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BIODIZELSKO GORIVO U HRVATSKOJ – TEHNOLOŠKA I POSLOVNA KONCEPCIJA

Sažetak

Projekt proizvodnje biodizelskog goriva u Hrvatskoj nakon nekoliko godina priprema i studijskog rada u područjima: tehnologija, osiguranja sirovina, priprema tržišta, te organizacijska struktura proizvodnog lanca "od polja do motora", ulazi u fazu odlučivanja o realizaciji. Odluka na razini EU, te društveni interes RH u području zaštite okoliša, zapošljavanja i korištenja prisutnih resursa stvaraju pozitivnu klimu u odnosu na taj projekt.

Tvrtka Maziva Zagreb d.o.o. član INA grupe namjerava izgraditi postrojenje na svojoj lokaciji kako bi se iskoristile postojeće prednosti tehnološke i intelektualne infrastrukture u Mazivima Zagreb i INA Grupe, te omogućio sinergijski razvojni učinak u području specijalnih proizvoda.

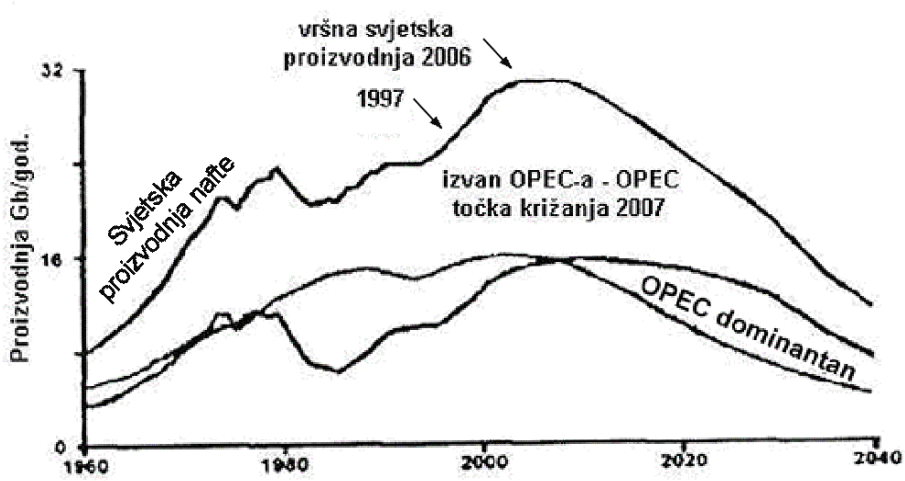
UVOD

Nakon nekoliko godina priprema i studijskog rada u područjima tehnologije, osiguranja sirovina, pripreme tržišta, te organizacijske strukture proizvodnog lanca projekt proizvodnje ulazi u fazu odlučivanja o realizaciji. Rentabilnost proizvodnje estera uvjetovana je prvenstveno cijenom sirovine i ograničenjima izlazne cijene proizvoda kroz uvjete na tržištu dizelskog goriva i glicerina. Državni poticaji za proizvodnju uljane repice ponekad nisu dovoljni za pozitivno poslovanje tog proizvodnog lanca. Hrvatska nije do sada dovoljno razvila proizvodnju uljane repice, tako da postoje poteškoće u osiguravanju sirovine. Navedene poteškoće postoje i drugdje u svijetu te su dovele do razvoja novih proizvodnih postupaka i organizacijskih koncepcija kojima se osigurava prosperitet te proizvodnje. Istodobno je uočena korisnost biokomponente kao modifikatora svojstava mineralnog goriva, te naftne tvrtke postaju ključni potrošači metilnog estera biljnih ulja. U Hrvatskoj se potencijal potrošnje biokomponente u rafinerijama nafte Urinj i Sisak procjenjuje na 35 - 45000 tona godišnje (3- 5% dodatka dizelskom gorivu po EN590). Korištenje Biodizela 100 kod specijalnih potrošača za sada ne bi bilo veće od 5000 tona godišnje. Tehnološka i poslovna, tj. tržišna koncepcija realizacije projekta

proizvodnje biodizelskog goriva u Hrvatskoj se ukratko može sažeti na sljedeće zahtjeve:

- Tehnološki postupak omogućuje preradu svih masnoća (biljna ulja, otpadna biljna ulja, otpadne životinjske masnoće) na način da izlazni proizvod zadovoljava sve zahtjeve europske / hrvatske norme i potrošača.
- Fleksibilnost u izboru sirovina i mogućnost proizvodnje estera potrebne čistoće omogućuje raznolikost estera na izlazu, tako da se proizvodi mogu po višoj cijeni plasirati i izvan energetske primjene kao sirovine za kemijske i druge specijalitete.
- Glicerin koji je nusproizvod, doraditi u proizvode koji se onda mogu plasirati po višoj cijeni.
- Kapacitet postrojenja postaviti na 50-60.000 tona estera godišnje.
- Realizaciju postrojenja esterifikacije i ukupnog poslovnog sustava u lancu provesti u savezništvima različitih formi s domaćim i inozemnim tvrtkama.
- Zaštitu društvenog interesa u dijelu proizvodnje uljarica postići strateškim partnerstvom s nekom od države / vlade zaduženom institucijom / tvrtkom.

Slika 1: Životni ciklus nafte
Figure 1: Life Cycle of Oil

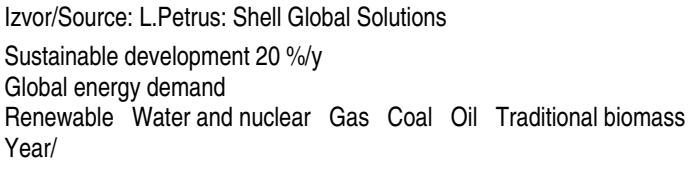


Izvor/Source: Connemann 2002-World Petroleum Cycle

/ Peak global production 2006
Production Global oil production Outside OPEC Crossing point OPEC-dominated/

Razvoj goriva uvjetovan je ograničenim resursima nafte u svijetu. Iz slike 1 vidljivo je da se vršna eksploatacija nafte očekuje već 2006. godine, nakon čega slijedi postupan, ali značajan pad eksploatacijskih mogućnosti. Posljedica mora biti orijentacija na druge izvore energije. Prema globalnim istraživanjima kompanije Shell do 2060. godine udio energije iz obnovljenih izvora narast će na vrijednost od 50% - vidi sliku 2.

Slika 2: Scenarij opskrbe energijom
Figure 2: Energy Supply Scenario



Navedena kretanja pratit će i razvoj industrije vozila. U cilju smanjenja zagađenja okoliša donose se sve oštriji kriteriji u pogledu kvalitete goriva. Zahtijeva se gorivo bez sumpora i aromata, kao i neprekidno smanjivanje specifične potrošnje goriva. Prema istraživanjima tvrtke Snamprogetti, razvoj tržišta vozila ići će prema povećanju udjela vozila na dizelska goriva, jer ona ostvaruju nižu specifičnu potrošnju – vidi sliku 3.

Biodizel kao gorivo za motorna vozila - dosadašnje aktivnosti

Poznata je činjenica da biodizel ne sadrži sumpor ni aromate, a u cjelokupnom lancu proizvodnje i potrošnje daje efekt smanjenja CO_2 (greenhouse effect), te je naročito s gledišta zaštite okoliša dobro došao kao energent.

Zbog navedenog razloga je 2001. godine izrađen Projekt Biodizel - uvođenje biodizelskog goriva u RH u sklopu programa BIOEN - Program korištenja energije biomase i otpada. Nositelj projekta je MInistarstvo poljoprivrede i šumarstva, a studiju su izradili:

- □ Agronomski fakultet poljoprivrede i šumarstva
- □ Energetski institut "Hrvoje Požar"
- □ INA d.d.
- □ Sabor RH
- □ Ministarstvo poljoprivrede i šumarstva
- □ Ministarstvo gospodarstva
- □ Ministarstvo financija
- □ Ministarstvo zaštite okoliša i prostornog uređenja
- □ Ministarstvo znanosti i tehnologije

Slika 3: Razvoj tržišta vozila
Figure 3: Vehicle Market Development

Vehicle production in Europe
Market division
Conventional gasoline DI/Advanced Direct Injection Gasoline DI/Advanced Direct Injection Diesel IDI diesel
Hybrids Fuel cells

U okviru razmatranja ukupne problematike izvršena je i simulacija troškova proizvodnje metilnog estera za različite kapacitete, kako je to prokazano tabelarnim prikazom (tablica 1).

Tablica 1: Troškovi proizvodnje metilnog estera za različite kapacitete

Kapacitet proizvodnje t/god	Troškovi proizvodnje (HRK/t biodizela)	Troškovi proizvodnje (u %)
2000	4620	100
5000	3770	82
15000	2900	63
45000	2230	48

Izvor: Projekt biodizel u sklopu programa BIOEN-Hrvatska

Iz tabelarnog prikaza je uočljivo da se troškovi proizvodnje biodizela rapidno smanjuju s povećanjem kapaciteta postrojenja. To upućuje na činjenicu da je, prvenstveno zbog ekonomskih razloga, orijentacija na izgradnju postrojenja većeg kapaciteta u današnje vrijeme jedino opravdana. Tome u prilog ide i saznanje temeljeno na dosadašnjem iskustvu europskih zemalja, da je traženu kvalitetu biodizela teško postići prikupljanjem od pojedinačnih sitnih proizvođača.
Godine 2002., inicijativom Ministrstva gospodarstva ("UNIDO focol point for RH"), predložena je suradnja Ministarstva zaštite okoliša i prostornog uređenja s UNIDO na izradi prijedloga projekta "Promotion of Biodiesel Production". Krajem 2003. u Hrvatskoj je u svom drugom radnom posjetu boravila savjetnica UNIDA dr.sc. Fatin Ali Mohamed. Zaključak sastanka kojem su prisustvovali i predstavnici INE, kao i Maziva Zagreb jest da će UNIDO financirati izradu studija fokusiranih na lokalnu proizvodnju i na profitabilnu industrijsku proizvodnju biodizela. Studije trebaju obuhvatiti i problematiku ulaznih sirovina, tržišnu orijentaciju gotovih produkata, te preporuke za prilagodbu porezne politike. Trenutačno je u tijeku davanje pisanih primjedbi predstavniku UNID-a na izrađene studije.

Koncepcija realizacije proizvodnje biodizela u Mazivima Zagreb

Korištenje biokomponenata u mineralnom gorivu u smijesi do 5% je u skladu s normom EN590, te ne podliježe posebnoj regulativi i nisu potrebne dodatne investicije u distribucijsku mrežu, što olakšava tržišnu poziciju. Potrošnja metilnog estera kao 100% goriva moguća je kod specijalnih potrošača kao na primjer gradski prijevoz, transporti i nacionalnim parkovima i slično, što predstavlja manji dio potencijalne potrošnje biodizela. Tehnologija proizvodnje uljnih estera u posljednje se vrijeme razvija na osnovi fleksibilnog korištenja raznorodnih biljnih ulja i životinjskih masnoča. Na taj način omogućeno je korištenje znatno jeftinije ulazne sirovine veće kalorične vrijednosti, proširena je sirovinska osnova, a postižu se i ekološki efekti (zbrinjavanje otpadnih ulja).

Eventualna izgradnja postrojenja za biodizel u Mazivima Zagreb prihvaćena je u projektu reinženjeringa lokacije. Prednosti takovog ulaganja temelje se među ostalim i na:

- mogućnosti prenamjene dijela postrojenja za preradu nafte koji sada nisu u funkciji,

- raspoloživom rezervoarskom prostoru za prihvat sirovina i otpremu gotovih proizvoda,
- raspoloživim energetskim kapacitetima,
- prometnoj infrastrukturi i dobroj povezanosti sa cestovnim i željezničkim prometnicama,
- laboratorijskim resursima,
- postojećem sustavu za obradu otpadnih voda,
- raspoloživim sredstvima i opremi protupožarne i tehničke zaštite,
- dovoljnom broju stručnih i kvalificiranih djelatnika za tu vrstu proizvodnje.

Procjenjuje se da raspoloživi resursi mogu znatno smanjiti investicijska ulaganja. Rentabilnost postrojenja može se poboljšati proizvodnjom šire palete estera biljnih ulja koji mogu poslužiti kao dragocjene sirovine za niz specijaliteta u području kemijskih proizvoda, plasiranih po višoj cijeni nego što je to slučaj u energetici.

Za realizaciju uspješne proizvodnje biodizelskog goriva postoji u Europi dovoljno iskustava koja se uz manje izmjene mogu primijeniti i u Hrvatskoj uz prilagodbu na lokalne okolnosti.

Za ostvarivanje racionalnog poslovanja Maziva Zagreb će postupiti po sljedećem modelu:

- Ukupni proizvodni lanac ("od polja do motora") u velikoj je mjeri poslovno integriran s ukupnom proizvodnjom primjerenom aktualnom stupnju razvoja lokalne poljoprivrede.
- Prerada ulja u metilni ester odvija se u postrojenju velikog kapaciteta (oko 60.000 tona/godišnje), koje može pored stalne kvalitete proizvoda uz niske specifične troškove osigurati i proizvodnju glicerina visoke čistoće.
  Moguća je i izgradnja u dvije faze.
- Sirovina za proizvodnju nadopunjuje se i iz drugih izvora, kao što su otpadna biljna ulja i ulja iz drugih uljarica, kao i životinjske masnoće, te se radi toga odabire fleksibilan tehnološki postupak njihove prerade. Sirovine koje se ne mogu nabaviti u okruženju, nabavljat će se na svjetskom tržištu.
- Dio proizvodnog procesa usmjeren je prema proizvodnji estera masnih kiselina iz odabranih uljnih sirovina uz daljnje njihovo korištenje kao industrijske sirovine za druge namjene bilo direktno u formulacijama ili daljnjom kemijskom preradom, te se tako postiže viši stupanj prerade osnovnog proizvoda. Postojeća oprema i infrastruktura, kao i potrebe sadašnjeg asortimana pogoduju realizaciji takve proizvodnje.
- Veličina projekta i složenost reprodukcijskog lanca zahtijeva povezivanje s potencijalnim domaćim i inozemnim strateškim partnerima na pripremi realizacije projekta.
- Pisma namjere odnosno okvirni ugovori između strateških partnera.
- Institucionalizacija interesnog kruga strateških partnera u formi odgovarajućeg pravnog subjekta.

ZAKLJUČAK

Hrvatska je zemlja velikih mogućnosti za proizvodnju uljane repice, kao osnovne sirovine za biodizelsko gorivo. Te mogućnosti s obzirom na kvalitetu i raspoloživost tala daleko prelaze potencijale razvijenih europskih zemalja. Kako je navedeno u BIOEN studiji, samo neobrađene, a već okrupnjene površine visokokvalitetnog zemljišta bivših kombinata iznose 400000 ha (mogućnost proizvodnje biodizela iznosi najmanje 1t/ha, što znači da je za proizvodnju od 60000 t/g biodizela potrebno zasaditi 60000 ha zemljišta).

Za uvođenje proizvodnje biodizela u Hrvatskoj, prema našim je saznanjima potreban čitav lanac sudionika, od kojih svaki treba obaviti svoj dio posla.

Vlada:

- donošenjem EN normi za biodizel i mješavinu s mineralnim dijelom do 5%,
- preispitivanjem poticaja za proizvodnju repice uključivo kreditiranje,
- definiranjem poreznog sustava uključivo trošarine.

Stručne institucije:

- Iz područja agrara: osiguranjem kvalitetnog sjemena i edukacijom poljoprivrednih proizvođača.
- Iz područja industrijske proizvodnje: (npr. Energetski institut Hrvoje Požar i/ili BICRO) definiranjem okvira i parametrom nepredne i konkurentno sposobne proizvodnje u čitavom lancu od polja do potrošača.
- Iz područja primjene goriva: (INA d.d.-Služba upravljanja poslovnim procesima) određivanjem svih primjenskih parametra u pogledu namješavanja, transporta, skladištenja biodizelskog goriva (mješavina do 5% i čisti biodizel).

Poljoprivredni proizvođači:

razvijanjem naprednih agrotehničkih mjera, tehnologija i sjemena u cilju ostvarivanja konkurentno sposobne proizvodnje (na europskom tržištu je već sada prisutna velika potražnja za repičinim uljem, a u gradnji su značajni novi kapaciteti za proizvodnju biodizela.

Maziva Zagreb d.o.o:

nakon definiranja svih navedenih odnosa u lancu, koji osiguravaju izvore sirovine i plasman biodizela, pristupit će realizaciji postrojenja za proizvodnju biodizela u suradnji s inozemnim tvrtkama, a na osnovi partnerskog odnosa (zajedničko ulaganje, rizik, dobit).

BIODIESEL FUEL IN CROATIA – TECHNOLOGICAL AND BUSINESS CONCEPTS

Abstract

The project of biodiesel production in Croatia is now, after several years of preparation and studies in the areas of: technology, feed ensurance, market preparation and organizational structure of production chain "from field to engine", finally entering the phase of decision making on implementation. Decision on EU level, and social interest of Croatia in the area of environmental protection,employment and utilization of available resources are creating a positive climate with regard to the project in question.

Maziva Zagreb company as an INA group member intends to build a plant at its location in order to utilize the existing advantages of technological and intellectual infrastructure at Maziva Zagreb and the INA Group, as well as enable a synergic development effect in the area of special products.

INTRODUCTION

After several years of preparation and studies in the areas of technology, feed ensurance, market preparation and organizational structure of production chain the production concept is finally entering the phase of decision making on implementation. The economical character of producing esters is conditioned primarily by the price of feed and limitations of the product's output price through conditions on the market of diesel fuel and glycerol. State incentives for the production of rapeseed are sometimes insufficient for a positive operation of the said production chain. Croatia has so far not sufficiently developed the production of rapeseed, so that there are certain difficulties in feed ensurance. The said difficulties also exist elsewhere in the world and have led to the development of new production procedures and organizational concepts by which the prosperity of the production in question is being ensured. At the same time, the usefulness of the biocomponent as property modifier of mineral fertilizer properties has been spotted, which is why the oil companies are becoming key consumers of the vegetable oil methyl ester. In Croatia, the potential of biocomponent consumption in the fuel refineries of Urinj and Sisak is estimated at 35 – 45,000 tons p.a. (3- 5% of addition to diesel fuel according to EN590). The use as Biodiesel 100 for special consumers would for the time being not exceed 5,000 tons p.a. Technological and business/market concept of implementing the project for the production of biodiesel fuel in Croatia may briefly be narrowed down to the following requirements:

-Technological procedure enables the processing of all fats (vegetable oil, waste vegetable oil, waste animal fat) so that the output product meets all the requirements of the European /Croatian standards and consumers.

-Flexibility in the choice of feeds and the possibility of producing esters with the necessary purity enables variety of esters at the output, so that the products may be marketed at a higher price even outside energy-related application as feeds for chemical and other specialities.

-Glycerol, as a by-product, may be finished as products to be marketed at a higher price.

-The capacity of plants to be set at 50-60,000 tons of ester p.a.

-Implement the erection of esterification plant as well as of the entire business system within the chain through various joint ventures with both local and foreign companies.

-The protection of the social interest in the part of the production of oil plants to be achieved through strategic partnership with an institution/a company appointed by the state/the government.

Development of fuels is conditioned by the limited resources of oil in the world. Figure 1 shows that peak oil exploitation is expected already in 2006, followed by a gradual but considerable decrease of exploitation possibilities. The result must be orientation to other energy sources. According to global research of of the Shell company, by 2060, the share of energy from renewable sources shall go up to 50% - see Figure 2.

The said developments shall also be following the development of automotive industry. For the purpose of reducing environmental pollution, increasingly stringent criteria are being passed as regards fuel quality. The fuel is required to be sulphur and aromatics free, with a continuous lowering of the specific fuel consumption. According to the studies conducted by the Snamprogetti company, the development of the vehicle market shall move towards the share increase of diesel fuel-powered vehicles, because their specific consumption is lower – see Figure 3.

Biodiesel as Engine Fuel -the So Far Activities

It is a known fact that biodiesel does not contain sulphur or aromatics, while in the entire production and consumption chain it provides the effect of CO_2 ("Greenhouse effect") reduction, so that particularly from the viewpoint of environmmental protection it is a welcome energent.

For the above reason, in 2001, the Biodiesel Project was elaborated - the introduction of biodiesel fuel in Croatia within the BIOEN program – The Program of Using the Energy of Biomass and Waste. The bearer of the project is the Ministry of Agriculture and Forestry, while the study has been elaborated by:

- □ Faculty of Agronomy, Agriculture and Forestry
- □ Energy Institute "Hrvoje Požar"

- □ INA d.d.
- □ The Parliament of the Republic of Croatia
- □ Ministry of Agriculture and Forestry
- □ Ministry of Economy
- □ Ministry of Finance
- □ Ministry of Environmental Protection and Development Planning
- □ Ministry of Science and Technology

Considering the overall issue, the cost simulation of methyl ester production for various capacities has also been performed, as shown in the Table below (Table 1).

Table 1: Production costs of methyl ester for various capacities

Production capacity t/y	Production costs (HRK/t biodizel)	Production costs (u %)
2000	4620	100
5000	3770	82
15000	2900	63
45000	2230	48

Source: The Biodiesel Project in the scope of the BIOEN-Croatia Program

It may be seen from the Table 1 that biodiesel production costs are rapidly decreased through the increase of the plant's capacity. This points to the fact that, primarily for economic reasons, the orientation towards building a higher capacity plant is today the only justified one. This may be substantiated by the fact that the so far experience of European countries has shown that the required quality of biodiesel is hard to achieve through collection from individual small-scale producers.

In 2002, upon the initiative of the Ministry of Economy ("UNIDO focal point for RH"), co-operation has been suggested between the Ministry of Environmental Protection and Development Planning and UNIDO on the making of "Promotion of Biodiesel Production" project proposal. Towards the end of 2003, UNIDO advisor, Ms. Fatin Ali Mohamed, DSc came for her second official visit to Croatia. The conclusion of the meeting attended by the representatives of INA, as well as of "Maziva Zagreb", was that UNIDO would finance the elaboration of the studies focused both on local production and on a profitable industrial production of biodiesel. The studies should encompass also the issues of input feeds, market orientation of finished products, and recommendations for adjusting the tax policy. Currently under way is the submitting of written remarks to UNIDO representative, regarding the already elaborated studies.

The Concept of Achieving Biodiesel Production at Maziva Zagreb

The use of bio-components in mineral fertilizer in the mixture of up to 5% is in compliance with the standard EN590, and is thus not subject to any special

regulations and no additional investments are necessary into the distribution network, which facilitates the market position.

The consumption of methyl ester as a 100% fuel is possible with special consumers such as for instance urban transportation; transport in national parks and the like, constituting a lesser part of the potential biodiesel consumption.

The technology of producing oil esters has lately been developing on the basis of a flexible use of various vegetable oils and animal fats. This has enabled the use of a much cheaper input feed with higher thermal value; the feed basis has been expanded, while environmental effects are also being achieved (management of waste oils).

A possible construction of the biodiesel plant at “Maziva Zagreb” has been adopted within the project of location re-engineering. The advantages of such an invetstment are based, among other things, also on the following:

- possibilities of changing the function of a part of the oil processing plants which are currently out of operation
- available tankage space for the intake of feeds and shipping of finished products
- available power-supply capacities
- traffic infrastructure and good connection with road and railroad paths
- laboratory resources
- the existing wastewater treatment system
- the available means and equipment of the fire protection and technical safety
- sufficient number of expert and qualified employees for that kind of production.

It is estimated that the available resources may considerably reduce the necessary investments.

The plant’s economical character may be improved through the production of a wider range of vegetable oil esters which may serve as valuable feeds for a number of specialties in the area of chemical products, marketed at a higher price than is the case in the area of power-supply.

In order to achieve a successful production of biodiesel fuel, there has been plenty of European experience which may also be applied in Croatia, with some minor adjustments given the specific local circumstances.

In order to achieve rational business making, “Maziva Zagreb” will be applying the following model:

- Total production chain ("from field to engine") is to a large extent integrated within the entire production adjusted to the current local agriculture development level.
- Processing of oil into methyl ester proceeds within a plant of a large capacity (around 60,000 tons/year), capable – apart from constant product quality with specific costs – of ensuring also glycerol production of a high degree of purity. Construction is also possible in two consecutive phases.

- Production feeds are also supplemented from other sources, such as waste vegetable oils and oils from other oil-generating plants, as well as animal fats, which is why a flexible technological procedure of their processing is being chosen. The feeds which are not available in the immediate surroundings shall be supplied from the global market.
- A part of the production process is directed towards producing the esters of fatty acids out of selected oil feeds with their further use as industrial feeds for other purposes either directly in formulations or through further chemical treatment, thus achieving a higher degree of the basic product's processing. The existing equipment and infrastructure, as well as the needs of the present product, are in favour of achieving such production.
- The project's size and the complexity of the reproduction chain requires association with the possible local and foreign strategic partners on preparing the project's implementation.
- Letters of Intent i.e. framework agreements among the strategic partners.
- Institutionalization of the interest circle of strategic partners in the shape of a corresponding legal entity.

Conclusion

Croatia is a country of great potentials for the production of rapeseed, as the basic feed for biodiesel fuel. These potenials - given the quality and the soil availability – by far exceed the potentials of developed European countries. As mentioned in the BIOEN study, merely the unworked, already agriculturally adapted areas of high quality soil of the former cooperatives amount to 400000 ha (the possibility of producing biodiesel amounts to 1t/ha in the least, which means that production in the amount of 60000 t/y of biodiesel requires the planting of 60000 ha of land).

For introducing the production of biodiesel in Croatia, according to our knowledge, a whole chain of participants is needed, each of whom needs to do his/her part of the work.

Government:

- by passing EN standards for biodiesel and mixture with the mineral fuel share of up to 5%
- by redefining incentives for rapeseed production, including loans
- by defining the tax system, including excise duties

Expert institutions:

- From the area of agriculture: by ensuring good quality seed and educating agricultural producers.
- From the area of industrial research (e.g. the Energy Institute "Hrvoje Požar" and/or BICRO) by defining the framework and parameters of an advanced and competitive production in the entire chain from the field to the consumer.

– From the area of fuel application (INA dd.- Department of Business Processes Management) by defining all application parameters in the sense of blending, transportation, storage of biodiesel fuel (mixture up to 5% and pure biodiesel).

Agricultural producers:
by developing advanced agrotechnical measures, technologies and seed for the purpose of achieving competitive production (on the European market there is already a great demand for rapeseed oil, while major new capacities for biodiesel production are currently under construction.

"Maziva Zagreb d.o.o":
After defining all the above relations within the chain, ensuring feed sources and biodiesel marketing, the construction of a biodiesel production plant shall begin in co-operation with foreign companies, based on a partnership relation (joint investment, risk, profit).

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UDK/UDC	Ključne riječi	Key words
665.334.94	biodizelsko gorivo	biodiesel fuel
.001.1	gledište opće koncepcije i ideje	general idea, concept viewpoint
.002.2	gledište proizvodnje	production, viewpoint
665.334.94	ulje uljene repice	rappseed oil
66.095.13	esterifikacija	esterification
66.094.942	metanoliza/transesterifikacija triglicerida	triglyceride methanolysis/transesterification
(497.13)	Hrvatska	Croatia

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