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Det Enerkipolitiske Udvalg  
EPU alm. del - Bilag 295  
Offentligt



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Dronninglund 18/8 2007

Det Enerkipolitiske Udvalg  
Folketinget  
Christiansborg  
1240 København K.

**Vedr.: Ren Planteolie anvendt som ren Biobrændstof (100%).**

Vi henvender os til Dem for at gøre opmærksom på en biobrændstofteknologi, som vi mener bliver overset i Danmark, men som bør indgå i en Dansk Biobrændstofstrategi. Det drejer sig om Ren Planteolie anvendt i ren form (100%) i dieselmotorer der er forberedt til eller ombygget og optimeret til at anvende Ren Planteolie. Den engelske benævnelse er PPO, Pure Plant Oil. Teknologien er først og fremmest udbredt i Tyskland, men på verdensplan er der stor interesse for den, ikke mindst i udviklingslandene hvor den forholdsvis simple teknologi kan realiseres lokalt og decentralt med lave investeringsomkostninger. PPO er nævnt som én af mange biobrændstofteknologier i EU's biobrændstofdirektiv fra 2003.

På det folkelige plan er der i Danmark efterhånden et meget udbredt kendskab til at anvende ren planteolie i ren form og mange har gjort positive erfaringer. Flere danske virksomheder har allerede satset på denne niche indenfor biobrændstofteknologi. Således findes der allerede en række virksomheder der producerer udstyr til produktion af PPO, andre der modificerer dieselmotorer til formålet, en lang række små producenter af PPO samt nogle enkelte store.

For at anskueliggøre hvilken fokus der er på teknologien internationalt har vi vedlagt en folder med program for en International PPO Kongres som afholdes i Erfurt, Tyskland, 6-7 September 2007. Her kan man møde eksperter inden for mange områder af teknologien, herunder kvalitetssikring iht. DIN normen der er gældende for PPO, motorkonvertering, emissioner fra dyrkning og udstødning, politik, mm. Desuden har vi vedlagt nyhedsbrev fra Biofuel-Cities, der her i sin allerførste udgave sætter fokus på PPO.

Det kan også nævnes, at afgiften for PPO i Tyskland kun udgør 16 øre/liter, og i England er små producenter med en årlig produktion på under 2500 liter/år netop blevet fritaget for at svare afgifter.

Herudover vil vi gerne henlede Deres opmærksomhed på følgende internetadresser, hvor der kan hentes information om emnet:

EPPOA – European Pure Plant Association: [www.eppoa.org](http://www.eppoa.org)

- Link til EPPOAs høringssvar til Energistyrelsen:

[http://www.eppoa.org/docs/hoeringsvar\\_biobraendstof\\_DK\\_06.08.2007.pdf](http://www.eppoa.org/docs/hoeringsvar_biobraendstof_DK_06.08.2007.pdf)

Rapsbil.dk – Forening til Planteoliens Fremme: [www.rapsbil.dk](http://www.rapsbil.dk)

Nordisk Folkecenter for Vedvarende Energi: <http://www.folkecenter.net/dk/rd/transport/raps>

DAJOLKA : [www.dajolka.dk](http://www.dajolka.dk). Link til internationale PPO projekter: <http://dajolka.dk/projects.htm>

PPO-MC Global Tour: [www.ppo-mc-global-tour.dk](http://www.ppo-mc-global-tour.dk),

(Danskeren Henning Bitsch på Jordomrejse på Motorcykel drevet af PPO)

Med venlig hilsen

Niels Ansø

Jacob Bugge





# First International Congress on Plant Oil Fuels

Messe Erfurt, 6th-7th September 2007 with exhibition

In the framework of the **naro.tech**  
Exhibition and Congress on Renewable Resources

[www.plant-oil-congress.info](http://www.plant-oil-congress.info)



## Pure Plant Oil / Straight Vegetable Oil as Fuels

For experts and key personnel from Germany, Europe and all continents:  
Scientists, developers, manufacturers, traders and users

### Main topics of the congress:

- Biofuels – Status and Perspectives
- Ecologic Evaluation
- Plant Oil: Technics – Production and Equality
- Plant Oil: International Markets and Economy
- Mobile Applications – Technics and Emissions
- Stationary Applications – Technics and Economy

Languages of the congress: German/English with simultaneous translation

### Partner



### Sponsor



### Media partner



## Thursday, 6.9.2007

### Biofuels – Status and Perspectives

- 10.30 **Dr. Klaus Kliem (Assistant chairman of the Agency of Renewable Resources, FNR, and President of the UFOP, Germany):**  
Bio-Fuels today and tomorrow – European and German strategies
- 10.50 **Michael Carus (nova-Institut GmbH, Germany):**  
Biofuels in the context of the worldwide energy shift

### Ecological Evaluation

- 11.10 **Dr. Guido Reinhardt (ifeu – Institut für Energie- und Umweltforschung Heidelberg GmbH, Germany):**  
Eco balances of plant oil fuels
- 11.30 **Dr. Norbert Schmitz (meo Consulting Team, Germany):**  
Sustainability certification of bio fuels and their raw materials (national view)
- 11.50 **Sebastian Meyer (Ecofys Germany GmbH, Germany):**  
Opportunities for a sustainable palm oil production
- 12.10 **Dr. Michael Grunert (Saxonian State Agency for Agriculture, LFL, Germany):**  
Sustainable rape cultivation with regard to the nutrient cycle, soil fertility and crop rotation
- 12.30 **Discussion – afterwards lunch break**

### Plant Oil: Technics – Production and Quality

- 14.00 **Thorsten Graf (Thuringian State Agency for Agriculture, TLL, Germany):**  
Requirements concerning raw material quality with emphasis on rape seed
- 14.20 **Peter Emberger (Technology and Support Centre, TFZ, Germany):**  
Production of rape oil fuel in decentralised plants
- 14.40 **Norbert Horn (Brökelmann & Co. Ölmühle GmbH & Co., Germany):**  
Production of rape oil fuel in industrial oil mills using the example of !Next Bio Drive
- 15.00 **Dr. Thomas Wilharm (ASG Analytik-Service Gesellschaft mbH):**  
Different plant oil fuels: Quality assurance according to Norm DIN V 51605
- 15.20 **Discussion – afterwards coffee break**

### Plant Oil: International Markets and Economy

- 16.20 **Hein Aberson (PPO.eu ivzw, The Netherlands):**  
Profitability views of the use of plant oil fuels on a European level
- 16.40 **Dr. Bernard Rice (Teagasc – Crops Research Centre, Ireland):**  
Pure plant oil: developments in Ireland and Great Britain
- 17.00 **Edward Beggs (PlantDrive International, Canada):**  
Market development in North America, use of pure plant oil in cold climates and future prospects
- 17.20 **Charles Anderson (Golden Fuel Systems, USA):**  
Plant oil use in Japan and the USA: Challenges and success, past, present and future
- 17.40 **Discussion – afterwards dinner buffet**

## Friday, 7.9.2007

### Plant Oil: International Markets and Economy

- 09.00 **Manfred van Eckert (Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Germany):**  
Plant oil fuels – development perspectives for Developing Countries and current status in GTZ
- 09.20 **Thomas Breuer (nova-Institut GmbH, Germany) / Arno Becker (University of Bonn, Institute for Food and Resource Economics, ILR, Germany):**  
General conditions, policies on subsidies and regional added value potentials of decentralized rape oil production
- 09.40 **Dr. Robert Manurung (School of Life Science and Technology, Indonesia):**  
Plant oil in Indonesia: Pure jatropha oil in direct use in cars – potentials and experiences and palm oil plantation and testing
- 10.00 **Discussion – afterwards coffee break**

### Mobile Applications – Technics and Emissions

- 11.00 **Klaus Thuncke (Technology and Support Centre, TFZ, Germany):**  
Combustion of plant oils in diesel engines – an up-to-date overview of national and international research results
- 11.20 **Volker Wichmann (University of Rostock, Germany):**  
Rape oil conversion of diesel engines – requirements and their implementation
- 11.40 **Prof. Dr. Gennadi Zikoridse (University of Applied Sciences Dresden, Germany):**  
Secondary treatment of exhaust gas from engines suitable for plant oil use
- 12.00 **Dr. Georg Gruber (United Facilities for Plant Oil Technology, VWP, Germany):**  
Pure plant oil – towards use in series engines: lorries, passenger cars and tractors (John Deere)
- 12.20 **Josef Rathbauer (BLT Wieselburg, Austria):**  
Results of the 35-tractors-programme in Austria
- 12.40 **Discussion – afterwards lunch break**

### Stationary Applications – Technics and Economy

- 14.10 **Markus Gailfuß (BHKW-Consult, Germany):**  
CHPP: Market developments, economy and main problems
- 14.30 **Kristoffer Dahlinger (NEED GmbH & Co. KG, Germany):**  
Operational experience with palm oil-operated combined heat and power plants (CHPP)
- 14.50 **Axel Hain (Würz Energy GmbH, Germany):**  
Practical experiences in the use of straight vegetable oil in medium-sized combined heat and power plants (CHPP)
- 15.10 **Yakup Erdogan (Städtwerke Düsseldorf AG, Germany):**  
Field report on plant oil fuels in combined heat and power plants (CHPP) and profitability views in contracting
- 15.30 **Summary**
- 16.00 **Coffee break**

### Workshop BHKW & Renewable Energy Sources Act (EEG)

- 16.30 **Markus Gailfuß (BHKW-Consult, Germany):**  
The German Renewable Energy Sources Act (EEG) – terms and trends

MESSE  
ERFURT

Already now, nearly 20 energy related exhibitors did book a stand! (June 2007)

In parallel with the congress, the narotech – Exhibition and Congress on Renewable Resources – will take place. Interested exhibitors please contact:



narotech

### Registration

Easy registration for the congress at:

[www.plant-oil-congress.info](http://www.plant-oil-congress.info)

Congress Fee: 390 € (plus 19% VAT)

Reduced conference fee for students: 200 € (plus 19% VAT)

Special conditions are available on request for: Administration, ministries, universities and participants from non-industrialised countries.

### Messe Erfurt AG

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www.narotech.de

### Are you interested in sponsoring the congress?

For detailed information please contact  
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## Editorial

JOHN NEEFT, SENTERNOVEM

[j.neeft@senternovem.nl](mailto:j.neeft@senternovem.nl)

### Welcome to Biofuel Cities Quarterly!

*In your hands is the first issue of **Biofuel Cities Quarterly**, your gateway to information on new and innovative biofuel applications. Every three months, **Biofuel Cities Quarterly** will offer you insights, views and background information on key topics on the biofuels agenda. In addition, you will be kept up-to-date on events, tools and publications, as well as relevant policies and projects.*

**Why subscribe to *Biofuel Cities Quarterly*?** More than ever, the issues of climate change and greenhouse gas emissions are at the top of the agenda. It is quite clear that something must be done to mitigate against the situation that we may soon find ourselves in. Using biofuels can contribute to that effort.

The use of biofuels for transport has two additional advantages: it reduces our dependency on oil and it offers an opportunity for diversification of activities in our agricultural sector. As a result, the European Commission is actively promoting the use of biofuels for transport. In 2003, the Commission adopted Directive 2003/30/EG obliging Member States to set indicative national targets, with a reference value of 5,75% of the amount of petrol and diesel in 2010. Currently, the Commission and its Member States are discussing a 10% biofuel target for 2020.

We have seen further important developments over the last 12 months. In Europe, a number of Member States actively work on the introduction of sustainability criteria to ensure that feedstock for biofuels is produced in a sustainable manner. In an increasing number of European countries, the use of high-blend fuels is actively encouraged. In the United States of America, more than a billion dollars have been allocated to the development of so-called "2<sup>nd</sup> generation" biofuels. These topics will be discussed in future *Quarterlies*.

*Biofuel Cities Quarterly* is published by the Biofuel Cities project. **What is Biofuel Cities?** Biofuel Cities is a European project to build and maintain a European Partnership, a platform in which participants can share all that they need to make progress in the implementation of biofuels. For instance, a few dozen European local car or bus fleets have been, or are, shifting from regular fuels to biogas, pure biodiesel or almost pure ethanol. Through the Biofuel Cities European Partnership, all participants can share information and experience to profit from this. Let's stop reinventing the wheel! Within Biofuel Cities you can find information and partners, start a discussion, address barriers and create new initiatives. Biofuel Cities was created to accelerate developments leading up to an increased use of biofuels in Europe. Find more information on this project on page two of this newsletter.

**We invite you to join us!**

## In focus

### Pure vegetable oil – a sustainable but controversial engine fuel

Pure vegetable oil could potentially produce the most comprehensive ecological, economic and social benefits of all presently existing biofuel options, however at the same time, it is presumably the most controversially debated biofuel on the market. Some critics go as far as saying that pure vegetable oil can not be viewed as an engine fuel at all, with French and Italian legislation reflecting this view by prohibiting pure vegetable oil use in engines, except for some very narrowly defined applications. On the other hand, some 10,000 vehicles, notably truck fleets, run on pure vegetable oil in Germany and Austria.

Hence, a discussion about pure vegetable oil used as an engine fuel highlights very strongly all aspects that must be taken into account when evaluating biofuel options in general and sharply marks the points to which attention must be paid. For this reason, this first issue of *Biofuel Cities Quarterly* focuses on pure vegetable oil.

Pure vegetable oil does not only present the simplest of all biofuel options, at least from a production point of view, but also illustrates the various aspects under which biofuels must be analysed and compared against each other and conventional transport fuels.

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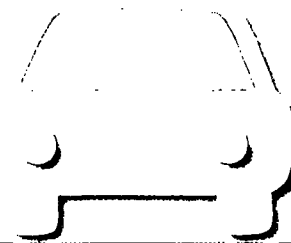
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## Biofuel Cities – a new initiative

The purpose of Biofuel Cities is to develop a European Partnership that demonstrates the broadscale use of new and innovative biofuel technologies. Biofuel Cities covers the complete chain from feedstock to biofuels production, distribution and utilisation in vehicle fleets.

### Biofuel Cities: what is in it for you?

The objectives of the Biofuel Cities project are to:

- a) **build a European Partnership** in which biofuel end-users, suppliers and those actors setting the frameworks for biofuel application are invited to form new partnerships for projects and engage in exchange and networking;
- b) **independently assess biofuel projects**, both Research & Development and demonstration, in order to guide industrial and commercial stakeholders, local governments, the European Commission and others on the implementation of biofuels vehicles;
- c) **support biofuel stakeholders through information and training** by offering a range of tools, events and publications, as well as guidance on biofuel policies and applications.

The European Partnership is designed for all stakeholders in the area of biofuel vehicles, such as local governments and local companies that, for example, work with local car fleets, businesses in the entire biofuel supply chain, the research community, governments and standardisation bodies, as well as organisations that provide connections to civil to society like non-governmental organisations and the media.

For these stakeholders, Biofuel Cities offers

- an interactive website, [www.biofuel-cities.eu](http://www.biofuel-cities.eu) – the website for biofuels application at

the local level. Users profit from a Europe-wide directory of projects and activities, find out about news and future events, access a resource centre on biofuels, with information about policies, legislation, technology and more;

- events and online facilities offering twinning, project co-operation and networking opportunities;
- expert workshops and study tours demonstrating practical examples of biofuel application;
- news and publications providing information on developments in biofuels, including good practice cases, guidebooks, and reports;
- tools for monitoring, standardisation of biofuels and biofuel application.

#### Becoming a participant of the European Biofuels European Partnership is easy:

- go to [www.biofuel-cities.eu/registration](http://www.biofuel-cities.eu/registration) to register online, or
- request an application form by e-mail from [secretariat@biofuel-cities.eu](mailto:secretariat@biofuel-cities.eu) or by post to SenterNovem, Biofuel Cities, PO Box 8242, 3503 RE Utrecht, The Netherlands.

What can you expect from us over the coming months? [www.biofuel-cities.eu](http://www.biofuel-cities.eu) is online and ready to use! We have just completed a survey that aimed to create a needs inventory of our target groups, the results of which will be available soon. Following the summer break, the Biofuel Cities European Partnership will be officially launched.

Meanwhile, we are busy organising a series of workshops. The first two workshops took place in May, the first in Brussels on “biofuel project assessment” and the second in Stockholm dealing with “the European Partnership and the role of end-users”. Reports will be available soon. This autumn we are organising workshops for end-users, which will focus on project assessment and biofuel projects.

### Biofuel Cities: the project behind the Partnership

The Biofuel Cities European Partnership is an EU-funded project. The project involves seven project partners: SenterNovem (Netherlands, project coordinator) and Exergia (Greece), ICLEI - Local Governments for Sustainability, INEM, the World Federation of National Business Associations for Environmental Management, the Institute for Fuels and Renewable Energy (Poland), NEN, the Dutch Standardisation Institute (Netherlands) as well as VITO, the Flemish Institute for Technological Research (Belgium). The organisations ICLEI and INEM operate world-wide. In the next issues of *Biofuel Cities Quarterly*, all partners will be presented in more detail.

As you can see, we offer you a diverse biofuel menu. Make your choice and enjoy!

**JOHN NEEFT, SENTERNOVEM**  
[j.Neeft@senternovem.nl](mailto:j.Neeft@senternovem.nl)



### → Policy agenda

#### • Biofuel developments in the European Union (EU)

On 10 January 2007, the European Commission unveiled an integrated energy and climate protection policy in its communication, “An Energy Policy for Europe”. The package of proposals includes a plan to set a binding target of at least 10% of vehicle fuels in the EU to originate from biofuels by 2020. For more information visit:

[www.consilium.europa.eu/uedocs/cms\\_Data/docs/pressdata/en/trans/92799.pdf](http://www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/en/trans/92799.pdf)

#### • EU public consultation on how the use of biofuel can be increased by 2020

The EU is currently completing a public consultation with citizens, discussing ideas on how the use of biofuel (bio-diesel, etc.) can be increased by 2020. The results will influence a new Directive that will be issued later this year. You find further information under:

[http://ec.europa.eu/energy/res/consultation/biofuels\\_en.htm](http://ec.europa.eu/energy/res/consultation/biofuels_en.htm)

## Pure vegetable oil – a sustainable but controversial engine fuel

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### Decentralised production

Pure vegetable oil can be produced decentrally and is immediately usable. There is no lengthy manufacturing chain. This has two consequences: Firstly, even small agricultural units are able to produce fuel. This results in a stabilisation of agricultural structures, which is desirable for socio-economic and spatial-structural reasons. Secondly, the energy losses and required energy input from harvest on the field to filling of the tanks (well-to-tank losses) are the lowest of all biofuels. Pure vegetable oil has a by-product for which a large market exists; oil cake – a protein-rich product that can be used as a domestic animal feed, replacing imports of soy into the EU.



Oil press on a farm

### Vehicle modification

The most fundamental argument against pure vegetable oil is that its low viscosity and low cetane number make it principally unsuitable for use in existing and future internal combustion engines. This is, however, disproved by some 10,000 vehicles running smoothly on pure vegetable oil once some vehicle modifications were undertaken. The concepts for vehicle modification can roughly be broken down into two-tank and single-tank concepts.

Two-tank concepts overcome the principle difficulties of pure vegetable oil combustion by starting the engine with conventional diesel taken from one tank and then switching over step-by-step to higher content of vegetable oil taken from the other tank. These concepts differ mainly in the sophistication of the control unit, which measures the temperature at different points of the engine and the fuel circuit and regulates the switch over between both fuels. Engine components in two-tank systems are generally little modified in comparison with standard diesel engines. → Page 5



Dr. Georg Gruber, VWP

### Interview with Dr. G. Gruber, "Vereingte Werkstätten für Pflanzenöltechnologie" (VWP):

interviewed by Dr. Michael Stöhr, INEM/B.A.U.M.

Dr. G. GRUBER is one of the partners of the United Workshops for Plant Oil Technology, *Vereinigten Werkstätten für Pflanzenöltechnologie (VWP)*, one of the leading developing companies for pure vegetable oil engines. Within the EU-Fifth Framework Programme funded project "100% RENET", VWP managed to realise the breakthrough of the adherence to the EURO-3-Norm for passenger cars, as well as the first use of plant oil in a small combined heat and power unit (CHP) with soot filter.



The converted passenger car of Mr. G. Gruber (VWP)

**M. STÖHR:** *I would like to start with a fundamental question: Is pure vegetable oil actually a motor fuel or not? The automobile industry says it is not, but your company has lived on the business of pure vegetable oil engines for 14 years now and you have already converted more than 4,000 vehicles. How do these positions reconcile with each other?*

**G. GRUBER:** The answer is very simple: It is problematic to use vegetable oil as a fuel for mobile applications. This is related to the enormous variability of its viscosity within the operating temperature range and its low flammability and cetane number.

After fuelling a modern standard diesel engine with pure vegetable oil, for certain the engine will be ruined – exceptions might prove the rule. Pure vegetable oil is not a fuel for the

currently serially produced diesel engines. Unfortunately, already here the perception of many people and institutions comes to an end. It is, thus, our challenge to demonstrate that with an appropriate adaptation of the engine, for which we have developed and applied concepts successfully for 14 years, an engine can run perfectly between pure vegetable oil and any blend with conventional diesel.

**M. STÖHR:** *Having this in mind, why is the rumour that plant oil is categorically not suitable as an engine fuel so persistent?*

**G. GRUBER:** Well, this is due to the fact that a lot of companies offer concepts for the conversion of engines that are poorly conceived. As a consequence, the engines may be damaged and at the very least emissions may reach unjustifiably high levels. → Page 4



In the VWP workshop

### → More about pure vegetable oil:

- <http://www.eppoa.org/>  
Website of EPPOA - European Pure Plant Oil Association.
- [http://www.gave.novem.nl/novem\\_2005/index.asp?id=20](http://www.gave.novem.nl/novem_2005/index.asp?id=20)  
Information on pure plant oil on the SenterNovem website.

#### In German:

- <http://www.vwp-europe.com/>  
Website of VWP – Vereinigte Werkstätten für Pflanzenöltechnologie.

#### ...or if you prefer books:

- Eder B. & F. Eder (Staufen 2004): *Pflanzenöl als Kraftstoff*. Autos und Verbrennungsmotoren mit Bioenergie antreiben.



### → Publication highlights:

- Bockey, D. (2006): **Current situation and prospects for biodiesel and vegetable oils as fuels:** From niche products to market players. Berlin.  
Available to download:  
<http://www.biomatnet.org/publications/1996repa.pdf>
- Haupt, J. & D. Bockey (2006): **Running vehicles successfully on bio-diesel.** Product quality requirements for FAME. Berlin.  
Available to download:  
<http://www.biomatnet.org/publications/1996repb.pdf>
- Kampman, B., den Boer, E. & H. Croezen (2005): **Biofuels under development.** Delft.  
An analysis of currently available and future biofuels and a comparison with biomass application in other sectors.  
Available to download:  
[http://www.senternovem.nl/mmf/files/150152\\_tcm24-124818.pdf](http://www.senternovem.nl/mmf/files/150152_tcm24-124818.pdf)

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### Interview with Dr. G. Gruber,

Director of the Institute for Agricultural Engineering and Agricultural Machinery at the University of Applied Sciences in Hohenheim, Germany

**M. STÖHR:** *Let's stick to the issue of emissions: One of the main points of those opposed to the utilisation of plant oil as an engine fuel is the accusations that this would result in high emissions. What are the norms for exhaust gas that may be reached by engines converted by your company?*

**G. GRUBER:** For new passenger cars this is the EURO-4. The main challenge is cold starting, which is compulsory for all exhaust-gas tests for passenger cars. These make it very difficult to reach EURO-4- and -5 norms with vegetable oil. There is still a lot of research to do. As tractors normally operate at constant load, there is no legally regulated testing with cold starts for tractors. Instead of this, a test with eight different load and idle steps is carried out. Our company reached the TIER 3 norm for tractors at the beginning of this year. This norm is valid for diesel, as well as for vegetable oil until 2011. Besides, the possibility of achieving the TIER 4 norm also exists.

**M. STÖHR:** *But haven't measurements, broadcast recently on German TV, shown that emissions from vegetable oil-fuelled vehicles are much more carcinogenic than emissions from diesel?*

**G. GRUBER:** These measurements have been made on a non-adapted motor with vegetable oil of unknown quality! They teach us nothing about emissions from engines adapted to vegetable oil. Quite the opposite. We know about measurements that show that the opposite is true: emissions from vegetable oil-fuelled adapted engines are most probably less carcinogenic than emissions from diesel engines fuelled with conventional diesel or with biodiesel.

**M. STÖHR:** *Last question: what are the additional costs for an engine adapted by your workshops to vegetable oil compared to a conventional diesel engine?*

**G. GRUBER:** The conversion of tractors and trucks costs approximately 5,000 to 6,000 €. Serial production could reduce the costs. An additional price of approximately 3,000 to 4,000 € compared to standard serial diesel engines is possible for the end customer.

Mr Gruber was interviewed by Dr. Michael Stöhr, INEM/B.A.U.M.

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Converted truck



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## Pure vegetable oil – a sustainable but controversial engine fuel

Single-tank systems allow engine starts with pure vegetable oil and require a modification of the engine itself. The components that are modified are essentially the fuel circuit and the injection system. Modifying the engine, however, terminates the warranty of the original engine manufacturer, however some specialist vegetable oil engine workshops compensate this loss with an own-warranty on the modified motor.

## Exhaust emissions of pure vegetable oil run engines

Exhaust emissions are a major point of the debate. Engines that have not been converted to pure vegetable oil operation generally produce high emissions, above legal thresholds, when fuelled with vegetable oil. The exact level depends on the specific engine, as well as on the quality of the vegetable oil that is used. This has recently been highlighted on German TV, where emission measurements on non-adapted engines fuelled with vegetable oil, not corresponding to the existing German pre-norm DIN V 51605, were presented. The measured emissions were not only high, but have shown a higher mutagenicity of the particulates than for diesel in the AMES test, which is a quick method of estimating the carcinogenic potential of a substance. Advocates of pure vegetable oil in Germany commented on the 'perfect timing' of this broadcast, which coincided with an important legislative debate on biofuels in Germany and stressed that the results presented tell nothing about converted engines running on pure vegetable oil (see interview in this issue). What can be learnt from this is that statements about pure vegetable oil – and other biofuels – are not untainted by the position of various interest groups and need to be examined more closely.

A modification of the engine, either as two-tank or single-tank system changes the situation and suitably adapted engines can comply with the EURO-3-norm even when running with pure vegetable oil.



Oilseed rape – the raw material most used for vegetable oil in Europe



The lack of a legal norm for vegetable oil fuel leads, however, to a paradoxical situation: in the course of the vehicle registration, the authorised workshops must measure the engine emissions with standardised diesel as test fuel, i.e. exactly with the fuel that will not be used in daily operation by the vehicle owner. Hence, this obligatory exhaust emission measurement tells nothing about the emissions under real operating conditions. Even worse, the engine cannot be adapted for lowest possible emissions under vegetable oil operation, as this requires setting engine parameters, such that the emission tests with diesel fuel might fail. As a consequence, not all specialist workshops that offer diesel engine modification care about the emissions under real operating conditions with pure vegetable oil and those that do are impeded by the present legislation to reduce emissions to the lowest technically possible level.

## Sustainable production of pure vegetable oil in Europe

A further point to be examined is the potential that exists for producing pure vegetable oil and how much this potential depends on (un)sustainable cultivation practices. Rape-seed oil, which is the presently most used vegetable oil in Europe, is difficult to cultivate organically, i.e. it requires energy input in the form of plant protection chemicals and mineral fertilisers. In addition, the oil yield per hectare is low, at approximately 1,000 litres, whereas the cultivation of maize for the production of biogas or of energy plants for the production of sun fuels can lead to yields up to 4,000 liters per hectare.

However, three considerations put this comparison into perspective:

- First, rape cultivation leads to a yield of about 2-3,000 kg of protein-rich oil cake in addition to the oil. Oil-cake can replace imports of soy for cattle feeding – an important aspect if one considers that the EU is a net importer of protein-rich animal food. The remaining straw can serve as additional fuel.
- Secondly, plant breeding has the potential to develop rape species that are more suitable for organic farming, the only fully sustainable form of agricultural production.
- Thirdly, other oil plants can be considered for producing engine fuels.



Mixed cropping with camelina sativa

Sunflower oil is also appropriate and is more suited to organic cultivation. An important opportunity for organically produced oil seeds in Europe, however, lies in companion cultures or mixed cropping. The method consists in cultivating oil plants like wild flax (*Camelina sativa*) simultaneously with cereals or legumes. This leads to synergy effects between the plants and allows a strong reduction in the use of plant protection agents, which is a large step towards organic farming by a simple change of the cultivation method. The yield of the main fruit, cereal or legume is not reduced, but is stabilised on average over the years. In addition to the main crop, 100 litre oil and 200 to 300 kg oil cake are gained per hectare. As huge areas in Europe are used for cereal production, the potential for producing pure vegetable oil is about 60 petajoule. This is only 60 % of the German biodiesel use in 2006, but can be produced without running into competition with food production and – due to synergy effects – at almost zero cost.

← continued from page 3

## Pure vegetable oil – a sustainable but controversial engine fuel

### Oil import options

There are a lot of other oils that could be taken into account for the development of vegetable oil engines. Coconut and palm oils, for example, are suitable for the use in CHPs. In hot countries, the oil is also suitable for mobile use. However, the risk of possible deforestation of the tropical rain forest for the cultivation of palm oil plantations requires that caution be exercised, if sustainability criteria are to be met. The most interesting (sub)tropical oil plant is jatropha, which has numerous advantages. Firstly, jatropha is not in competition with food production. Jatropha grows in arid and semi-arid regions and is used in hedges to protect fields from goats. The plant stabilises the groundwater level and can even deal with a certain salt content.

Jatropha has not been cultivated very much until now, however a number of pilot projects have been implemented to produce jatropha oil as an engine fuel. It seems to be well suited for converted engines. In this respect, jatropha even has advantages over sunflower oil. The engines that have been converted for rapeseed oil need only a few changes to run on jatropha oil.

### In conclusion

In summary, one can say that **pure vegetable oil can be considered as an engine fuel**. It is most suitable for applications that require few starts of the engine, i.e. engines used in hot countries, hybrid engines and engines used for long distances or longer constant loads, such as tractors and other agricultural machinery. The environmental-friendly nature of pure vegetable oil make it suitable for applications in environmentally sensitive areas.



Tractor running on pure plant oil

From a logistics point of view its low flammability is a strong advantage, as the risk of explosion is almost zero.

The potential for pure vegetable oil does not allow to replace a major part of the presently used mineral fuels, but is large enough to make an important contribution to the biofuels market. In particular, pure vegetable oil has by-products that can be used for animal feed (oil cake) or may not compete with food production at all (oils from mixed cropping). Specific advantages of pure vegetable oil include the fact that it can be produced in small units, allowing income generation for farmers, who profit from the whole value-creation chain and that very little energy losses occur in the process chain from seeds to oil.

The challenges to be met are oil quality, definition of standards for emission measurements, breeding of suitable oil plants and engine conversion. A European standard for pure vegetable oil needs to be defined and, when the vehicle is intended to be run on vegetable oil, emission measurements need to be taken with pure vegetable oil in the tank. Research and development is needed on plant breeding for vegetable oil

use as fuel. In particular, oils with a low iodine number, i.e. high oleic acid content and low linoleic and linolenic acid content are required and corresponding species need to be bred. In addition, the research and development of engine concepts that until now been carried out by a few small technology development companies needs to be intensified.

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## → Resources – Recommended websites

- [http://ec.europa.eu/agriculture/biomass/biofuel/index\\_en.htm](http://ec.europa.eu/agriculture/biomass/biofuel/index_en.htm)  
Website on the EU Strategy for Biofuels.
- [http://ec.europa.eu/energy/res/legislation/biofuels\\_members\\_states\\_en.htm](http://ec.europa.eu/energy/res/legislation/biofuels_members_states_en.htm)  
Country reports on implementation of the Biofuels Directive.
- <http://www.biofuelstp.eu/home.html>  
The European biofuels technology platform.
- <http://www.eubionet.net/>  
The EUBIONET II – European bioenergy network analyses current and future biomass fuel market trends and biomass fuel prices.
- <http://www.premia-eu.org/reports.htm>  
PREMIA investigates the effectiveness of support programmes to facilitate and secure the market introduction of alternative motor fuels in the European Union.

## Experts gather to advise on biofuel project assessment standards

On 4 May 2007, the Biofuel Cities project organised an expert workshop on biofuel project assessment in Brussels. 21 experts with a broad variety of backgrounds, including biofuel producers, end-users, experts in biofuels implementation and scientific evaluators, discussed approaches to assessment and data sharing on biofuel projects.

The aim was to work on indicators and a possible framework for the collection of data, in order to contribute to the assessment tool that will be developed in the Biofuel Cities project and be available to interested stakeholders.

Examples of assessments within the BEST bioethanol project and BIOGASMAX biogas project showed that a long consultation process with project partners is normally required to come up with an accepted data collection methodology. The existence of a common assessment framework, which is clear from the start of a project (even from the proposal phase), would have an important added value.

The approach for biofuel project assessment in Biofuel Cities will be based on the biofuel Well-to-Wheel (WTW) chains and will aim at collecting key indicators for the defined WTW-chain, bringing together all information and lessons learnt from European biofuel projects. The projects themselves actively participate by inputting their information.

A web-based tool with the following goals will be uploaded on the Biofuel Cities website:

- to inform the general public and other stakeholders through the provision of up-to-date information. Examples of literature for each biofuel and each part of the WTW chain will be shown. This includes recently updated figures by participating projects. Relevant reports on certain topics (e.g. socio-economic studies, sustainability, safety,...) will also be uploaded;
- to gather input from projects (indicators) and help them find the place for their application in the WTW balance. Participants can give input in underlying blocks. This allows follow-up of the project over time and the calculation of overall indicators with existing tools on WTW basis, using general background information;
- to propose a common assessment framework, which can be used as a tool to evaluate the evolution of biofuel technology in the project on technological, environmental, economic, safety/regulations and socio-economic level.

With the comments and input of experts, the project partners of Biofuel Cities will further elaborate upon a common assessment framework and data-sharing system. This web-based tool should be available by the beginning of 2008.

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www.FreeFoto.com:  
p. 1, 2, 4 (bus), 5 (filling station, rape field)  
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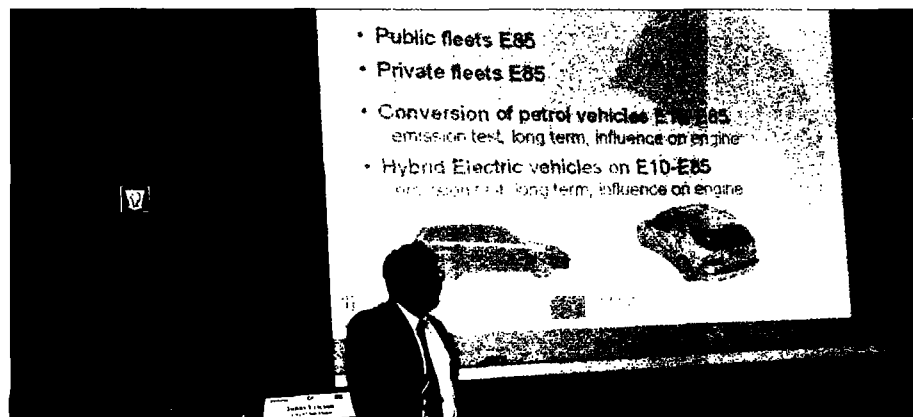
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The Biofuel Cities Consortium strives to provide relevant and user-friendly services and products, both in terms of quality and quantity of information design and of the actual information supplied. Please help us to improve our work and tailor it according to your needs and wishes! We will carefully evaluate and use all your comments and proposals, please send them to secretariat@biofuel-cities.eu

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Presentation of the BEST project

## Research and development – work in progress

The project **Bioethanol for Sustainable Transport** deals with the introduction and market penetration of bioethanol as a vehicle fuel, establishment of infrastructure for supply and fuelling of bioethanol, the introduction and wider use of ethanol cars and flexible fuel vehicles on the market. During the project more than 10,000 ethanol cars and 160 ethanol buses will be put in operation and E85 and E95 fuel stations will be opened. Participating cities/regions are: Biofuel Region (SE), Brandenburg (DE), Somerset (UK), Rotterdam (NL), Basque Country and Madrid (ES), La Spezia (IT), Nanyang (China), Sao Paulo (Brazil). Co-ordinating City is Stockholm (SE). Industrial partners are Ford Europe, Saab Automobile and several bioethanol suppliers.

To find out more, visit [www.best-europe.org](http://www.best-europe.org)



**Sustainable Green Fleets (SUGRE)** is an accompanying measure to European Union research promoting alternative propulsion and mainly focuses on fleets, yet not only with regards to land transport. The main objective is to promote and support the conversion of fleets to alternative propulsion (ranging from biofuels and methane as fuel to hybrid systems comprised of combustion engines and electric propulsion systems) and their energy efficient usage.

For further details, visit [www.sugre.info](http://www.sugre.info)



The object of the **Renewable Fuels for a Sustainable Europe (REFUEL)** project is to develop a roadmap for biofuels to effectively reach targeted market penetration in 2030. It expects to deliver: a meaningful road map consistent with EU policies and which has been discussed and agreed to by a wide range of stakeholders, resulting in a biofuels scenario consistent with a target market penetration in 2030; a design of the required supply chain and market structure;

the assessment of costs and potentials and the evaluation of short and long term barriers to implementation.

For more information, visit [www.refuel.eu](http://www.refuel.eu)

The national academic, research and industrial stakeholders of Thessaly and other regions of Greece involved in promoting biofuels as an alternative energy carrier are taking the initiative to establish the **Biofuels Technological Platform** in Thessaly. This regional Biofuels Technological Platform is established as an action of the overall program "Development of Regional Innovation Poles (RIP)" of the Greek Secretariat for Research and Development. The Platform is intended to provide and implement a common vision and strategy for the production of biofuels for transport applications.

For more information about the platform please visit: <http://tp-biofuels.cperl.certh.gr>

or contact Dr. Vasiliki Kazantz, Biofuels Technological Platform, Regional Innovation Pole – Thessaly, Phone: +30.24210.78287; Fax: +30.24210.78298.

### 2007 Biofuel Cities Survey

#### → 29 - 31 August 2007

2nd European Summer School on Renewable Motor Fuels, Warsaw, Poland

The 2nd European Summer School on Renewable Motor Fuels is organised within the RENEW project and addresses students, researchers and professionals from the automobile and chemical industries, agriculture, as well as other interested persons. The event focuses on 2nd generation bio-fuels and the RENEW results.

[http://www.renew-fuel.com/jfs\\_documents.php](http://www.renew-fuel.com/jfs_documents.php)

#### → 3 - 6 September 2007

BIOENERGY 2007, Jyväskylä, Finland

BIOENERGY 2007 Conference and Exhibition is a large event on factors affecting the future of the bioenergy, biopower and biobased modern technologies and products.

<http://seminaarit.ohoi.fi/default.sp?seminarID=6>

#### → 6 - 9 September 2007

naro.tech 2007, Erfurt, Germany

The naro.tech exhibition will be an essential

meeting-place for all and people interested in renewable resources. The Exhibition with three conferences, exhibition and European co-operation exchange is an expertise summit.

<http://narotech.messe-erfurt.de/>

#### → 6 - 7 September 2007

First International Congress on Plant Oil Fuels, Erfurt, Germany

The First International Congress on Plant Oil Fuels will focus on renewable energy, mobility and biofuels in the context of the world-wide energy shift.

<http://www.pflanzenoel-kongress.de/>

#### → 4 - 5 October 2007

NextGeneration Biofuel Markets, Amsterdam, Netherlands

This networking conference will build upon the success of the next generation biofuels seminar held in Brussels this March. The focus of the conference is on how market-leaders tackle barriers and explore the market potential and opportunities of next generation biofuels.

[http://www.greenpowerconferences.com/general/event\\_listings.html](http://www.greenpowerconferences.com/general/event_listings.html)

#### → 15 October 2007

Biofuel Cities Expert Meeting: Practical barriers for the application of biofuels

The aims of this expert meeting, organised by the Biofuel Cities project, are to identify practical and technical barriers to the application of biofuels and guidelines to remove these barriers. The results of the Biofuel Cities survey (see page 2) will provide a basis for discussion. The meeting addresses experts on biofuels, as well as people with practical experience.

For further information:

René Wismeijer: [r.wismeijer@senternovem.nl](mailto:r.wismeijer@senternovem.nl),

<http://www.senternovem.nl/senternovem/>

or [www.biofuel-cities.eu](http://www.biofuel-cities.eu)

#### → 8 - 9 November 2007

Clean Vehicles and Fuels, European Symposium and Exhibition, Stockholm, Sweden

Clean Vehicles and Fuel aims at addressing climate change and reducing the dependency of the transport sector on oil. Products and services for cleaner vehicles and cleaner fuels will be displayed, current initiatives and projects presented and national and international policies and trends will be discussed.

[www.cleanvehicles.net](http://www.cleanvehicles.net)

