RESEARCHES ON THE POSSIBILITIES OF USING ALTERNATIVE FUELS AT AUTOMOBILES AND TRACTORS MOTORS

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Abstract: *The present problems which mankind confronted with in the last 2 decades, related to the environmental protection and the instability of the petrol fuel prices led to the discovery of fuels based on vegetal oils (bio-fuels) which can be the quick answers in solving these problems. The later developments of theoretical and practical studies on the bio-fuels showed that, beside the good results already obtained, there are also negative effects (such as, the emission of emissions of nitrogen oxides), which demand the necessity of the deeper experimental studies in this domain. In order to replicate all the functional conditions of motors refueled with bio-fuels, the experiments are realized on the trial stand, based on a thorough process and a well defined methodology by the present norms .The purpose of the paper is to explore the possibilities of using alternative fuels, such as bio-fuels, to auto-vehicles motors. The material used for experiments are different tractor motors. The trial stands of motors refueled with bio-fuels have the advantage of allowing the locating of a big number of sensors, which get the necessary information, analised with the help of a calculus system. There are a big number of studies and researches related by the compatibility of motors with compression ignition with bio-fuels made by some motors constructors firms (Cummings), firms which make agricultural tractors (John Deer, Ford, Mitsubishi), firms which make auto-vehicles (Mercedes Benz, Ford, Dodge),firms making exchanging pieces and accessories (Fosseen Manufacturing and Development Co, Parker, Wilden Chemical, 3M,) as well as by universities and governamental agencies from the entire world. The originality of the researches consist in presenting the minimum of technical changes which must be realized over the following component parts and installations of motor: waterproofing elements, low-pressure conducts system of the fuel installation, elements of the injection pump, injectors and the fuel installation. The practical applications of the researches made in this paper can be immediate, both to the automobiles and tractors motors.*

Key words**:** *alternative fuel, biodiesel, supplying system*

INTRODUCTION

Considering the fact that in the last years the quest for alternative fuels is more and more actual, we want to research the possibilities of using some of bio-fuels at vehicles motors.

The alternative sources of energy are; the nuclear fuels, solar energy, wind energy and biomass energy. These energy sources have 2 major advantages compared to old fuels:

- They have a much more span life (fro example, nuclear fuels) or are completely regenerative (have an indefinite life span).
- Assures the decreasing of gases emulsions with green house effect (especially that of carbon dioxide).

This gradual passing from old fuelsto alternative sources of energy is considered an important contribution to the lasting development of the world economy.

One of the most important fuels used in our days are biodiesel fuels. They are metil-esters obtained from vegetal and animal fat, as a result of a trans-esterification process. Biodiesel can be used in all motors with compression ignition, alone or mixed with diesel oil, with small modification to the injection system. Biodiesel assures the same motor power as

diesel oil, having even the cetanic figure bigger than the ususal diesel oil. After researches, it was observed the the consumption is similar, at the same performances of the motor.

The biodiesel has very good lubrificant properties, such as its adding to diesel oil leads to a better protection of motor and of the other pieces in movement.

A disadvantage of biodiesel is the fact that it can deteriorate some rubber types, altering the gaskets and hoses. The biodiesel can also solve the sediments from the diesel oil, such as a period after putting it in the tank, there is the danger of dishing the filters, which must be changed more often than usually.

MATERIAL AND METHODS

The material used for experiments are different tractor motors.

In order to replicate all the functional conditions of motors fed with bio-fuels, the experiments are made on trial stands, based on a thorough process and a well defined methodology according to present norms. The trial stands of motors fed with bio-fuels have the advantages to allow the setting of a big number of sensors which take the necessary information, analised with a calculus system.

The researches were made starting from the single cylinder motors till the many-cylinder motors (12 cylinders), from the indirect injection of fuel, till the direct injection of fuels. During the researches, was changed the percent of bio-fuel in diesel oil (the percent of bio-fuel in diesel oil changed from 2 % to 100 %). Another aspect followed by us was the influence degree of different additives from bio-fuels over the physic-chemical properties of bio-fuels.

Through the experiments and researches synthesis made on world wide plan until present, we can make some considerations related to the necessary technical modifications in order to motors with compression ignition to function at the same functional parameters as those fed with diesel oil.

Minimum technical modifications which must be made over the componentor installations of motors

- **Tightening elements and low pressure conducts of the supplying system**

They present the lowest degree of chemical interaction with bio-fuel type B100. Considering the fact that the bio-diesel B100 represents a natural solvent, at supplying of motors with compression ignition, can appear significant deterioration of tightening elements (gasket type O) at long exposures. The most vulnerable component are those of natural rubber, polyvinyl and poly-propylene.

In case of using bio-diesel B 20 (the percent of vegetal oil from bio-diesel is 20 %), it was observed that there are no negative effects related to the compatibility of materials used for construction of tightening elements.

- **Elements of injection pump**

From the injection pump point of view, the different viscosity of bio-diesel and diesel oil leads to the necessity of making of some constructive modifications to the motor in order to have the same performances of the supplying with diesel oil.

Also, because of the viscosity properties of bio-fuel, at using pure vegetal (B100), its passing from the injection pump body inside the rejection element is made more difficult , the proposed solutions is that of changing the passing diameter.

- **Injectors**

In order to reduce the influence of viscosity and to increase the degree of pulverization of fuel inside the burning room, it was proposed the solution of adding the classic injectors with heating elements of bio-fuels (fig.1).

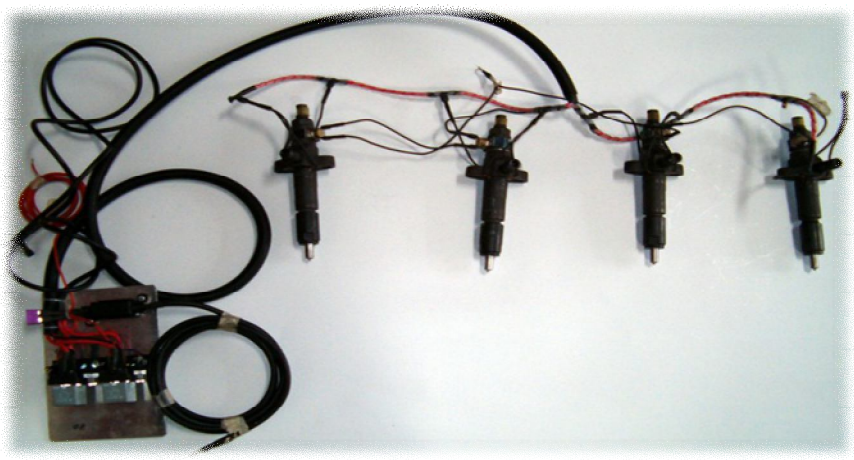

Figure 1. Heating elements mounted on injectors

• **Tank**

Especially when it is used bio-fuel as pure vegetal oil or when the percent of the mixture of bio-fuel and diesel oil is 80 % and 20 %, are recommended the following technical modifications: for increasing the fuel viscosity and stopping the forming of wax crystals is recommended the heating of bio-fuel in the tank or, another solution, is heating the bio-fuel with heat changing mounted on supplying system after tank (fig.2).

Other modifications that can appear at using bio-diesel to motors can appear to injectors, valves, the head of pistons and other pieces.

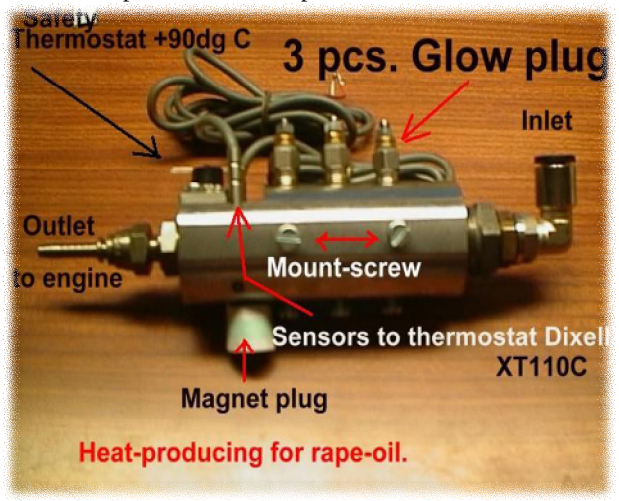

Figure 2. Heat changer mounted on supplying system

From the point of view of compatibility of material of tank, it is recommended using of aluminum, stainless steel and glass fiber in order to eliminate the potential oxidation reactions that can appear.

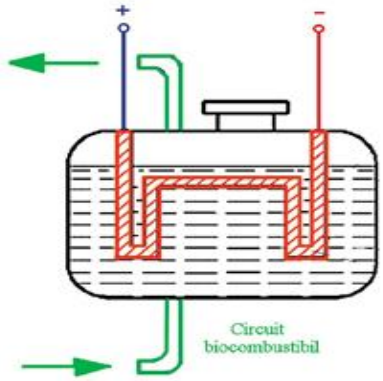

Figure 3. Heating instalaltion in the tank

RESULTS AND DISCUSSIONS

The systems which fulfill the requirements of easy using of motors fed with bio-diesel are mixt supplying systems, which allow initial start with diesel oil, functioning with bio-diesel and stopping with diesel oil.

The most important element of this system is the switch of fuel. Its role is to automaticly allow passing from the initial supplying with diesel oil (at starting and stopping) to supplying with bio-diesel. The switching is ordered through an electronic block, which senses with the help of a sensor the bio-diesel temperature, commands switching off the supplying circuit with diesel oil and changes the motor on bio-diesel supplying. It is recommended that the time of starting and stopping of the supplying with diesel oil circuit to be about 2-3 minutes.

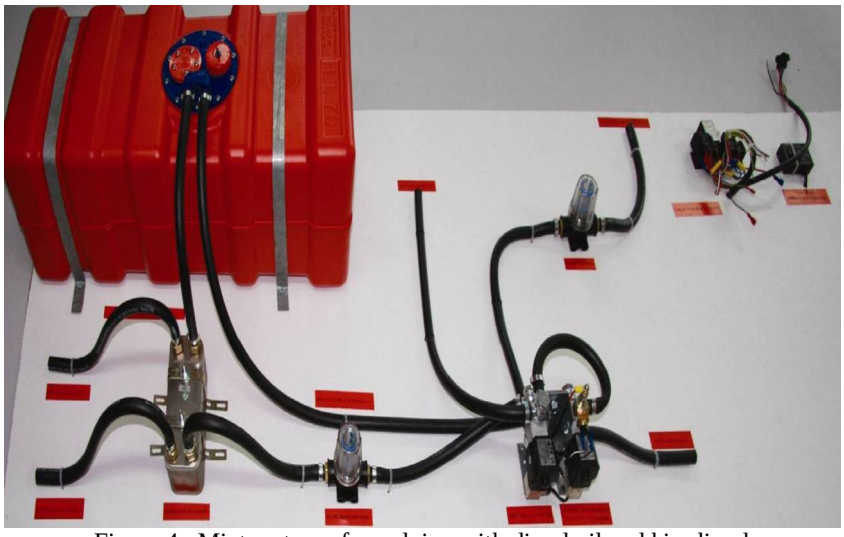

Figure.4. Mixt system of supplying with diesel oil and bio-diesel

CONCLUSIONS

As a result of studying the effects that biodiesel has over some components of motor, it was concluded that it influences in a negative way some of them. For example, the injectors, valves, the head of cylinders, the piston and crankshaft have sediments which influence negatively the good functioning of motor. Although, these shortcomings can be easlily eliminated through using some special aditives.

Considering all the aspects presented in this paper, we can conclude that using of bio-fuels is a valuable alternative to the classic fuels.

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