

## A BRIEF DISCUSSION ON BIOFUEL PRODUCTION

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**ABSTRACT** - Looking up to a future energy crisis, new solutions have to appear. Using renewable natural means we can replace the existing demand for fossil fuels, preserving not only our non-renewable resources but also our environment.

New technologies are making their way towards sustainability. Implementing different methods, such as the Fischer-Tropsch reaction, fuels like green diesel will be produced. With the help of these biofuels we will be able to reduce the exhaust emissions and fossil fuel consumption.

Feedstock such as soybeans, palm trees will help develop a new way of life. These changes will not help only in the development of new fuels for the automotive industries but also in the food department, by producing cooking oil.

### INTRODUCTION

There has been registered a relatively fast growth regarding the energy demand. We use more and more different technologies that require different types of fuels. Therefore we neglect the fact that those fuels are non-renewable. People tend to think that all there is on this planet should be used, without thinking of the future that has to come. The rising scale of demands regarding energy is hard to face. Here it appears the need for a new method of satisfying these requests.

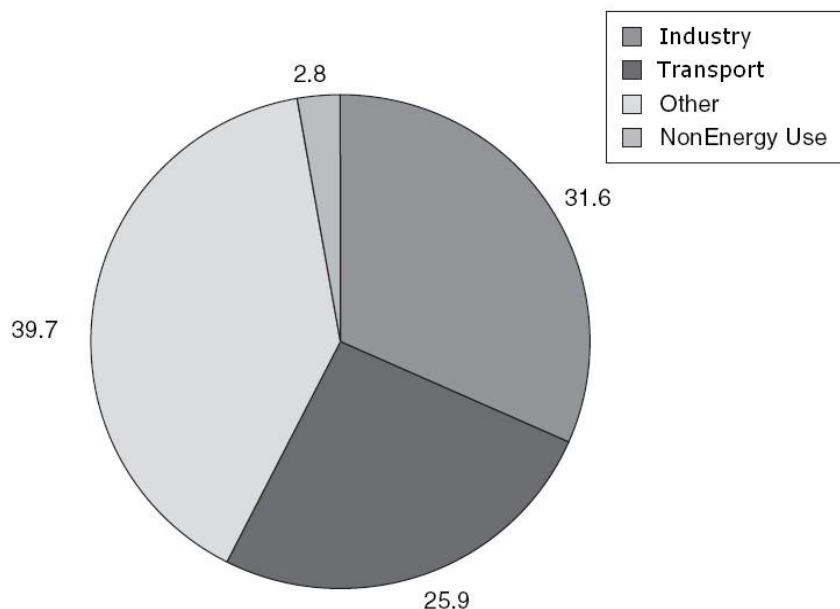


Fig. 1 World energy demand by economic sector (From “Fuelling our future - An introduction to sustainable energy”, Robert L. Evans, pg 40)

One of the areas that need most attention is transportation. Every one of us is in need of a

mean of transportation; that helps us live our everyday lives. Using the bus, or our personal car, we find a way of making it useful. Nowadays, the demand for fuel has increased so much that we need to find a solution that may help our rapidly decreasing resources preserve. Furthermore, another important issue, besides fossil fuel consumption, is pollution due to an incomplete burn of the fuel. Therefore we need to find new solutions to fuel our cars, solutions that will help reducing the exhaust emissions.

## **GASOLINE AND DIESEL FUEL**

Traditional transportation fuels can be classified as gasoline, diesel fuel and jet fuel. Regarding the first two types of fuel, they are meant for spark ignition engines (gasoline) and compression ignition engines (diesel fuel). Gasoline is formed of different hydrocarbons obtained from a large number of refinery processes. Diesel fuels are also a mixture of light distillate hydrocarbons, with lower volatility and higher viscosity. These traditional fuels are made from non-renewable resources that are slowly decreasing. Next to be discussed are bio-based fuels. Currently dominating the market are ethanol and biodiesel.

## **BIOFUELS**

### **ETHANOL**

Ethanol can be obtained from the fermentation of vegetal products such as sugar and starch crops. Regarding its power, this kind of fuel has only 66% of the heating value of gasoline. In order to produce a substantial amount of energy is needed, especially for distillation. Another thing to have in mind is that if a plant is rich in sugar but lacks additional fuel, one must consider an alternative fuel source such as wood. Therefore sugar cane is the best option, producing sugar from its sap and fuel from the squeezed out stalks (bagasse).

The production of ethanol starts with the extraction of juice from the bagasse, which can be made mechanically by squeezing or by extracting it with water. Then the juice is diluted to allow fermentation and placed into vats. There a yeast culture is added. The juice has to be maintained at 37° C, the carbon dioxide starting to evolve. The substance resulting, like a whine, has 10% alcohol, and it's transported to be distilled.

Ethanol can be diluted in water, so they form an azeotrope, which has the boiling point at 78.2° C considering normal pressure. The alcohol and water distill with a fixed composition of 95.6% alcohol. To get to a higher percent of alcohol, a big amount of energy is needed.

Distillation holds two resulting products: leftover solids and concentrated ethanol. The solids that result due to distillation are rich in nutrients. The only problem to be noticed is their disposal, being a polluting source if not thrown correctly. Therefore a need for it has been found. It can be used as fertilizer, but the distillation station has to be near the plantation, because its transportation represents a problem.

Ethanol represents a very good bio-fuel substitute, but only for gasoline. The next ting to have in mind is to find a way to switch all petrochemical fuels to renewable ones.

### **BIODIESEL**

Biodiesel represents a mono-alkyl ester that is derived from lipid feedstock. Its chemical



## FEEDSTOCK

To produce biodiesel and other renewable fuels, we need some prime material, which is called feedstock. There exists a large variety of feedstock, some of them showing a big potential as a future fuel component.

### SOYBEANS

Cracking the seed of soybeans produces the soybean oil. To extract the oil it's used a solvent such as hexane. The finished product is used not only as cooking oil but also in the production of biodiesel. Compared to other oil crops, the production of soybean oil is quite low. Even though the oil yields are low, soybeans are capable of atmospheric nitrogen fixation, and therefore no special pesticide is needed, causing less water pollution.

### RAPSEED

Rapeseed oil is mostly the choice regarding Europe when it comes to biodiesel feed stock. Its major disadvantage is the big need of nitrogen fertilizer that will pollute the water. Compared to the soybean oil it holds a bigger production rate.

### PALM OIL

Nowadays palm oil is one of the most used worldwide. It has one of the biggest production rates, being also very promising when it comes to biofuels. The disadvantage is that in order to obtain a large amount of oil deforestation appears, therefore plans for planting new trees instead of the ones that were cut is needed.

### ALGAE

In this case, there are some species of algae that can produce lipids, which can help at the production of biodiesel. They have the highest rate of oil production, thirty times bigger than that of the palm oil. The only challenge is the technological means needed for the processing.

The world we live in has limited resources and a declining stock of fossil fuels reserves. Every one of us aspires to a higher standard of living. The energy policies that we presented are an attempt to balance all needs of the common citizen. These measures must consider the ecology of the planet so that the future generations will not be affected and will have the opportunities that we had.

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