German Bundestag **Publication 15/5816**
15th Election period 06-21-2005

Instruction
By the Federal Government

Report on the tax-privilege for biofuels and bio-heatingoil

Contents

Sent by communication of the Federal Finance Ministry dated 17th June 2005 according to § 2a Para 3 of the Mineral Oil Tax Law dated 21st December 1992 in the version dated 25th June 2004 (Fed Law Gaz I p 1383 1387)

I. Background

Since 1st January 2004 tax reliefs have been introduced for several biofuels and bio-heating oil (§ 2a Mineral Oil Tax Law). These extend to pure biofuels and bio-heatingoil and to the biogenic share concerning mixtures with fossil energy carriers and are initially limited to 31st December 2009. Up to the present the tax privilege is granted completely i.e. in the form of a Mineral Oil tax exemption.

The tax-related measure is intended to reimburse the difference between the costs for the biofuel (for ex.: biodiesel) and the price for the corresponding fossil fuel (for ex.: fossil Diesel). Is the privilege beyond this compensation the costs for the biofuel are over-reimbursed and the concerned biofuel is over-supported. In this case the volatility of the markets has to be taken into consideration as well.

In order to avoid an over-support of biofuels § 2a Para 3 MinOilTaxLaw contains the duty to report on the market and price development of biofuels and Bioheizstoffs to the German Bundestag once per annum. The report is done by the Federal Finance Ministry with the involvement of the Federal Ministry for Consumer Protection Food and Agriculture the Federal Ministry for Economical Affairs and Labor and the Federal Ministry for Environment Conservation and Reactor Safety – for the first time to 31st March 2005 - . This report has the aim to submit any suggestions for an adaptation if an overcompensating tax privilege arises.

Concerning the report § 2a Para 3 MinOilTaxLaw contains performance targets. It is to report

1. on the launch of biofuels and bio-heatingoil and
2. on the development of prices for Biomass and Raw Oil and Motor Fuel and Fuels as well as
3. in case of an over-compensation – to suggest an adaptation of the tax relief for biofuels and bio-heatingoil corresponding to the development of prices of Raw Materials to the market development.

The latter has to consider climate and environmental protection the protection of natural resources the external costs of the different Fuels the guaranteed supply and the realization of a minimum share of the biofuels and other renewable Fuels.

The following presents the first report of the Federal Finance Ministry for the year 2004.

II. First report on tax privilege of the biofuels and bio-heatingoil acc. to § 2a para 2 MinöStG (MinOilTaxLaw)

1. Market situation and environmental effects

1.1 Market situation

Following products can potentially be used as biofuels and bio-heatingoil according to § 2a MinOilTaxLaw **:**

- Vegetable Oil Methyl Ester so-called biodiesel especially Rape Oil Methyl Ester (RME) and other fatty acid – Methyl Ester
- Bio-Ethanol
- ETBE (Ethyl-Tertiary-Butyl-Ether)
- Synthetic biofuels – BtL (Biomass to Liquid)
- Bio-Methanol
- Vegetable oil
- Biogas
- Dimethyl-Ether out of Biomass (DME)
- Hydrogen out of Biomass.

The following describes the market situation (marketability and merchantability) of biofuels biodiesel bioethanol and ETBE which are market-relevant in Germany. The remaining biofuels will be detailed in the Appendix 1. The following details are limited to biofuels as the above-mentioned energy products made of Biomass are not used as fuel – for cost reasons – (except for model projects like for ex. biodiesel for heating the building of the "Reichstag").

a) biodiesel

A mixture of Fatty-Acid-Methyl-Ether is named biodiesel which is produced during the chemical reaction of fats and oils with Methanol. However Methanol still originates from fossil sources but in the future it could be replaced by "biomethanol" made out of the Biomass gasification or production of Biogas. Standardized biodiesel can be used in most of the diesel engines – if a release for it has been taken place by the producer - . Up until now biodiesel has regularly been produced out of Rape Oil in Germany. Other fats and oils like animal fats made out of animal carcasses Palm Oil or cameline oil alone do not comply with the European Standard for biodiesel (DIN EN 14214) as they show especially strong disadvantaged with the cold features in comparison with RME. These problems can be solved by corresponding mixtures with Rape Oil[1] or by use of additives.

Biodiesel is presently the only broadly launched Biofuel in Germany. The domestic production capacity of biodiesel is approx. 1.1 Mio. t/a (approx. 1.3 bn. l). Further plants with a capacity of 0.6 Mio. t/a (rd. 0.7 bn. l) are under construction or in the concrete planning stage. With the existing and planned production capacities the potential of rape cultivation being limited for reasons of rotation of crops and land utilization for the non-food area of 1.5 Mio. ha/a is then nearly exhausted in Germany. Domestic production could deliver rd. 2.0 Mio. t/a (rd. 2.2 bn. l) of Rape Oil for the production of biodiesel. This could cover approx. 3.7 percent of the total demand of

[1] Formal translation from German read as "mixtures with Rape seed Methyl ester (RME)

fuel in Germany (compared with the energy content 3.4 percent). The share of Rape Rape Oil and biodiesel imported in 2004 could not be reliably ascertained. Domestic Rape production is however sufficient independent from the stream of goods in order to fully meet the demand of biodiesel producers.

In 2004 the sale of biodiesel amounted to 1.05 Mio. t (approx. 1.19 bn. l). So far 40 percent of that has been used as pure fuel in vehicle fleets (predominantly motor lorries) and 30 percent as pure fuel in private cars. Further 30 percent have been blended with Diesel Fuel at a max rate of 5 %. The 5% limit is due to the Diesel Fuel Standard DIN EN 590. Diesel Fuel is only then adjusted to the standard if the additions by mixing of biodiesel do not exceed this limit. Blending within the mentioned DIN at the filling stations does not need a label. Fuel mixtures containing more than 5 percent by volume of biodiesel have to be labeled at the roadside petrol by “contains more than 5 percent of biodiesel” according to 10th Federal Emission Protection Directive (Directive on the characteristic feature and the labeling of the qualities of Fuels).

In the coming years a clear increase of the quota of blending with fossil fuelsand a reduction of the use of biodiesel as pure fuel has to be reckoned with. The exhaust gas level EURO 4 can technically already been reached today with pure biodiesel. This however needs the application of a biodiesel sensor which is offered only by very few automobile producers and moreover only as an extra. This means that only a limited number of the modern Diesel vehicles will be in the position to comply with the prescribed exhaust gas values if being run on biodiesel.

Given rape seed production in Germany and the related biodiesel output biofuels will contribute to net product and work which is particularly true in rural areas.

b) bioethanol

bioethanol (Ethyl-Alcohol) can be produced by distillation after alcoholic fermentation or by comparable biochemical methods out of renewable raw materials. In Germany all grain (wheat rye) or sugar beets can be used for the production of Ethanol. Concerning the production of Ethanol on the basis of lignocellulose (for ex. Straw or wood) no commercially run plants can be found at present. Such processes are still in the early developing stages.

According to DIN EN 228 Ethanol when blended with fossil fuels up to 5 percent by volume can be added to the carburetor fuel. It is similar to Diesel fuel; additions by mixing of bioethanol to the carburetor fuel are only then standard if they do not exceed the 5 percent by volume limit. Additions by mixing effected within this DIN at the filling stations do not need a label.

Blending fossil fuel with more than 5% of ethanol require vehicles with adjusted engines which can work with mixtures of up to 85 percent by volume of Ethanol (E85) and which are called “Flexible Fuel Vehicles” – FFV. In case of pure Ethanol vehicles with special Ethanol engines are needed. FFV are used in the USA Brazil and Sweden. The technology has predominantly been developed by German enterprises. German automobile enterprises offer FFV in Brazil and the USA. Up to now such vehicles have not been used. E85 additionally requires an own filling station infrastructure. Independently from this the potential use of E 85 should be examined within the frame of a demonstration test.

In 2004 bioethanol in its pure form was not still added by blending in a significant volume in Germany. There have namely been some field tests but bioethanol was only used in marginal amounts. Furthermore these test results are not representative for the question if in 2004 an over-support has been taken place. The enterprises of the mineral oil industry have announced to start with corresponding additions by blending from winter 2005/2006 onwards. Due to the technical requirements (steam pressure anomaly water solubility more details referring to this in App.2) it is first of all to be expected that the addition by blending will not be carried out extensively. From the year 2006 onwards the direct blending of bioethanol will probably become more important concerning the fuel applications.

c) ETBE (Ethyl-Tertiary-Butyl-Ether)

According to DIN EN 228 the carburetor fuel can be added by blending up to 15 percent of the total volume of ETBE. ETBE is an Ether being produced by a share of 45.1 percent Ethanol (purity over 99 percent) and 54.9 percent fossil isobutene. ETBE does not show any steam pressure anomaly and is also little soluble in water. It is to be expected that fossil MTBE (Methyl-Tertiary-Butyl-Ether) will be replaced by ETBE in future. Both ETBE and MTBE serve as octane number improver in the carburetor fuel. At present the MTBE-production plants are converted to the production of ETBE. Due to the substitution of MTBE being presently used in the carburetor fuel by ETBE theoretically 220,000 t/a (rd. 280 Mio. l) of Ethanol would be required. As ETBE can be added by mixing within the DIN see above in a far higher volume than only as a substitution of MTBE this is in no case the upper limit of a possible use of ETBE.

In 2004 two bioethanol plants (burning plant) have started a trial run – up to now it is exclusively for the use of bioethanol for the production of ETBE - . A further plant is under construction. Should the mentioned plants be erected as planned and be run Germany could dispose of a capacity of bioethanol of approx. 500,000 t/a (round 630 Mio. l) by the end of 2005.
In 2004 only approx. 65,000 t (appr. 82 Mio. l) of bioethanol (mainly for the production of ETBE) were applied.

d) Summary of the market situation

In 2004 biodiesel produced from Rape was the most important Biofuel in Germany. It was predominantly used as pure fuel. But also additions by blending to traditional (fossil) Diesel fuel have gained importance and will increase further in the coming years.

Ethanol as Biofuel has been used in the form of an ETBE-addition to the carburetor fuel (Ethanol content: 45.1 percent). We expect the addition of Ethanol in its pure form to the carburetor fuel from the end of October 2005 onward but without being offered extensively.

1.2 Environmental effects

In Germany current fuel consumption in the traffic sector depends on petroleum for more than 95 percent. Following the politically and economically insecure situation on the petroleum market but mainly due to reasons to protect climate the consumption of fossil fuel has to be lowered. The development of alternative fuels and energy-saving actuations is therefore of significant importance to secure a lasting mobility. biofuels can play an important contribution to reduce the gas emissions of the greenhouse effect in traffic and also to improve the supply safety by fuel diversification. The projects on the development of a national fuel strategy within the frame of the lastingness strategy of the Federal Government have showed that biofuels can play a prior role in the short and longer term. This refers to the efficiency increases of the conventional actuations being sold at present the intensified use of combined (hybrid) actuations and of natural gas. This can be derived particularly from the high reduction potential of the greenhouse gas emissions of biofuels. For biodiesel this could be between 18-89 percent and for bioethanol made out of grain between 13-92 percent. For BTL-fuels the reduction potential can generally amount to over 90 percent in the future. The ranges originate from the different raw materials and the differences in the cultivation in the ways of transport and ways of processing. The greenhouse reduction potentials can be found again in the matrices of the fuel strategy (fuel matrix) of the Federal Government of the year 2004. Owing to their sweetness little water and soil endangerment and little toxicity of all biofuels show advantages compared with fossil fuels.

The importance of the biofuels to reach the environment-related aims is also recognized by the EU. Therefore the guideline for the “Support the Use of biofuels and Other Fuels in the Trade Sector” was adopted in May 2003. The guideline determines that the sale of biofuels up to 2005 should increase to 2 percent and up to 2010 to 5.75 percent of the energy use in the fuel market. The reason of consideration 10 of the guideline says: “The support of the use of biofuels is a step in the direction of a stronger use of the Biomass; this will lead to an increased development of biofuels in the future without excluding other options in particular the hydrogen technique.”

a) Biodiesel

Each liter of biodiesel being used led to a saving of approx. 2.2 kg CO_2 in 2004 in comparison with the use of fossil Diesel (expertise of the IFEU-Institute “Expansion of the Eco-Balance for RME”). This value applies with a production on the basis of Rape seed with average production conditions in Germany and with a typical use of the complementary products. With the use of 1.05 Mio. t (approx. 1.19 Bn. l) of biodiesel in 2004 26 Mio t CO_2 as a total were saved in Germany. One ton of saved CO_2 is faced with round 215 EURO of mineral oil tax subsidies.

Considering the required energy expense for the biodiesel production one used energy unit produces ca. 3.5 fold of the energy in the form of biodiesel. The energetic relation of the input/output of biodiesel thus amounts to 1:3.5.

b) Bioethanol

Each liter of Ethanol led to a saving of 08 up to 15 kg CO_2 in comparison with fossil fuels in 2004 (mean value: 115 kg CO_2). The CO_2-saving with the amount of 65,000 t (round 82 Mio. l) used bioethanol in 2004 thus amounted to ca. 94,000 t (calculation based on the above-mentioned mean value). One ton of saved CO_2 is faced with round 574 EURO of mineral oil tax subsidies. The energetic relation of the input/output is also lower than with biodiesel even if the plants are modern. It depends on the raw material and utilization of the by-product and lies between 1:14 and 1:31. Here as well more energy is produced than it has to be expended for the alcohol production.

2. Examination of an over-compensation in 2004

The tax privilege (up to now in the form of a tax exemption) must not exceed the difference of the costs for the production of the concerned biofuel (for ex. biodiesel) in comparison with the price of the concerned fuel being of fossil origin (for ex. fossil Diesel). The tax-relation measure must therefore not lead to an overcompensation of the mentioned cost difference and thus not to an over-support of the biofuels.

2.1 Biodiesel

The following examines if and to what amount biodiesel has been over-supported (on the basis compared to fossil Diesel) under consideration of the complete tax exemption in 2004. The figures for the following data investigation is based on generally accessible sources (researches on the internet specialist journals) information by the association and last but not least on information from biodiesel producers.

For ascertaining product costs a differentiation between the different use of biodiesel is needed. On the one hand biodiesel can be used as pure fuel. On the other hand biodiesel is applied as a 5-percent addition by mixing to fossil fuel (see 1.1 Market situation). According to the application different product costs arise. The comparative value is the selling price of the product for fossil Diesel fuel (selling price ex filling station without purchase tax) which amounted to an average of 0.81 EUR per l in 2004.

For 2004 the product costs per l of biodiesel are based on the average price of the used raw material of Rape Oil (stock exchange price). Furthermore the costs for the esterification (under consideration of the credit note for Glycerin) the costs for the refinery logistic costs the technical extra expenses as well as the extra consumption have to be considered.

In case of a 5-percent addition by mixing of biodiesel to fossil Diesel the costs for the technical extra expenses and for the extra consumption remain unconsidered. The technical extra expenses mainly depend on the shorter oil change intervals. These ones are only necessary in case of pure biodiesel operations. Moreover the lower energy values of biodiesel in comparison with fossil Diesel (extra consumption) are insignificant for the price calculation for the addition by mixing. The extra consumption has no influence on the price formation of the fuel regarding the 5-percent addition by mixing.

Instead of the technical extra expenses and the extra consumption in case of pure biodiesel additional costs will arise for the addition by mixing (so-called costs for the addition by mixing = storage and warehousing proportional depreciation of the investment costs costs of the storage and mixing technique costs of the actual procedure of addition by mixing including all the possible savings by means of positive characteristics of biodiesel additional administration costs for example for the quality assurance and analysis). These costs have to be considered in the calculation.

The following table lists the factors for the examination of an over-compensation of biodiesel and each of the ascertained costs in detail (in Euro/liter):

Use of biodiesel as:	**Pure fuel**	**Addition by mixing**
Price of Rape Oil ex oil mill (Stock exchange price on average in 2004)	0.49 €/l	0.49 €/l
Refinery (Cleaning and preparation of the Rape Oil)	0.04 €/l	0.04 €/l
Esterification less Glycerin credit Rape Oil becomes Rape Oil Methyl Ester and Glycerin	0.07 €/l	0.07 €/l
Costs for addition by mixing Storage and warehousing proportional depreciation of the investment costs costs of the storage and mixing technique costs of the actual procedure of addition by mixing including all the possible savings by means of positive characteristics of biodiesel additional administration costs (for ex. quality assurance)	--	0.03 €/l
Logistics (Freight storage delivery filling station margin)	0.08 €/l	0.08 €/l
Technical extra expenses Shortened oil change intervals and oil filter changes special equipment for biodiesel	0.03 €/l	--
Extra consumption (Due to the lower energy content of biodiesel compared with fossil Diesel fuel amounting to 8%)	0.05 €/l	--
Sum (without purchase tax): (Theoretical price RME for the comparison with fossil Diesel)	**0.76 €/l**	**0.71 €/l**
Price on average of fossil Diesel in 2004 (mineral oil tax included without purchase tax)	**0.81 €/l**	**0.81 €/l**
Over-compensation	**0.05 €/l**	**0.10 €/l**

The development of the overcompensation in the course of the year - dependent on the fluctuation of the Rape Oil and Diesel fuel prices – is shown in the Appendix 3.

Result:

In case of the application of biodiesel in its pure form the product costs amounted to 0.76 EUR/l (without purchase tax) in 2004. The price advantage or the over-compensation respectively with biodiesel was at approx. 0.05 EUR/l this corresponds to 11 percent of the tax set for Diesel fuel.

The ascertained average costs for biodiesel in mixings with fossil Diesel amounted to only 0.71 EUR/l (without purchase tax) in 2004. The price advantage summed up to 0.10 EUR/l which corresponds to round 21 percent of the tax set for Diesel fuel.

The tax support of biodiesel by means of the complete mineral oil tax exemption led to reduced tax revenue shortfalls amounting to a total sum of round 559 Mio. EUR in 2004. Of this the revenue shortfalls amounted to – taking the above-mentioned calculation of the overcompensation as basis – which are only put down to the over-compensation round 42 Mio. EUR for the pure fuel (70 percent of the total sale) and round 35 Mio. EUR for the additions by mixing (30 percent of the total sale). Thus a sum of approx. 77 Mio. EUR.

2.2 Bioethanol

In comparison with the sale of biodiesel (see above 1.05 Mio. t or approx. 1.19 Bn. l) bioethanol was only used in small volumes (65,000 t or 82 Mio. l) in 2004. bioethanol has – concerning the year of 2004 – not a market maturity yet (see 1.1 Market situation). For the addition by mixing of bioethanol and ETBE the economical benchmark data for the evaluation of the overcompensation are still incomplete. Concerning the small amounts of bioethanol being directly added to the carburetor fuel the enterprises are presently occupied with solving the steam press problem resulting from the addition by mixing bioethanol to the carburetor fuel (see 1.1 and Appendix 2). So far this seems only to be possible by means of the addition of relatively expensive gasoline components. Due to the variety of the mixings a representative cost estimation has not been carried out yet.

Therefore in 2004 an addition by mixing of bioethanol to the carburetor fuel was only effected in small amounts and moreover only in test series. The examination of an over-support of directly added bioethanol in the conversation and test phase in 2004 was refused.

2.3 ETBE

Concerning the replacement of MTBE in the carburetor fuel by the biogenetic ETBE test series is still taking place. Hence some different shares of bioethanol are tested in the cooperation with ETBE. The consideration of each share would need different calculations. Moreover the single component Isobutene which is required for the production of ETBE is mostly produced out of refinery-interne processes. This would lead to different bases of inner-operational utilization prices. The addition by mixing of bioethanol or ETBE is still in the development stage. The tax exemption offers the necessary incentive for the test-wise conversion in favour of the biogenetic components by the concerned enterprises.

For the above-mentioned reasons the examination relating to an over-support of bioethanol for the production of ETBE in 2004 was also relinquished.

3. Evaluation and recommendation

The preceding examination results stated that one liter of biodiesel in its pure form amounting to 5 cent and one liter of biodiesel as component of addition by mixing to the fossil Diesel amounting to 10 cent are over-supported. Therefore it is recommended to tax biodiesel proportionately in the future.

bioethanol and ETBE were not examined – for the above-mentioned reasons. These biofuels should not yet – due to the lacking determination of the over-compensation in 2004 – be taxed.

For reason of the different volumes of the over-support for biodiesel it is proposed to differentiate between biodiesel in its pure form and biodiesel as a component of addition by mixing concerning the concrete determination of the tax amounts. The tax-related difference between these two applications of biodiesel should not be too high as otherwise the incentive for inhibited additions by mixing in the free traffic would be increased (mixing in the free traffic is only allowed for the end-user for tax reasons). The lead-in to the taxation must not lead to the possibility or support of tax manipulations.

The future taxation has to be adjusted to over-calculated amounts for 2004. However it should be done moderately for the reasons given below:

- The sum of the factors presented in the table concerning the ascertainment of the over-compensation can only be seen as an indication of the overcompensation – due to the fluctuations in the market which each factor is subject to.

- According to § 2 a para 3 MinOilTaxLaw the positive effects for the climate and environmental protection the safety of supply and the realization of a minimum share of biofuels and of other renewable fuels have to be suitably considered with the adaptation of the tax rates independently from the calculation result referring to an overcompensation.

- The future taxation must not lead to risking the already made progress concerning the selling of biodiesel and therefore the further building-up/establishing of a biodiesel market. Pure biodiesel is sold to traders and private users because it is offered with a price difference in an average size of 10 cent per liter. If this price difference decreasing tremendously the incentive element to consume biodiesel would then be inapplicable.

- Unlike with the pure form the end-user of the fuel does not usually learn anything on the component of Biofuel contained in standard additions by mixing as the biogenetic share has not to be labeled. A price-related incentive element is not necessary so far. However it should be remained guaranteed that the addition by mixing of biodiesel will also be attractive for the Mineral Oil Industry in the future.

- Finally future taxation of biodiesel in its pure form that the introduction of the Mineral Oil taxation for biodiesel manufacturers will lead to additional expenses which cannot be figured and which is the result of the compliance of tax-related demands (for ex. establishment of a tax depot) and the administration costs involved has to be taken into consideration. These extra costs do not arise with the Mineral Oil Industry working with additions by mixing due to the already existing Mineral Oil Tax refund proceeding.

III. List of appendix

Appendix 1: Summary of potential biofuels and bio-heatingoil

Appendix 2: Presentation of the characteristic features of fuels containing bioethanol

Appendix 3: Summary: Development of the over-compensation in the course of the year of 2004

Appendix 1

Summary of potential biofuels and bio-heatingoil

1. Synthetic biofuels (also: Biomass-to-Liquid [BTL])

Due to the technical development and the still remaining demand in research and development BTL-fuels are a promising medium-term option. With the BTL-production Biomass converts to synthetic gas which for many decades has been known and tested in the coal area. From this liquid hydrocarbons are produced being able to be prepared for standard fuel.

BTL-fuels can be used in today’s engines (in Otto engines as well as in Diesel engines). In comparison with fossil fuels they show some advantages concerning the emission behavior in the sense that they are sweet and low-aromatic. Even in new engine generations with new combustion processes requiring modified fuels compared with the standards of today the BTL-fuels can be used as the production process makes an adaptation of the fuel structures to the demands of the engines possible. Using the infrastructure of today BTL-fuels can be distributed without any problems.

The production of BTL is not yet mature for the market. So far there exists only a small pilot plant. Another plant which is to produce 15,000 t fuel p.a. is under construction. Technical economical and ecological questions concerning the BTL-production are still to answer before an industrial production can begin. Precise statements referring to the energy and ecological balances are still to come.

It is not expected that BTL-fuels will make a significant contribution to reach the EU-targets for the set amounts by 2010. But they can become a bigger factor in the market in the course of the second decade. The emerging potential of the BTL-fuels is much higher than that of biodiesel or of Ethanol on the basis of grain or sugar. BTL can be produced on the basis of every solid Biomass a circumstance which is especially favorable to the cultivation of energy plants. With the use of the whole plants much higher yields per hectare are possible than in comparison with the production of Rape for example. With technically favorable conditions ca. 25 percent of today’s consumption of Diesel fuel could be produced on an annual area of 2 Mio. ha.

2. Biomethanol

Like the BTL-fuels Methanol can be produced via synthetic gas out of a wide range of Biomass. However Methanol requires own combustion engines. Thus in comparison with Ethanol Methanol shows some disadvantages like for example low combustion value high emissions and a distribution infrastructure to be adapted. In the past Methanol was favoured as fuel for vehicles with a fuel cell actuation. For the short-term Methanol made out of Biomass can not pay any contribution due to a lack of large-scale production plants and a lack of fleets of vehicle. A change for the current situation depends on the further development of the fuel cell technology. Substituting the fossil share of Methanol in biodiesel by Biomethanol is neither technically nor economically convertible under the present frame conditions.

3. Vegetable Oil

Like biodiesel Vegetable Oil can be produced from Rape or other Oil plants. There is no conversion like in the case of biodiesel. Vegetable Oil can only be applied in specially converted engines. Using Vegetable Oil as fuel in converted private cars motor lorries or agricultural vehicles still needs further technical development. Securing the necessary fuel quality remains presently still a problem. An obligatory standard for this fuel is under development. Modern demands to the exhaust with Vegetable Oil engines can currently only be met with particular conversions. Therefore Vegetable Oil requires an own engine development.

4. Biogas

As a gas rich of Methane Biogas arises from the fermentation of Biomass. The potential of the Biogas production is high as Biogas can also be produced from energy plants. After a preparation Biogas can be applied in vehicles with engines suitable for natural gas. In Sweden Switzerland and France first experiences have been gained concerning this. The network of natural gas filling stations is currently massively enlarged by up to 1,000 stations. But due to the favorable frame conditions of the current production out of Biogas as it is offered by Law (thus giving Priority to Renewable Energies as well as due to the reduced taxation of natural gas in combustion engines up to 2020) an application of Biogas in vehicles suitable for natural gas is uneconomical in the area for the foreseeable future.

5. Dimethyl-Ether (DME)

Like the BTL-fuels or Methanol DME is an Ether being able to be produced out of a broad range of initial products from Biogas to synthetic gas. In the normal state DME is gaseous and requires both converted engines and an own infrastructure. An independent development in Germany does not take place. In Scandinavia however DME has a certain position. Today DME is a not relevant Biofuel due to its development stage.

6. Hydrogen out of Biomass

In the long term the use of Hydrogen in fuel cells is considered a promising option. However the development requires new actuation technologies and high investments in plants for the production of Hydrogen and a new system of distribution making

Hydrogen fuel an extremely expensive option. In the foreseeable future the Hydrogen production out of Biomass is not taken into consideration.

Appendix 2*

Characteristic features of fuels containing bioethanol

Carburetor Fuels with an Ethanol content of more than 5 percent by volume have already been used in Brazil the USA and in Sweden for years in the vehicles being adapted to them. Even on EU-level some standardization activities for fuels with a higher bioethanol share have already started.

In particular concerning the addition by mixing of small amounts of Biomethanol (up to max. 5 percent by volume) problems arise. They are described as follows:

a) Steam pressure

With the addition of bioethanol to the carburetor fuel the steam pressure increase happens quickly with small concentrations of alcohol and then it remains nearly constant over a longer concentration area (so-called steam pressure anomaly).

If Ethanol is added by mixing to a carburetor fuel it comes to a higher steam pressure than it could normally be expected for the ideal mixing of two liquids. Although the steam pressure of the Ethanol lies below that of the carburetor fuel the steam pressure of the mixing can be higher than that of the used carburetor fuel. This effect is most intensive with low Ethanol concentrations and decreases if the concentrations increase. The increase of the steam pressure is to derive from the mutual effect between the molecules of the Hydrocarbon and of the Ethanol ones (breaking up the Hydrocarbon bridge bond between the Alcohol molecules).

With certain driving circumstances (low mountain situation in midsummer) can an inhibited increase of the steam pressure be the cause for engine failures (sputtering up to standstill due to the formation of steam bubbles in the fuel pipe); in particular vehicles with consumption-low directly injecting Otto engines are concerned. Next to this problems can arise concerning the compliance with the evaporation emissions out of the fuel tank and pipe. For this reason the steam pressure in the carburetor fuel was limited to a maximum value of 60 kPa with the European Fuel Standard EN 228.

In order to be able to guarantee the steam pressure specification prescribed by EN 228 even in these cases it is required to lower the steam pressure of the carburetor fuel containing bioethanol by the addition by mixing of additives lowering the steam pressure and / or to take away the petrol components increasing the steam pressure. Moreover the supply of the carburetor fuel containing bioethanol with a logistic pure in its quality (tanks systems of supply) to avoid mixings of fuels containing Ethanol and purely fossil fuels in the supply chain up to the filling stations can reduce the lasting steam pressure.

b) Reaction regarding water

Ethanol can be mixed with water. If you add bioethanol to a carburetor fuel then its behavior regarding water changes. If the water amount exceeds a limit value being particularly dependent on the alcohol content and the temperature and sinking with falling grades then it can result in a separation into an upper Hydrocarbon-Alcohol phase and into a lower Alcohol-Water phase. This lower phase is inappropriate for the operation of engines. This separation of the phases takes away the Alcohol from the mixture and these changes the characteristic feature of the product. This concerns mainly the steam pressure and octane number.

Due to the danger of the phase separation it is important during the transport and supply of carburetor fuels containing Alcohol to hold the whole system free of water. This is possible with some corresponding precautionary and controlling measures.

c) Outlook

Due to the technical problems listed concerning the addition by mixing of bioethanol to the carburetor fuel up to now no extensive practical application has been effected. Next to the activities of an independent supplier in Berlin at present (November 2004 to May 2005) a field test with normal carburetor fuel containing Ethanol is taking place at 76 filling stations with the leading mineral oil enterprises involved in the Northern part of Germany. Target is to gain control of the technical and logistic problems in order to be in the position to add directly by mixing bioethanol into the carburetor fuel from autumn/winter 2005 on.

---

* Source: Dr. Bernd Rüdiger Altmann DGMK Deutsche Wissenschaftliche Gesellschaft für Erdöl Erdgas und Kohle e.V. (= German Scientific Association for Crude Oil Natural Gas and Coal reg. Ass.)

Appendix 3
Development of the over-compensation in the course of the year of 2004

Pure fuel

	biodiesel*	Min. Diesel	Difference
	Prices without purchase tax		
01/2004	0.73	0.76	0.02
02/2004	0.77	0.75	-0.02
03/2004	0.76	0.75	-001
04/2004	0.79	0.79	0.00
05/2004	0.81	0.80	-0.01
06/2004	0.75	0.78	0.03
07/2004	0.75	0.80	0.05
08/2004	0.77	0.84	0.08
09/2004	0.75	0.83	0.09
10/2004	0.73	0.91	0.18
11/2004	0.73	0.84	0.11
12/2004	0.74	0.84	0.11
Average:	0.76	0.81	0.05

Additions by mixing

	biodiesel*	Min. Diesel	Difference
	Prices without purchase tax		
01/2004	0.68	0.76	0.07
02/2004	0.72	0.75	0.03
03/2004	0.71	0.75	0.04
04/2004	0.73	0.79	0.06
05/2004	0.76	0.80	0.04
06/2004	0.70	0.78	0.08
07/2004	0.70	0.80	0.10
08/2004	0.72	0.84	0.13
09/2004	0.70	0.83	0.14
10/2004	0.68	0.91	0.23
11/2004	0.68	0.84	0.16
12/2004	0.69	0.84	0.16
Average:	0.71	0.81	0.10

Shown is the development of the over-compensation due to fluctuating prices of Rape Oil and Diesel fuel in the course of 2004.

Source: www.iwr.de ISTA Mielke
* own calculations