BIOFUELS AND THEIR INTRODUCTION IN SLOVENIA
BIOGORIVA I NJIHOVO UVOĐENJE U SLOVENIJU

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Abstract: *This article concerns with the introduction of biofuels. The European Directive obligates European countries to gradually increase per cent of biofuels used for transportation. For some new EU state members like Slovenia this is not an easy task. Additionally, in the last time it becomes evident that biofuels can exhibit also certain negative influences on the environment. Therefore, the substitution of fossil fuels with biofuels at any price is not reasonable.*

Key words: *biofuels, greenhouse effect, carbon dioxide emissions, fuel life cycle*

Sažetak: *Rad obrađuje uvođenje biogoriva .Europska direktiva obvezuje zemlje Europe na povećanje postotka korištenja biogoriva u prijevozu.Za neke zemlje,nove članice Europske unije poput Slovenije to nije lak zadatak.Uz to u posljednje vrijeme postalo je jasno da biogoriva imaju neke negativne učinke na okoliš.Stoga je nerazumno zamijeniti fosilna goriva biogorivima po svaku cijenu.*

Ključne riječi: *biogoriva,efekt staklenika,emisija ugljičnog dioksida,životni ciklus goriva*

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1. Introduction

Use of biofuels for internal combustion engines powering is known for more than hundred years. It is well-known that the inventor of the compression ignition engine dr. Rudolph Diesel, during the presentation of his invention at the world exhibition in Paris in 1900, used peanut oil as a fuel. Oil derivatives later, due to their lower price, almost completely replaced biofuels. However, in the last years biofuels have become very actual, because of increasingly more evident signs of greenhouse effect and related climatic changes.
European Union presented directive, which binds state members to assure until 2020 at least 10 per cent of energy used in transportation from biofuels. Particularly for the new EU member states as is Slovenia this can present quite a difficult task. This EU directive includes biodiesel as well as bioethanol. However, it seems that in Slovenia there is planned to fulfil the requirements mainly with biodiesel introduction.

2. Production of biofuels

European Union (particularly Germany) is the world leading producer of biodiesel. As the main source for biodiesel production in Europe rapeseed oil is used, meanwhile in the Northern America soybean oil is prevailing.
Bioethanol (ethanol produced from biological sources) is used instead of gasoline in spark ignition engines. In Brazil, where it was introduced because of economical reasons, bioethanol is used widely from the end of 1970's and is produced from cane sugar. There is evident a considerable increase in bioethanol consumption for transportation in the United States in the last eight years (after 2000). In United States bioethanol it is produced mainly from corn.

3. Environmental aspects of biofuels

When compared with the conventional fossil derived diesel fuel biodiesel consumption produces lower emissions of pollutants except nitrogen oxides (Biodiesel Fact Sheeet, 2007). However, in the case of biofuels the aspect of carbon dioxide emissions is still more important than that of classical pollutants. Biofuels are considered as carbon neutral fuels – it means that their use does not produce any net emissions of carbon dioxide.
Naturally, as biofuels consist of organic compounds, their combustion is not free from carbon dioxide emissions. In the case of bioethanol there appear some additional emissions of carbon dioxide during the process of fermentation. However, all these emissions are compensated by the carbon dioxide taken from the atmosphere during the photosynthesis by the growth of plants which are then used for biofuel production. Therefore, ideally the life cycle of biofuel does not produce any net contribution to the greenhouse effect. Unfortunately, in the real circumstances biofuells are not always environmentally beneficent.
The gradual substitution of fossil derived fuels with biofuels is expected to contribute considerably in reducing of greenhouse gases emissions. The chances of national

agriculture prosperity as well as reduced dependence on imported fossil fuels are estimated as advantages of biofuels, too. The European Union directive therefore provides that 5.75 per cent of all fuels, used for transportation, in 2010 and 10 per cent in 2020 should derive from renewable biological sources.

Unfortunately, it proved that biological origin of the fuel does not automatically mean environmental benefit. The enhanced demand on biofuels has an important influence on the agriculture.

There appears a competition between food production and fuel production. It is common the opinion that increasing prices of food which have broken out in the last period are to a high degree provoked by biofuels. Cultivation of certain plants frequently used for biofuels production demands intensive use of pesticides and mineral fertilizers.

Therefore, it is important from which plant biofuel is produced and the way how this plant is grown. By the example, cane sugar for bioethanol production and palm oil for biodiesel production seem very attractive sources. Both of them derive from plants growing in tropic environment. The enhanced request for these resources requires additional surfaces for plants cultivation which are acquired mainly by deforestation.

Deforestation process has extremely negative environmental consequences which range from negative influences on biodiversity to increased greenhouse gases emissions. Namely, tropical rainforest is very efficient sink of carbon dioxide. When the forest is replaced by fields on which monocultures are growing the extent of photosynthesis per area unit decreases markedly. This presents net increase in carbon dioxide emissions which can not be compensated with the effect reached when fossil fuel is substituted with biofuel (Rosenthal, 2008). The intensive production of biofuels in undeveloped countries will still aggravate the starvation problem in this part of the world.

The intensive cultivation of plants as well as biofuel production requires a certain energy input. The important characteristic is the ratio between energy input and output. This is particularly significant as the energy used for plant cultivation and biofuel production often derives from fossil fuels.

A low output/input ratio therefore means a poor contribution to lowering of greenhouse gases emission. Output/input ratios for biofuels deriving from different plants range from 1.3 for corn and 2.5 for oil rape to 8.0 for sugar cane (Wilkipedia, 2007; Bourne, 2007; Vuk, et al., 2008).

The output/input ratio is particularly unfavourable for corn, which is the main source for bioethanol production in the United States. Much better is this ratio for sugar cane. However, cultivation of sugar cane demands tropical or at least subtropical climate. Cellulosic ethanol can obtain very high ratios (from 2 to 36) depending on the mode of production as ethanol can be produced from lignocellulosis using many different plants (Wilkipedia, 2007).

This method is, similarly as biodiesel production by algae, very promising as it is essentially not competitive with food production (Bourne, 2007; Briggs, 2004; Sheehan, et al., 1998). Cellulosic ethanol and biodiesel from algae are both designated as second generation biofuels. However, both methods are not developed

yet to the level at which they can be exploited commercially and thus, until recently, they remain very interesting options for future but not realistic choice at this moment. Therefore, biofuels derived from more conventional sources should be used to fulfil the EU directives. Introduction of biofuels at any price, as mentioned, can cause more environmental harm than benefit.

4. Situation in Slovenia

Regarding the greenhouse gases emissions in Slovenia the emissions deriving from traffic are particularly problematic. According to the data for 2006, by comparison with various sectors, traffic is on the second place (after energetics). The contribution of traffic to the total emissions rose from 10 per cent in the reference year 1986 to 23.3 per cent in 2006 (Mekinda Majaron, 2008).

In Slovenia biodiesel use was introduced in 2004. In 2005 appeared certain problems with biodiesel fuel quality which caused a temporary interruption of biodiesel application. In 2006 there was observed considerable increase in the application of biofuels. The provided quota, however, was not reached.

The average share of biofuels in the entire fuel quantity used for transportation in Slovenia in 2006 was 0.328 per cent in mass units and 0.275 per cent in energy units (Tauzes & Bizjak, 2007).

According to the manufacturers data in Slovenia in 2005 about 6,000 tons of biodiesel were produced and approximately one half of this quantity was exported. The main raw material used in production is rape seed oil. It is estimated that in Slovenia maximally 7,000 hectares can be exploited for oil rape cultivation. As minor sources for domestic production also sun flower oil and waste oils are provided. A certain part of necessary biodiesel quantities also in the future is expected to be provided from import (Tauzes & Bizjak, 2007; Environmental Indicators, 2008). Actually in Slovenia is operating one biodiesel factory with the annual capacity of 10 thousand tons.

Another factory with the same capacity is momentarily out of operation because of conflagration and another one with greater capacity (50 thousand tons) is projected for 2010. There is also planned the same capacity for bioethanol factory which will operate on the location of abandoned sugar factory.

5. Conclusions

Substitution of fossil derived fuels with biofuels a few years ago seemed an efficient measure to lower greenhouse gases emissions. Unfortunately, it becomes more and more evident that the situation is more complicated and the problem may not be considered linearly.

When considering a certain kind of fuel, the entire fuel life cycle must be taken into consideration – not only fuel consumption and direct production but also all the accompanying activities needed. In the case of biofuels such activities are land preparation, use of fertilizers, pesticides etc.

To value the actual impact of a certain kind of biofuel on the environment all influences on the environment must be taken into consideration and an objective

evaluation of greenhouse gases emissions performed. Besides environmental influences also other possible effects as are social and economical are very important.

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