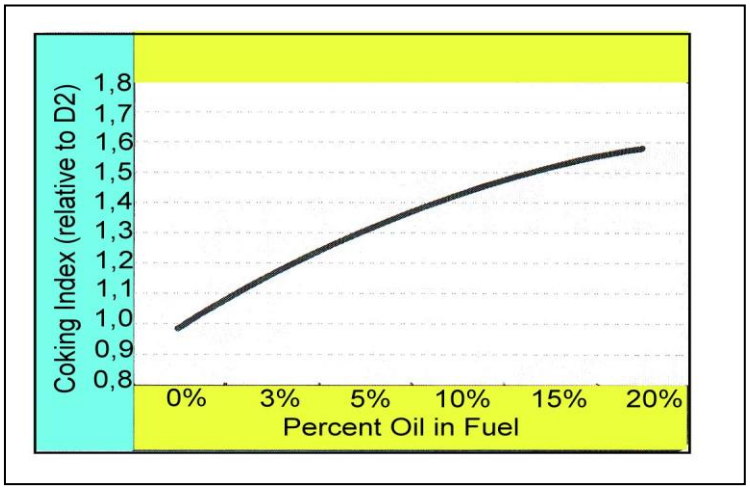

Figure 3. The tendency to form carbon deposits as function of percent vegetable oil into diesel fuel

2. EXPERIMENTAL

Tests of the effect of biodiesel and mineral diesel mixture on diesel exhaust emissions have been performed on a three cylinder tractors DI diesel engine (THDM 33/T~ TD 3.152 Perkins) of rated power 40.5 kW, 2250 R.P.M. swept volume 2.5 dm^3 , turbocharged KKK 14 with intercooler. The engine is an older design with an open combustion chamber in the piston, while nozzles have 4 holes with dia.0.28 mm each. Injection pressure is 210 bar and injection angle 12^0 . It is well known that the majority of investigations relating to the effect of fuel quality on diesel emissions are performed on engines of modern design that having considerably higher injection pressures and that have nozzles with greater number of holes.

Four types of diesel fuel have been used in this study: 1) regular diesel fuel (according EN 590: ρ=0.84g/cm^{3,} S=0.035%, CI=48.6, aromatics=26%) as a reference (BO), 2) mineral diesel-biodiesel 20% (B20 v/v blend of rape seed biodiesel-RME (ρ=0.86 g/cm^3 , CI=49.5) , 3) mineral diesel-biodiesel 30% (B30) v/v blend (ρ=0.87 g/cm^3, CI=52.7),, and 4) mineral diesel –biodiesel 50% blend (ρ=0.89 g/cm^3, CI=53.5)
It is observed that density of blends is higher, while the mass-based energy content is lower then those of mineral diesel. Diesel engine emissions were measured in accordance with ECE R96 Regulation, 8-mode cycle.

3. RESULTS AND DISCUSION

The value of specific emissions NOx and PM (g/kWh) for four types of diesel fuel are shown in Figure 4. They are the result of making an average value of an emission for each mode and basic parameters of engine functional characteristics.

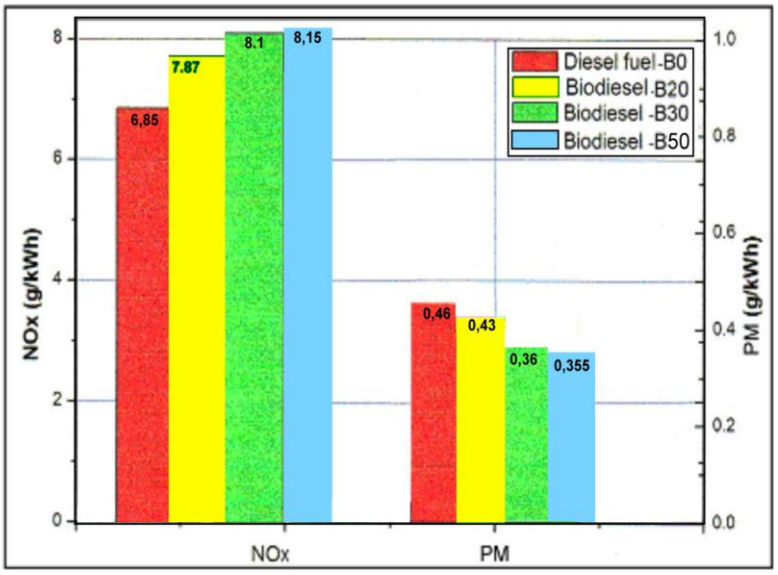

Figure 4. Specific PM and NOx emissions with four types of diesel fuels

It can be seen from Figure 4, that PM emission level of B20 and B30 fuel is decreased by 6.5 % and 21.7 % , respectively, in relation to the reference regular diesel fuel, while PM emission of B50 blend is approximately the same as ones of B30, whereas NOx level is increased by 12% and 15.4% in relation to the reference regular diesel fuel, while NOx emission of B50 blend is approximately the same as ones of B30.
It is unclear why PM emissions of B50 blend are not lower in relation of B30 ones. It should be said that it blend contain considerably higher, mainly, unsaturated fat acid. The composition of RME approximately is: 54% erucic acid (22:1), 12-24% linoleic acid, 6-15% linolenic acid (18:3), 7% eicosenic acid (20:1), 11-60% oleic acid (18:1) and 2-5% palmitic acid. Palmitic and stearic are the only two saturated fatty acids in minor amount in RME. It means that total unsaturated of RME is about 96% [16-18].
It is unknown exact cause of the increased NOx emissions for biodiesel. However, a number of fuel properties -as cetane number, density, heating value and iodine number, as well as operating conditions have influence on NOx emissions. The higher oxygen availability in the combustion chamber could promote higher NOx emissions. As far as PM there are several factors that contribute in the reduction of its [18]. The oxygen content of the bidiesel molecule, the absence of aromatics, the lack of sulfur, and the lower final boiling point of biodiesel are the main factors that govern PM formation.
Fatty acids containing one double bond posses the lowest iodine number. Increasing the number of the double bonds, the iodine number, thus the aptitude for polymerization increases, and oxidation stability decreases. The number of the fatty acids also influence on the properties of the product.
If triglycerides containing shorter fatty acids, the oxygen content of the molecule are higher, which improves the combustion and has a favorable effect on the emission and the cold flow properties, as well. The higher the density of the biodiesel fuel, the higher is its volume specific energy content. Thus, constant injection quantities of a lower density fuel results in leaner change mixtures and lower PM emissions.

4. CONCLUSIONS

The following conclusion may be drowning as a result of this study:

1. In the first years of the last decade many countryies have very ambitious polich targets for biofuels. But the boom in the agricultural prices and the foloving food crisis in 2007-2008 have several depreciated the public image of biofuels because of their potential negative impact on world food security in a contect of land scarcity.
2. First generation biofuels produced from traditional foodcrops are increasiglycriticized for their adviser impact on world food security because they can divert land from food and feed, as well as land forest uses. As a result of it is turn to a quick development of second generation biofuels produced from various sources of biomass which do not directly compete with food and feed crops and, are expected to be more efficient in transforming biomass into bioenergy.
3. It is very important that biofuels unlike fossil fuels, they are not subject to geographical location- such as oil zone and human factors-such as wear, but they are subject of of the green plants that cover the land surface of tth Earth.
4. Biofuels, particularly from lignocelluloses i.e. 2 -generation biofuels are a great opportunity for the world economy, esspecialy for developing country, and a great chance to increase employment, reduce the consumption of mineral fuels and reduce greenhouse gas emissions. Biofuels can gradualy reduce the dependance on mineral oil imports and reduction of energy dependence.
5. Studiously designed and launched the news, with the news media constantly repeated on the catastrophic dangers of climate change due to global warming, as a consequence of human activities in increasing concentrations of CO_2, are unfounded and with out scientific evidence.
6. Claims that the car is responsible for climate change due to CO_2 emissions are unfounded, and political demands to reduce automotive CO_2 emissions, there is justification only from aspect fuel consumption i.e. rational primary energy consumption, since CO2 emissions is directly proportional to fuel consumption.
7. The density and cetane index of mineral diesel– biodiesel blends is increased compared to the density of the mineral diesel fuel, due to the higher density of the biodiesel fuel.
8. PM emission level of B20 and B30 fuel is decreased by 6.5 % and 21.7%, respectively, in relation to the reference regular diesel fuel, while PM emission of B50 blend is approximately the same as ones of B30.
9. NOx emission level of B20 and B30 fuel is increased by 15-18%, respectively, in relation to the reference regular diesel fuel, while NOx emission of B50 blend is approximately the same as ones of B30.
10. Using blends of biodiesel and mineral diesel can reduce consumption mineral diesel and therefore reduce the dependence on mineral oil imports, and reduction of energetic dependence.
11.Biofuels can help to slow down the exploitation of mineral resources, for whose exploitation of the main problem is today`s drilling technology ie.ultradeep wells, and not the reduction in reserves as it is proclaimed.

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