11. Prezentarea proiectului in limba engleza: (Max. 10 pagini)

11.1. The importance and relevance of the scientific content

Romania is a part to United Nations Frame Convention on climate changes, which is ratified by Low Act nr. 24/1994 and also to Kyoto protocol on the mentioned Convention, ratified by Low Act nr. 3/2001. In the convention our country is mentioned on the Appendix 1, among other countries either with developed or transition economy. Those international legal instruments mentioned above allow the countries stipulated on Appendix 1 to apply in a common manner the stipulations related to gases emissions reduction. Based on Kyoto Protocol, which become valid since February 16th 2005, Romania is going to reduce the greenhouse gases with 8 % in the first period (2008-2012) compared to reference year 1989.

In the EU, transport is responsible for an estimated 21% of all greenhouse gas emissions that are contributing to global warming, and the percentage is rising. In order to reduction of greenhouse gas emissions it is therefore essential to find ways of reducing emissions from transport.

The European Union decided that starting from 2005 the biofuels to be used at a level of 2% and so, in 2010 it will go up to 5.75%.

The marks proposed by the UE were missed except a few countries (Germany 3,75% and Sweden 2,23%), average EU 25 being 1% (Fig. 1).

The main causes being [4] of economic nature, legislative, technological and those concerning the ensurance of the first matter and those connected to the durability of the solutions, resources, for which, through the adoption of the directive "An EU Strategy for Biofuels" - COM(2006) 34, 8.2.2006 were established 7 levers, including reserches.

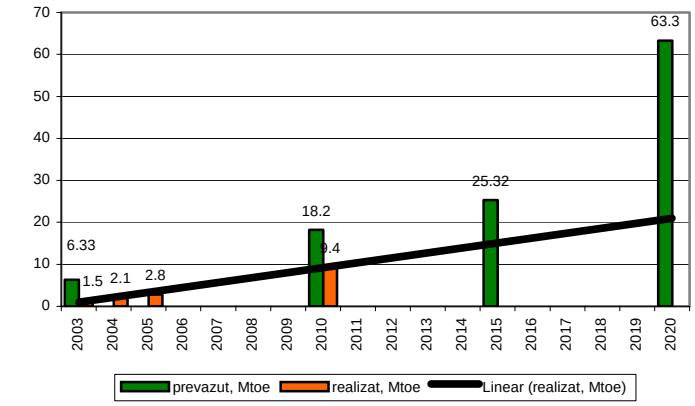

Fig. 1. Targets and treds of biofuel production in EU.

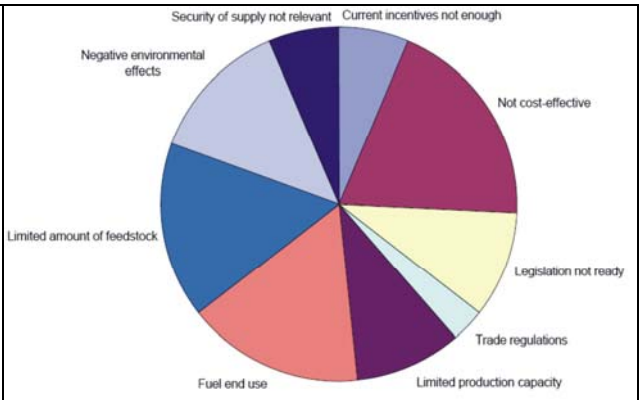

Fig. 2. Overall view on the barriers for 2005.

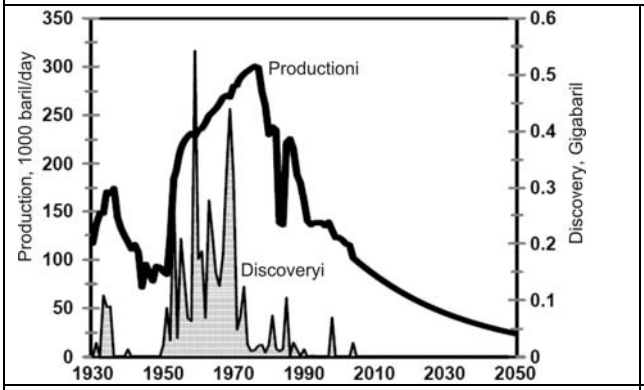

Fig. 3. Evolution and estimation.

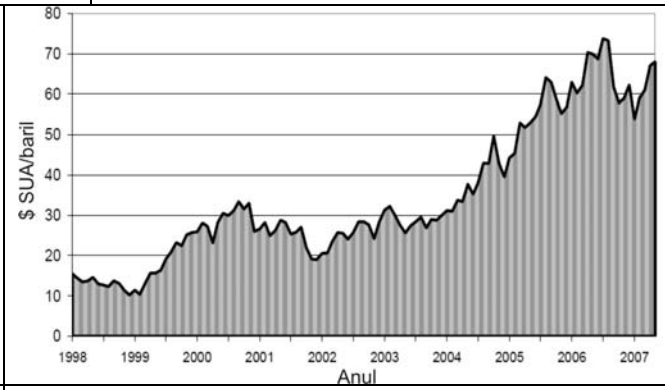

Fig. 4. Oil price.

Romania, through the harmonization of the national law with the European one, adopted Directive no. 30 from 8.03.2003 of the European Parliament through the Governs Decision no. 1844/2005 from 22/12/2005 concerning the promovation of the biofules use and other regenerable fuels for the transport, published in Monitorul Oficial, Part I no. 44 from 18/01/2006, updated through The Guvern's Decision no. 456/2007 from 16/05/2007, published in Monitorul Oficial, no. 345 from 22/06/2007, it establishes the concrete terms for the introduction of biofuels in the classics fuels composition:

Terms	Diesel oil	Gas
July 1st2007	minimum 2% in volume	
January 1st 2008	minimum 3% in volume	
July 1st 2008	minimum 4% in volume	
January 1st 2009		minimum 2% in volume
January 1st 2010		minimum 4% in volume

Biodiesel

Even if the father of compression ignition engines (Rudolf Diesel) predicted from the very beginning that those will be able to work fueled by vegetable oils (in spirit of this idea at the World Exhibition in Paris-1990 a compression ignition engines fueled by peanut oil was shown), still the usage of fuels based on vegetable oils became a priority only in the last years by reasons related to mineral oil scarcity and, mostly, related on environmental reasons. Research concerning the use of vegetal oil and their derivates as fuels for the compression ignition engines take place in our country but at a world level too, with their special results and applications. Still, the existent solution have their disadvantages:

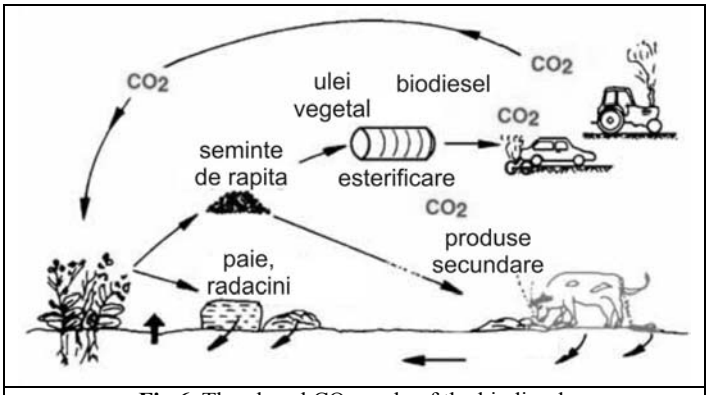

Fig.6. The closed CO_2 cycle of the biodiesel.

– could difficult start;

– higher viscosity of vegetal oil and their derivates, than the one of diesel oil, which makes more difficult the mixture between air and fuel;

– compensation of the viscosity through the rise of the injection pressure may lead to bigger solicitations of the injection system.

Biodiesel based on vegetable oils is a clean, biodegradable and renewable fuel and the biodiesel product technology is clean. Some countries are already using biofuel, pure or mixed. A good example in this way is urban transport in cities like Paris, Florence, Stockholm and Luxemburg where buses fueled by natural gases, biodiesel or sulphurless mineral diesel fuel are used. The same forms of fuels are supposed to be used also for utility vehicles.

Bioethanol

Concerning the use of bioethanol in a mixture with the diesel oil, research has showed that even though the history is not so big, the results are better.

In the compression ignition engines, the ethanol can be used as a fuel so:

- ethanol width 15% additives to delay the ignition, without modifying the engine [3, 7];
- pure ethanol in modified engines, the ignition being assured through spark,
- dual alimentation (two injection pumps and two injectors on a cylinder) ethanol and diesel oil; the ignition takes place thanks to a ignition doze (constant quantity, of cca. 10–15% diesel oil);
- the injection of 20-25% ethanol after the turbo compressor;
- the use of ethanol-diesel oil is the best solution, but, because the ethanol does not mix with the diesel oil, emulsions must be added (ethylic acetate);

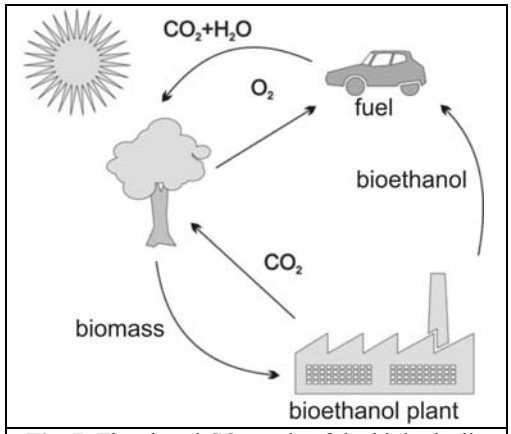

Fig. 7. The closed CO_2 cycle of the biologically produced ethanol.

The use of pure ethanol as a fuel for the compression ignition engines it has a series of disadvantages [7]:

– because of the small cetan number (2-4) and evaporation heat of the alcohol, it is necessary the adaptation of the engine and/or fuel

– the caloric power of the alcohol is smaller than the one of the diesel oil, which leads to minimize the engine power and rise of the fuel consumption.

The purpose of using the additives in case of using ethanol- diesel oil mixtures is triple [10]:

- the necessity of minimizing the ignition properties, because the cetan number of the mixture is smaller because of the ethanol,
- bringing to an original value the low viscosity of the mixture (which drops because of the small viscosity of the ethanol),
- keeping the stability of the mixture in chamber conditions at extreme temperatures, even in presence of water.

In [2] the comparative results are being presented through the trials made on a bus with Euro 2, with a few biological fuels, among which the mixture of 15% ethanol and diesel oil. It was showed that the Nox emission are lower but CO, HC and PAH grew comparing to diesel oil.. The level of pollutant emissions at other fuels were insignificant.

The [10] work presents the results of the tests made with mixtures of 25% ethanol with 69% diesel oil, 1% additive to diminuate the ignition properties and 5% emulsion on alcohol base with a highly content of carbon. The mixture was stabile at a temperature of -20°C.

In [2] are presented the results of the trials made with mixtures of 5, 10, 15 and 20% of ethanol on unmodified engines. In case of the 20% mixture of ethanol, was observed: the minimize of the engine power which was insignificant (3%), specific fuel consumption rose up to 9%, CO emission have gotten to 62%, and the NO_x have been minimized to 24%. The engine had an easy start both could and warm conditions.

The solutions adopted to a country level may be influenced by the economical-political factors. For example, according to a study concerning three solutions (with injection doze of diesel oil for the ignition, spark, additive to improve the ignition properties) in Brazil [9], for the series made engines the solution of diesel oil was adopted, which isn't very good concerning the reduction of the pollution, but it solves the dependence of petroleum import and the maximize of the alcohol production.

The bioethanolbiodiesel-bioethanol blends

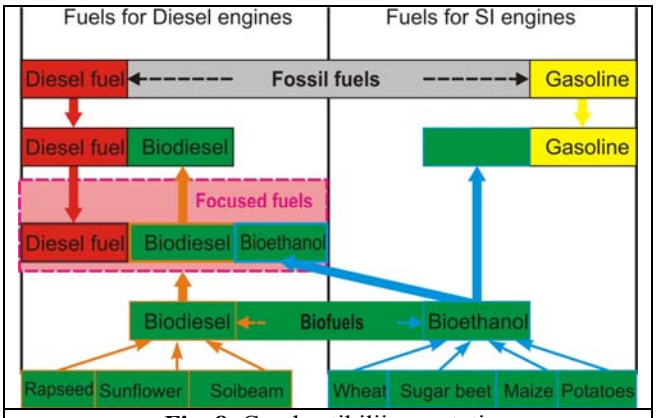

Fig. 8. Combustibilii cercetati.

An alternative, with real potential to use the diesel oil- biofuel mixtures is the one with three components, compose of biodesel–diesel oil–bioethanol. The idea stands on the fact that a series of properties of the two biofuels complete each other (Fig. 8, 9, 10, Table 1) and there is no reason for a third component to be used. The used additives are very expensive so, it is for the best if there is no need for them to be used and it is better that way especially for the selling price.

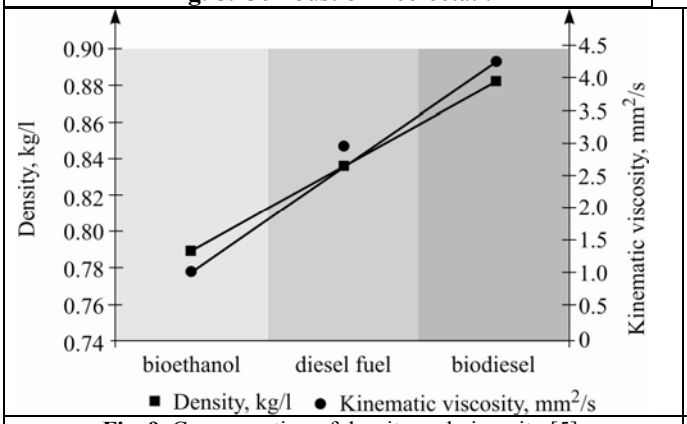

Fig. 9. Compensation of density and viscosity [5].

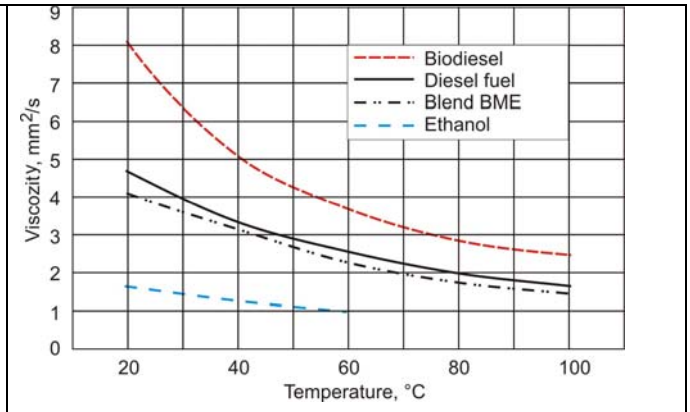

Fig. 10. Viscosity vs. temperature [11].

Table 1

Fuel type	Density	Viscosity	Heating value		Equivalence ratio
	kg/l	mm^2/s	MJ/kg	MJ/l	
Diesel fuel	0.84	3.0	42.7	35.9	1
Biodiesel	0.88	4.2	37.1	32.7	0.91
Bioethanol	0.79	1.0	26.8	21.2	0.60

References

1. AAKKO, P. – MAKELA, T.: Emission from Heavy-duty Engine with and without Aftertreatment Using Selected Biofuels. Helsinki, F02E195, Fisita 2002.
2. AJAVA, E.A. – BACHCHAN, S. – BHATTACHARYA, T.K.: Experimental study of some ferformance parameters of constant speed stationary diesel engine using ethanol+diesel blends as fuel. Biomass and Bioenergy 17, Thomson Scientific, 1999, p. 357-365.
3. BAUER, H. (editor): Diesel-Engine Management. Plochingen, Robert Bosch GmBH, 2004.
4. DEURWAARDER, E.P.: Overview and analysis of national reports on the eu biofuel directive. Prospects and barriers for 2005. Energy research Centre of the Netherlands, ECN-C--05-042.
5. EMŐD, I. – TÖLGYESI, Z. – ZÖLDY, M. Altenatív járműhajtások. Maróti Könyvkiadó, Budapest, 2006. p, 19-99.
6. HEINRICH, W.: Entwicklung und Erbrobung von Alkoholkraftstoffen für Nutzfarhzeung-Dieselmotoren. MTZ Motortechnische Zeitscrift, 48/3, 1987, p. 91-98.
7. MOLLENHAUER, K. (editor): Handbuch Dieselmotoren, Springer, 1997.
8. SATT DE CARO, P. et. ali.: Interest of combining an additive with diesel-ethanol blends for use in diesel engines. Fuel 80, 2001, p. 565-574.
9. SYASSEN, O.: Chancen und Problematik nachwachsender Kraftstoffe. MTZ Motortechnische Zeitscrift, 53/12, 1992, p. 560-568.
10. WEIDMANN, K. – MENRAD, H.: Fahrzeungkonzept und Flottenversuche mit Alkohol–Diesel–Mischkraftstoffen. MTZ Motortechnische Zeitscrift, 46/10, 1985, p. 373-377.
11. ZÖLDY, M. – EMŐD, I. – OLÁH, ZS.: Lubrication and Viscosity of the Bioethanol-Biodiesel-Bioethanol Blends (PT01-3), 11TH EUROPEAN AUTOMOTIVE CONGRESS – "Automobile for the Future", 30 May – 1 June 2007, Budapest, Hungary.

11.2. Project objectives

The general objective of the project is the discovery of a fuel dedicated to the diesel engines with a content of 20% biofuel, without the use of additives.
To this main objective, other smaller objectives join to be realized through other activities specific to each and every project:

1. Determination of the chemical-physical parameters of the fuel components.
2. Elaboration of the mixture recipes of biodiesel-diesel oil-bioethanol.
3. The qualitative elaboration of the analyzed mixtures.
4. The optimization of the injection process through numerical simulation.
5. The experimental deduction of the characteristics of the injection process.
6. The deduction of the economical parameters of the internal combustion engine through experimental tests.
7. The evaluation of the internal combustion engine pollution through experimental tests.
8. The impact of the study on the environment, social and economical impact in case the suggested solution is used.
9. Evaluation of the influence of tested fuels on the engine functions.
10. The trial of the fuel in exploitation.
11. The scatter of the results and promovation of the biofuels.

Achieving this objective will allow:
The partial substitution of the diesel oil used with biodiesel-diesel oil- bioethanol used in transports, minimizing the pollution of the compression ignition engines, especially of those with a warming effect.
Although there are researches on a world plan concerning the use of mixed fuels biodiesel- diesel oil- bioethanol they are small at a national level they represent only the beginning.
The project is important because of the biodisel which has a few problems which have not found a solution of improvement.
The originality of the project consists in the idea that the three components, biodiesel-diesel oil-bioethanol, combine their properties, the density and viscosity, which influence the doze of fuel, the quality of the fuel-air mixture, the burning process and eventually the quantity of the polluting gases made by the engine.
It is estimated that through the obtained results, both theoretical and experimental, especially experimental, the biofuels in the diesel oil can reach to 20% without major modifications in their built brought to the internal combustion engine. The modifications will be focused on the material used in the alimentation system with materials resistant to biofuels.
It is estimated that the project will have impact in multiple fields.
The nature and the complexity of the research involves, beside the mechanical engineering, chemistry knowledge, mathematics and informatics knowledge.

Project expected impact

Environmental impact	Social impact	Economic impact	Technical impact
• reducing the pollution in the urban areas according to the European Norms • reducing the pollution risk for soil and water • reducing the percent of abbandonated arable fields; • diminishing of the chemicals use in agriculture;	• life quality increasing; • increasing the population employability; • developing the economic life in the rural areas that had no other chances; • people education on the necessity of environment preservation and of pollution reduction.	• increasing the crop profitability; • increasing the arable land using degree in Romania • putting in value the pedo-climaterical conditions of Romania • diminishing the energy resources import; • decreasing the fuels expenses in the case of urban transport companies.	• basis for a new industry development; • technological transfer opportunities; • increasing the cooperation level between the scientists in the field from Romania and from abroad • development of high tech research directions related to the diesel engines.