

# WORLDWIDE REVIEW ON BIODIESEL PRODUCTION

Prepared for

**IEA Bioenergy Task 39, Subtask „Biodiesel“**

Prepared by

**Austrian Biofuels Institute, [www.biodiesel.at](http://www.biodiesel.at)**

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## EDITORIAL:

IEA Bioenergy, an implementation agreement of the International Energy Agency and an international collaboration in Bioenergy, aims to accelerate the use of environmentally sound and cost-competitive bioenergy on a sustainable basis, and thereby achieve a substantial contribution to future energy demands.

([www.ieabioenergy.com/](http://www.ieabioenergy.com/)).

The main objectives of Task 39 "Liquid Biofuels" are to work jointly with governments and industry to identify and eliminate non-technical environmental and institutional barriers which impede the use of liquid fuels from biomass in the transportation sector, and to identify remaining technological barriers to Liquid Biofuels technologies. IEA Bioenergy Task 39 "Liquid Biofuels" is currently composed of 10 countries (Austria, Canada, Denmark, European Union, Finland, Ireland, The Netherlands, Sweden, USA and UK) interested in working together to successfully introduce biofuels for transportation into the marketplace. This Task reviews technical and policy/regulatory issues and provides participants with comprehensive information that will assist them with the development and deployment of biofuels for motor fuel use ([www.forestry.ubc.ca/task39/GT4/Frames/home.html](http://www.forestry.ubc.ca/task39/GT4/Frames/home.html)).

The extent to which biofuels have entered the marketplace varies significantly by country. The reasons for these differences are complex and include a variety of policy and market issues. While biofuels offer significant potential, the prices of biofuels are higher than their petroleum equivalents. As a result, biofuels have been successfully implemented only in those countries that have recognized the value of the benefits and have made appropriate policy decisions to support biofuels ([www.liquid-biofuels.com/FinalReport1.html](http://www.liquid-biofuels.com/FinalReport1.html)).

The lack of knowledge on the successful implementation of biodiesel on national and international markets limits the further development. To overcome this barrier the Austrian Biofuels Institute (ABI) was commissioned by Task 39 with a detailed documentation of the latest status in the development, production, utilization, marketing and legal framework of Biodiesel worldwide. Based on the results of a previous study for the Liquid Biofuels Activity in Task XII, the study should include Biodiesel activities by countries, profiles of national institutions dealing with Biodiesel, profiles of single Biodiesel production enterprises, and a summary and forecast of the national Biodiesel markets.

The study defines the state of the worldwide development of Biodiesel. Thanks to the authors it is made in a modern form: a multitude of well arranged links offers the access to comprehensive the Biodiesel web world.

M. Wörgetter

Wieselburg, August 11, 2003



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## 1 ABSTRACT:

Having completed the first IEA-report on the world-wide production of Biodiesel production in December 1997 as an attempt to provide knowledge about Biodiesel development at an early stage this new report is updating the first report after years of intensive activity to get commercial Biodiesel production established in the fuel markets. The method applied was approaching targeted active and potential actors with a short questionnaire in electronic and hard copy versions with approx. 280 valid and detailed responses from all over the world providing the following information:

1. Legislation: As a required basis for implementation several initiatives for a pace setting legislation were established e.g. by defining market share targets in the European Union (EU), by subsidies to feedstock usage in the USA and by requiring renewable energy usage in Australia, recognising also the importance of reducing greenhouse gas emissions.

2. Feedstock: Rapeseed production on set-aside non-food acreage represented the most important feedstock source in the EU, with recycling oils growing quickly in importance, while soybean was the oilseed of choice in the USA and South America and palm oil is being in consideration in Malaysia.

3. Process technology and engineering companies were striving for continuously improving the required Biodiesel quality and for reducing production cost with an increasing number of such companies providing reliable quality at low investment cost.

4. Biodiesel fuel quality reached a level of high quality definition by establishing the European standard EN 14214, the US standard ASTM D-6751-02 and the Australian Biodiesel fuel standard, with an effective quality management system in Germany (AGQM).

5. New marketing strategies, which vary by country, as one can observe the pure Biodiesel usage, the anonymised blend as well as a "blend & brand" strategy, and also strategies selling only on a low price, while others are promoting the differential advantages at a higher price.

6. In world-wide production Europe took the lead with more than 1,6 mill t Biodiesel produced in 2002 (at capacities of approx. 2,1 mill t), with Germany producing 580 000 t, France 400 000 t, Slovakia 120 000 t (in 2001) and the Czech Republic producing 70 000 t, while the USA were second to Europe with approx. 40 000 t production and Australia being in the phase of establishing 48 000 t production capacity. New initiatives in Brazil, Canada, Malaysia and the United Kingdom may change however this situation quickly.



## 2 METHOD:

The Austrian Biofuels Institute developed a new questionnaire together with the *Platypus-Creative Software team* and the *Institute for Technology of the University for Economy* in Vienna, which is reflecting actual Biodiesel experience.

The questionnaire was structured on 4 pages, with the goal of covering both quantitative and qualitative aspects, while assuring an easy and short interview in less than 8 minutes (see the questionnaire in the appendices).

The questionnaire was distributed online via the website [www.biodiesel.at](http://www.biodiesel.at) in an English and Spanish version to Biodiesel producers, with 43 valid responses from 130 recipients.

The e-mail version of the questionnaire and a few print copies were targeted to stakeholders and multipliers (e.g. ministries, energy and environmental agencies, trade attachés) with 280 valid responses from 1 180 addressed recipients with communication in English, German, Spanish, Portuguese and French.

The action covered nearly all countries around the world, in which any indication for Biodiesel activities had been reported.

Furthermore potential multipliers such as university institutes, trade delegations, commercial associations, commercial production and consulting companies were asked to support additional distribution of this questionnaire in print or e-copy.

At the occasion of conferences related to Biodiesel interview partners were identified, contacted and invited to filling in the questionnaire on the spot.

The data from the returned questionnaires were screened and evaluated, then cross-checked with published data and literature from sources available in the library of the Austrian Biofuels Institute and the Institute for Technology of the University for Economy in Vienna.

Where required personal phone interviews with key players completed the situation analysis where necessary.

Additionally detailed internet investigations were run in addition to the questionnaire and yielded 1 147 informative websites and valuable data, which selectively were finally compiled in the format as described below.



### 3 GLOBAL DEVELOPMENT AND TRENDS:

#### 3.1 Policies and legislation:

Numerous legislative measures have been developed in recent years and are now practiced. They vary according to the different policy objectives and motivations, with the following examples:

- a) Reduction of risks caused by inhalation of locally harmful exhaust emissions (e.g. CO, HC, PM, NO<sub>x</sub>, PAH):

Typical examples are the Clean Air Act (USA), the Directive on Quality of Fuels (European Union); the EPA-Standards for Off-Road Engines (USA); the EURO-emission standards for personal cars and heavy duty vehicles as defined in the Auto-Oil-programmes I and II (European Union).

- b) Reduction of risks caused by greenhouse gas emissions and the resulting climate change:

The new Directive on the Promotion of the Use of Biofuels (European Union) and a specific greenhouse tax on top of the mineral-oil tax (Germany); the voluntary agreement of ACEA (Association des Constructeurs Européens d'Automobiles) and the European Commission to reach a fleet emission limit of max. 140 g CO<sub>2</sub>/km by the year 2008.

- c) Reduction of risks in supply of energy for the transport sector:

The EPA Act (Energy Policy Act – USA); the new Directive for the Promotion of the Use of Biofuels (European Union).

- d) Reduction of risks to the environment caused by toxic substances:

Regulation to use biodegradable fuels in all boats on Lake Constance.

In further justification for those legislations the macroeconomic factors such as creation of additional jobs and improvements of the trade balance are usually mentioned.

Taxation issues are described in the individual country reports as taxation measures vary a lot by country.

#### 3.2 Feedstock supply and suitability:

In our previous report "Review on Commercial Production of Biodiesel World-wide" published in December 1997 rapeseed-oil was by far the leading feedstock for Biodiesel production, and this position has become even stronger, when analyzing the leading nations Germany and France, as well as Austria, the Czech Republic, Denmark, Slovakia and Sweden. There can be observed however a clear trend to a larger variety and to tailor-made blends of different feedstock sources:

- a) Rapeseed-oil: because of its favorable properties e.g. relatively high oxidation stability, Iodine Value (IV) lower than 120, acceptable winter operability and the high rapeseed yields per acreage rapeseed-oil is dominating the supply market.

- b) Sunflower-oil: for the time being sunflower yields are lower than rapeseed yields, but represent a choice in countries with warm and dry climatic conditions. The Iodine value (IV) of sunflower oil is higher than 120 (the European Standard EN 14214 requires less than 120), so this oil should be blended with low IV-oils.
- c) Recycling oils and animal fats: We have observed a kind of gold rush mentality in some places as these oils and fats are rather cheap and promise high profitability. With the European Biodiesel fuel standard EN 14241 there are however clear parameters set, which cannot be achieved with some recycling oils, e.g. those with high polymer content. Careful and clean recycling practices are needed in order to achieve the required quality of the collected feedstock. Successful models are practiced at the 130 McDonald restaurants in Austria, which yields over 1 300 t/a recycling oil of high and suitable quality, and by the efficient and clean collection system "Olli®", which was developed by ATM in the province of Tyrol.
- d) Soy-oil: This is the feedstock of choice in the USA, Argentina and other soy-bean growing countries, but as soy-oil has also an IV of higher than 120 it does not meet the EN 14214 standard. As the American standard ASTM D-6751-02 does not contain an IV limit, soy-oil can be used in the USA. In order to achieve European standards soy-oil may be used as multi-feedstock blending component to some extent.
- e) Palm-oil: As mentioned in the country report Malaysia palm-oil-methyl-ester was used already in 1987 as Biodiesel in Mercedes buses. With a limitation in the CFPP (Cold Filter Plugging Point) of + 11°C this type of Biodiesel faces a major obstacle in colder climatic conditions, but it may also be used in multi-feedstock blends.
- f) Other sources: The full scope of potentially suitable and useful oilseeds is not yet explored. A few oilseed plants can be mentioned, as they had been tested already: Biodiesel from oil of the physic nut (*Jatropha curcas*) was successfully produced in Nicaragua; cottonseed oil was tested in Greece; oils from sal (*Shorea robusta*), mahua (*Madhuca indica*) and neem (*Azadirachta indica*) may be of interest in India.
- g) New oilseeds: In order to produce an Biodiesel with optimized properties the following fatty acid profiles would be required:
- Lowest possible levels of polyunsaturated fatty acids such as linolenic acid (18:3) in order to increase oxidation stability.
  - Highest possible level of mono-unsaturated fatty acid such as oleic acid (18:1) in order to achieve good stability together with improved winter operability.
  - Lowest possible level of saturated fatty acids such as palmitic (16:0) and stearic acid (18:0) for improved winter operability.

Such new varieties are already planted and available (high-oleic rapeseed and sunflower, low-linolenic rapeseed) and represent an interesting feedstock source from a Biodiesel quality point of view.

### 3.3 Process technology development:

Industrial process technology has advanced significantly since the early days of 1988. The increasing requirements for producing high quality according to the established Biodiesel fuel standards and the continuously more demanding modern Diesel engine have been the driving forces for switching from simple batch processing to more sophisticated process technologies with e.g. fast liquid-liquid separation of methyl-ester and glycerin and with more accurate cleaning steps for the final Biodiesel meeting at least the standard EN 14214 or better.

Generally it can be observed that in the early phases of starting Biodiesel projects in a country experiments with rather simple process technologies with single-step transesterification and only basic purification are tested, which do not achieve the required high quality needed for the modern Diesel engine.

Purposely this report does not contain a list of potential process technology providers and plant engineering companies, but further information can be obtained at the Austrian Biofuels Institute.

### 3.4 Biodiesel fuel standardization and quality management:

The assurance for quality of the fuel was a key issue for developing confidence in Biodiesel among all customer groups, specifically the Diesel engine and vehicle producer. Besides existing criteria related typically to fossil Diesel e.g. Cetane number and CCR (Conradson Carbon Residue), new criteria and analytical methods related to the oleo-chemistry had to be developed e.g. for Mono-, Di- and Triglyceride levels.

In 1994 Austria published the first national Biodiesel standard ON C 1190 for Rape-seedoil-methyl-ester (RME), followed by ON C 1191 for Fatty-acid-methyl-ester (FAME) in July 1997, thus allowing a broader scope of feedstock sources to be used for Biodiesel production.

Other standards followed in the Czech Republic (CSN 65 6507), France (by decree), Italy (CUNA NC 635-01), Sweden (SS 15 54 36), and the German DIN E 51606 as well for FAME.

With the objective to create a European standard the European Commission appointed the CEN (COMITÉ EUROPÉEN DE NORMALISATION) with a mandate to develop standards concerning minimum requirements and test methods for Biodiesel. This work was started by end of 1997 in several working groups. With the official publication of the new standard EN 14214 for Fatty-acid-methyl-ester in autumn 2003 a common European agreement for understanding of Biodiesel quality has been established.

The AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) has also started its work to develop a Biodiesel standard for the USA and has published in 2002 a “Standards Specification for Biodiesel Fuel (B-100) Blend Stock for Distillate Fuels” (ASTM D-6751-02).

In Australia the Minister for the Environment and Heritage published a “Discussion Paper – National Standard for Biodiesel”, which was followed by the publication of an Australian standard for Fatty-acid-methyl-ester in September 2003, which is integrating European and American elements.

It can be mentioned that Biodiesel's favourable lubricity properties are promoted by various distributors, but this property is not described in any Biodiesel fuel standard for the time being.

### 3.5 Marketing strategies:

Not unexpectedly quite a variation of different marketing approaches can be observed, which can be described as follows:

a) Commodity Strategy:

Biodiesel is sold as a pure fuel, but there is no visible product differentiation in comparison to the competitive fossil Diesel at the fuel station; any existing differential advantage (e.g. lubricity or ultra-low-sulphur content) is not utilised in the communication to the customer. In this case Biodiesel is usually sold only over a lower price as a cheap fuel (e.g. Austria).

Another commodity strategy is to blend Biodiesel in refineries into fossil Diesel up to 5% and sell it anonymised at fuel pumps (e.g. France).

b) Quality Strategy:

- Quality seal strategy: Biodiesel is sold as a 100-% pure fuel and is differentiated as a quality product, which is highlighted by a quality seal at the pump, where informative product information flyers are distributed to the customer as well (e.g. Germany). This is also intended to protect producer of standardised quality Biodiesel against inferior quality.
- Brand Strategy: The fuel (pure or blended between 1 – 20% with fossil Diesel) is differentiated by a specific trademark (e.g. "Soygold", "Envirodiesel", "Bio-Plus", "GlobalDiesel"). Differential advantages are promoted and linked to a differentiating pricing strategy (e.g. USA, United Kingdom).

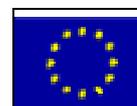
## 4 WORLD-WIDE DEVELOPMENT / COUNTRY REPORTS BY WORLD REGIONS

### 4.1 Europe

As the legislation of the European Union influences most of the European countries directly as well as indirectly, a special EU chapter is put in front of the single country reports. Having screened all the 15 existing EU member states, the 10 joining states and the remaining non-member states, this study has compiled

- 11 full country reports, where actual Biodiesel production plants are installed and Biodiesel is marketed backed by appropriate legislation,
- 9 shorter country reports, where initial Biodiesel initiatives can be observed.
- In all other countries, Biodiesel activities were below a reportable level or could not be observed at all.

#### European Union



#### 1. Introduction / History

- 1987:

Commercially motivated Biodiesel initiatives in Europe started in Austria, where the first industrial scale Biodiesel production plants went into operation in 1991, followed by similar initiatives in Germany, France and Italy.

- 1992

The reform of the Common Agricultural Policy addressed European agricultural surpluses by idling some land used for food production through a set-aside policy. This policy stimulated the use of set-aside land for non-food crop production.

- 1998

As a consequence of the 1997 Kyoto Conference on Climate Change the EU-member states have decided in June 1998 a reduction of 8 % on the basis of 1990 emissions for 2012. Substantial increases in using renewable energy sources including liquid biofuels can provide a significant contribution in reaching these challenging goals.

- 2003

Driven by the need to reduce increasing greenhouse gas emissions from the transport sector and to increase the security of energy supply the European Directive on the Promotion of the Use of Biofuels was passed by the European Council and the European Parliament in May.

In the past years the production of Biodiesel has made a substantial leap in the European Union. From 1996 to 2002, the Biodiesel production capacity grew fourfold to nearly 2 million tons.

## 2. Legislative Framework

### • Energy

The DG XVII (General Directorate for Energy) developed and published in 1998 the “Energy for the Future: Renewable Energy - White Paper for a Common Strategy and an Action Plan”.

The White Paper asks for increasing the share of renewable energy from 5.3 % in 1995 up to 12 % market share by the year 2010. The following results are expected:

- reduction of greenhouse gases by 400 million tons,
- slower exploitation of fossil resources,
- creation of additional 500.000 jobs,
- development of new technologies and related export market opportunities.

The target for biofuels is defined with 5 million tons (crude oil equivalent) by the year 2003 and 18 million tons by the year 2010 [5].

In November 2000 the DG TREN (General Directorate for Transport & Energy) published the Green Paper “Towards a European Strategy for the Security of Energy Supply” dealing with a key issue, namely to reinforce sustainable security of supply.

On May 17th 2003, the “European Directive for the Promotion of the Use of Biofuels” was published, which is setting goals for reaching market shares of biofuels sold in each member state and is asking for 2 % market share by 2005 and 5.75 % by 2010.

The initial plan to introduce a mandatory blend was dropped. Every country shall be free to choose its way to comply with the market shares stated. For countries having considerable problems to achieve these goals the fulfilment may be postponed by 2 years upon request.

### • Environment

In 1996, on initiative of DG XI (General Directorate for Environment) and as a result of the European Auto-Oil programme the “Directive for the Quality of Petrol and Diesel Fuels” (Directive 98/70/EC) was developed. Its main objective is to reduce exhaust emissions (sulphur, nitrogen oxides, unburned hydrocarbons and particulate matter, carbon monoxide, etc.) as well as greenhouse gas emissions.

This legislation was amended by Directive 2003/17/EC in March 2003 for further improvement of air quality standards (reduction of sulphur content to max. 10 mg/kg), for inclusion of non-road mobile machinery and to underline the Community’s target of 120 g/km of average CO<sub>2</sub> emissions (Biodiesel, which is an ultra low sulphur fuel by nature, is meeting the strict Directive’s requirements).

Concerning the European commitments as made in the Kyoto-Protocol in reducing greenhouse gas emissions the Commissioner for the Environment *Mrs. Margot Wallström* stated: “The EU-Ministers have emphasised that they are committed to the Kyoto-Protocol and that they are ready to ratify it.” This statement was made on June 12<sup>th</sup> 2001 as an answer to the hesitations as expressed by some states concerning the Kyoto-Protocol.

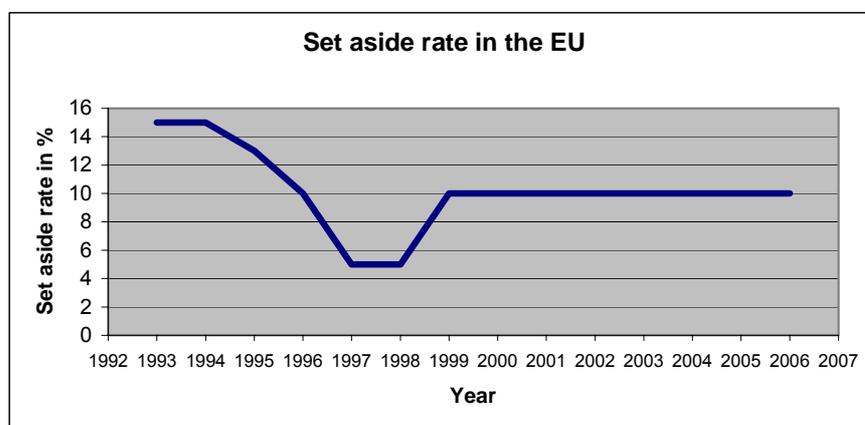
Appropriate actions resulting from the Kyoto-objectives were integrated into both the Directive for the Promotion of the Use of Biofuels and the Directive for the Quality of Fuels.

- **Agriculture**

The industry relied on obtaining the required quantity of feedstock at a competitive price by virtue of the non-food set-aside scheme, which resulted from the MacSharry Common Agricultural Policy (CAP) Reforms introduced in 1992.

The variable nature of set aside rates actually applied from year to year did not always offer sustainable feedstock availability for Biodiesel production and led to significant supply problems in the years 1997-1998.

In order to assure consistent feedstock supply to the Biodiesel industry the CAP Reform was re-reformed at the Berlin Summit of March 1999: a reference rate for obligatory set-aside of 10% for the period 2000/2006 was introduced.



Set aside rate in the EU

A further limitation is given by the Blair House Agreement, which has set up a limit of 1 Mio. t of soy meal equivalent for non-food oilseeds produced on set aside land.

- **Taxation**

Actually there are plenty of different regulations regarding tax relief and other financial incentives in favour of liquid biofuels in Europe:

In 1994 the first attempts to harmonize these regulations on a European basis were undertaken:

Detaxation scheme (1994):

A first draft for a European Directive with the objective to support the development of biofuels (Bioethanol and Biodiesel) in Europe that suggested a unitary detaxation scheme for both biofuels was proposed in 1994. The initiative was already accepted by the European Parliament but did not reach however the required unanimous agreement in the European Council.

Currently, the Directive on the taxation of energy products is once more under debate. The proposal allows tax exemption up to 100%.

### 3. Implementation

- **Supportive Institutions**

Name	Details
 European Biodiesel Board	Association of European Biodiesel producers, promotion of R&D, information and dissemination activities, lobbying. Members from Austria, France, Germany, Italy, Spain so far.  Website: <a href="http://www.ebb-eu.org/">http://www.ebb-eu.org/</a>
 Comité Européen des Biocarburants	Association of European biofuels producers, lobby activities for Bioethanol and Biodiesel  Contact: <a href="mailto:contact@adeca.net">contact@adeca.net</a>
 EU Seed Crushers´ and Oil Processors´ Federation	Association of European oilseed crushers.  Website: <a href="http://www.fediol.be/">http://www.fediol.be/</a>
 ACEA - European Automobile Manufacturers Association	Representative body of 13 European car, truck and bus manufacturers. Participant together with the European Commission and CONCAWE in the Auto-Oil-Programmes, which defined new fuel quality standards with the objective to reduce exhaust and greenhouse gas emission levels.  Website: <a href="http://www.acea.be">http://www.acea.be</a>

- **Feedstock Supply**

At present rapeseed oil as highly suitable feedstock has by far the leading position in supply with an estimated share of approx. 95%, while sunflower oil taking second place at a rather minor volume followed closely by recycling oils and fats.

There has been a considerable reduction in land cultivation for Biodiesel purposes from 1996 to 1998. This was caused by a reduction of the percentage of obligatory non-food set-aside-land in those years creating significant problems in supply of non-food oil from set-aside acreage. With renewed increase of the minimum rate, production increased again.

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Set-aside land (%)	15	15	12	10	5	5	10	10	10	10

**Obligatory set-aside land, % of total acreage [48]**

It is expected that triggered by the tremendously increased demand for feedstock more food-rapeseed in addition to non-food rapeseed is going to be used for Biodiesel production. This allows increasing the available volume beyond the limits as set in the Blair-House agreement

<b>Rapeseed development in the EU-15</b>			
Year	2001	2002	2003
Acreage (ha)			
EU- 15	2.990,000	3.070,000	3.220,000
Germany	1.140,000	1.300,000	1.30,0000
Yield (t/ha)			
EU- 15	2.97	3.05	2.89
Germany	3.66	2.99	3.05
Production (t)			
EU- 15	8.870,000	9.340,000	9.300,000
Germany	4.160,000	3.880,000	3.950,000
Source: UFOP according to Oil World			

Recycled vegetable oils and fats have obtained great attention as they represent a cheap source for feedstock supply and are not affected by EU land use policies. They are however limited in volume (best estimate 1 Mio. t collectable) and require a strict quality management in order to assure risk free collection and to meet the quality requirements as set indirectly by the CEN standard EN 14214.

Technically also other vegetable oils are suitable feedstock sources such as soy oil (e.g. USA, Argentina) and palm oil (e.g. Malaysia), which countries have already expressed their supply interest for this emerging market.

#### • **Quality Management**

In 1997 the European Commission appointed the CEN (Comité Européen de Normalisation) with a mandate to develop standards concerning minimum requirements and test methods for Biodiesel. During the drafting it was decided to use the same requirements for both applications:

- FAME as sole diesel fuel and
- FAME as blending component to EN 590 diesel fuel.

In 2001 the following two drafts were presented and have been subject to the 6-months inquiry process:

- prEN 14214 - FAME as automotive fuel for diesel engines
- prEN 14213 - FAME as heating oil

National remarks were included and the final standards were passed on to the formal vote. Since 4<sup>th</sup> quarter 2003 the standards is now available defining the world wide highest quality requirements for Biodiesel.

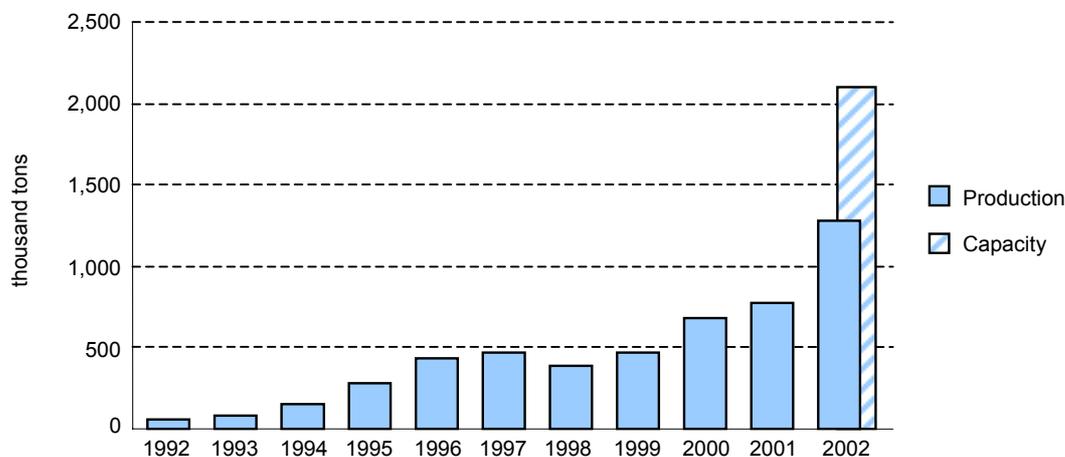
#### • **Production Development**

Since 1992 Biodiesel production has strongly increased. The estimations for the total European production in 2001 were approx. 780 000 t, representing 14 times the production levels of 1992. The present trend is characterised by a faster growth of capacity than of actual production and marketing of Biodiesel.

In 2001 the main Biodiesel producing countries in the EU-15 were Germany (market share: 45 %), France (40 %), Italy (10 %), Austria (4 %) and Sweden (1%).

As shown in the graph below capacity growth has developed progressively to approx. 2 Mio. t of Biodiesel, mainly with Germany as the driving force, while production and actual consumption lagged behind, as the main activity focus was given to plant investment and less to market development.

### Production and Capacity in Europe



#### • Marketing Strategy

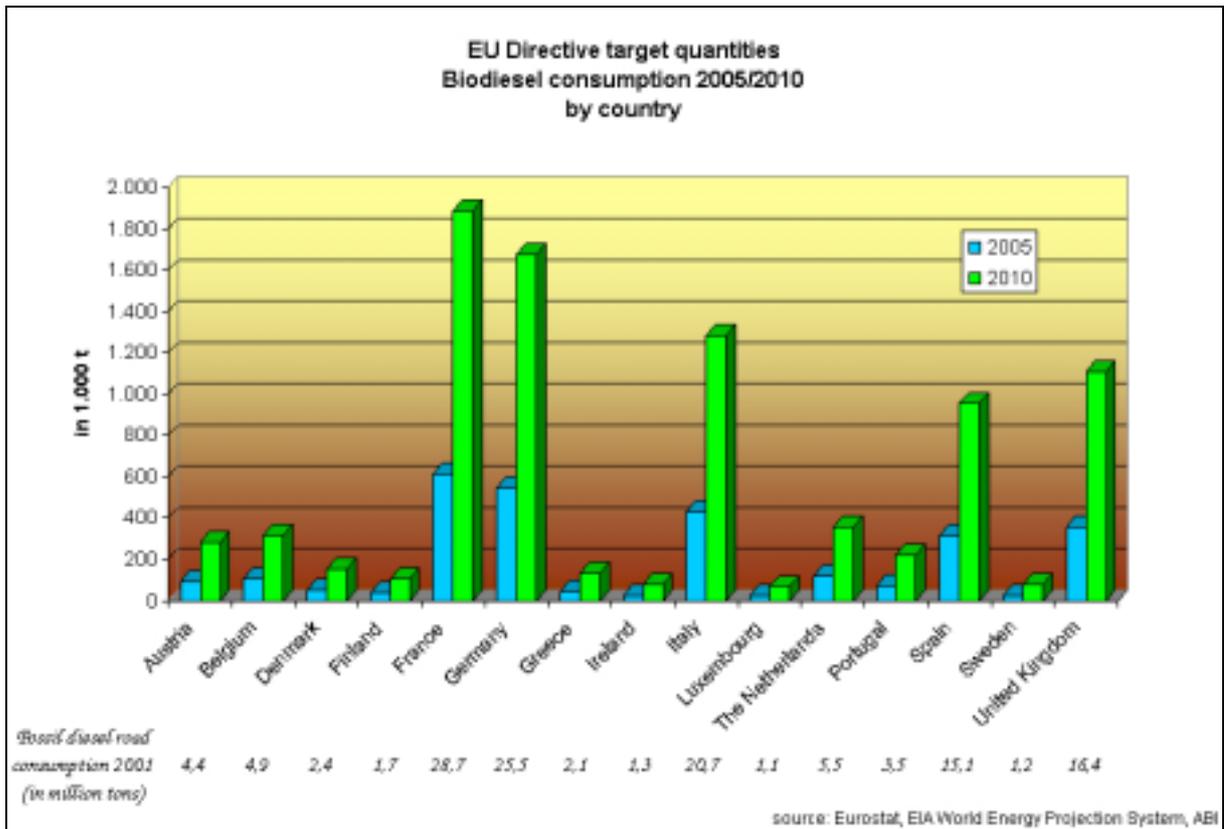
In 2003 approx. 35 - 40% of Europeans drive diesel passenger cars and it is expected that this trend will increase further as vehicles equipped with modern diesel engines offer low fuel consumption with improved energy efficiency at low CO<sub>2</sub> emission level and therefore have become very attractive. An ongoing increase is also expected in the heavy and light transport sector.

Concerning the marketing strategies, one can observe a large variety of different approaches, which are:

- 100-% pure Biodiesel sold at specific roadside pumps (e.g. Germany, Austria)
- blends up to 5 % in fossil diesel without any visible differentiation (e.g. France)
- blends with 5 % in fossil diesel marketed with a specific trademark (e.g. UK)
- blends with 30 - 40 % in fossil diesel marketed with a specific trademark (e.g. Czech Republic).

#### 4. Summary / Forecast

With a set of new Directives regarding transport & energy, agriculture and the environment the European Commission has developed a solid and committing framework for the development of liquid biofuels in the European Union. The quantities for Biodiesel production needed from 2005 to 2010 can be determined by country (EU-15) as follows:



With the accession of the 10 candidate countries (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia) on 1 May 2004 the overall committed volume for biofuels within the EU-25 will be increased furthermore.

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**Austria**

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**1. Introduction / History**

The shortage of mineral oil supply in the early 70ies represented the main trigger to search for renewable alternatives, and consequently basic R&D was initiated by the Ministry for Agriculture at the Federal Institute for Agricultural Engineering (BLT) in Wieselburg as early as 1974.

Trials with pure vegetable oils were unsatisfactory, but Rapeseed-oil-Methyl-Ester (RME) tested already in 1982 showed promising results. In 1987 two small Biodiesel pilot plants were started at the agricultural school in Silberberg and at BLT. This unintended competitive position accelerated the development and encouraged scientists and industry to set specific efforts.

Already from 1988 onwards several commercial Biodiesel production plants were established: Initially some smaller farmers' cooperatives production units were built (Asperhofen 500 t/a, Güssing 500 t/a, Schönkirchen 300 t/a, and Mureck 500 t/a) and in 1990 the construction of the first industrial-scale Biodiesel-plant (10 000 t) was started in Aschach. The largest commercial plant (15 000 t) in Bruck started production soon after in 1993. The assured use of all that Biodiesel was backed by the successful fleet tests of BLT in 1988, leading to a large number of warranties of Diesel-engined tractors, making Austria the leading country in Biodiesel know-how.

A leading position was also established in the definition of the first Biodiesel fuel standard ON C 1190 (RME) in 1992 as a quality management tool providing assurance to the Diesel engine industry, which was followed by the world-wide first Biodiesel fuel standard ON C 1191 for Fatty-acid-methyl-ester (FAME) in July 1997.

1995 saw the 1<sup>st</sup> International Conference on Standardisation and Analysis of Biodiesel in Vienna. In the same year ten buses from the public fleet of Graz switched to 100% Biodiesel produced from recycled frying oil as a new source of suitable feedstock for FAME-production.

**2. Legislative Framework**

- **Supportive Taxation Measures**

Beginning with January 1st 2000 the utilisation of fuels from renewable raw materials is tax exempt if it is used

- as sole (bio-)fuel at 100 % or
- up to 2% Biodiesel blended with fossil diesel fuel.

- **Other Regulative Measures**

On voluntary and/or incentive basis:

- Biodiesel for public traffic in cities (e.g. Graz, Feldkirch), and
- logistic systems for clean and efficient recycling oil collection (Tyrol, Upper and Lower Austria, the cities of Graz and Vienna).

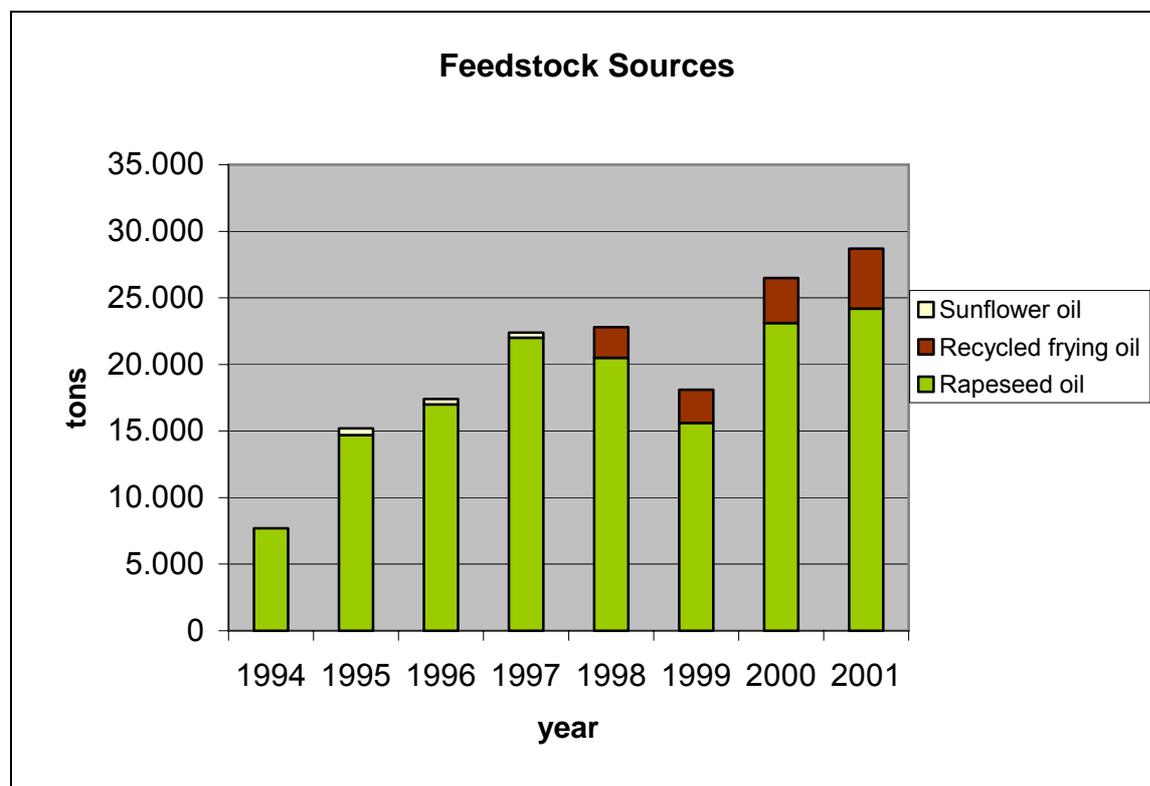
### 3. Implementation

#### • Supportive Institutions

Name	Details
ABÖ - Arbeitsgemeinschaft der Biodiesel-Hersteller Österreichs	Founded in 2001 by 5 national Biodiesel producers (Bruck, Zistersdorf, Mureck, Starrein, Güssing) with action areas in quality management, public relation, lobbying.
 <p>Austrian Energy Agency</p>	<p>Energy research and policy institution. Its mission is to promote rational use of energy and to stimulate renewable energy.</p> <p>Website: <a href="http://www.eva.wsr.ac.at/">http://www.eva.wsr.ac.at/</a></p>
 <p>Austrian Biofuels Institute</p>	<p>International competence centre for liquid biofuels: R&amp;D, demonstration, dissemination, specific studies. Co-ordinator for biofuels projects within the ALTENER-program. International consulting for Biodiesel investment projects world-wide.</p> <p>Website: <a href="http://www.biodiesel.at">http://www.biodiesel.at</a></p>
<b>R &amp; D institutions</b>	
 <p>Federal Institute of Agricultural Engineering in Wieselburg</p>	<p>R&amp;D in the field of agricultural engineering; trial production of innovative Biodiesel from a large variety of feedstock sources in a batch process pilot plant; diesel engine performance and emission tests; quality control and chemical analysis.</p> <p>Website: <a href="http://www.blt.bmlf.gv.at">http://www.blt.bmlf.gv.at</a></p>
 <p>University of Graz, Institute for Chemistry</p>	<p>The Institute of Organic Chemistry has more than 20 years of extensive R&amp;D experience in feedstock analysis, quality control and in the development of Biodiesel fuel standards.</p> <p>Website: <a href="http://www.kfunigraz.ac.at">http://www.kfunigraz.ac.at</a>  <a href="http://www-och.uni-graz.at/">http://www-och.uni-graz.at/</a></p>
 <p>TU Graz, Institute for Combustion Engines and Thermodynamics</p>	<p>Diesel engine tests with a variety of different Biodiesel fuels (rapeseed, sunflower, recycling oils etc.) in stationary and transient cycle tests. Tests in heavy duty diesel engine (6 cylindre, 12 m<sup>3</sup> volume, common rail fuel injection equipment), with electronically optimized fuel injection timing.</p> <p>Website: <a href="http://fvkma.tu-graz.ac.at/">http://fvkma.tu-graz.ac.at/</a></p>
 <p>IMU - Institute for Mineraloil and Environmental Analysis in Vienna</p>	<p>Involved in the development of the Austrian and the European fuel standard for Biodiesel (ON C 1190 &amp; ON C 1191, EN 14214). Quality management for both fossil and Biodiesel.</p> <p>Website: <a href="http://www.imu.at">http://www.imu.at</a></p>
 <p>Joanneum Research in Graz</p>	<p>Research on greenhouse gas emissions and transportation systems.</p> <p>Website: <a href="http://www.joanneum.at">http://www.joanneum.at</a></p>

## • Feedstock Supply

Initially mainly rapeseed and occasionally sunflower oil was tested as feedstock, but later on low-cost recycled frying oil was also used successfully. Currently McDonalds (135 restaurants in Austria) collects approx. 1 400 tons of recycled frying oil, as well as recycled oils from households and other restaurants are collected by the ÖLI™-system, which then is transesterified into Fatty-acid-methyl-ester (FAME) of standardised quality.



Feedstock- usage and application 1994-2001

## • Quality Management

Research institutes, the Biodiesel and the mineral oil industry together with the motor industry developed and completed the world's first Biodiesel standard ON C 1190 for Rapeseed-oil-Methyl-Ester (RME) in 1991. This standard was the basis for further work in France, Czechoslovakia, Italy, Sweden, Germany and the USA.

The world's first Biodiesel standard ON C 1191 for Fatty-acid-methyl-ester (FAME) followed in July 1997 thus allowing a broad scope for any suitable feedstock. This standard set the basis for the German DIN 51606 and the CEN-standard EN 14214 (FAME), which has been published by CEN in 4<sup>th</sup> quarter 2003.

- **Production Development**

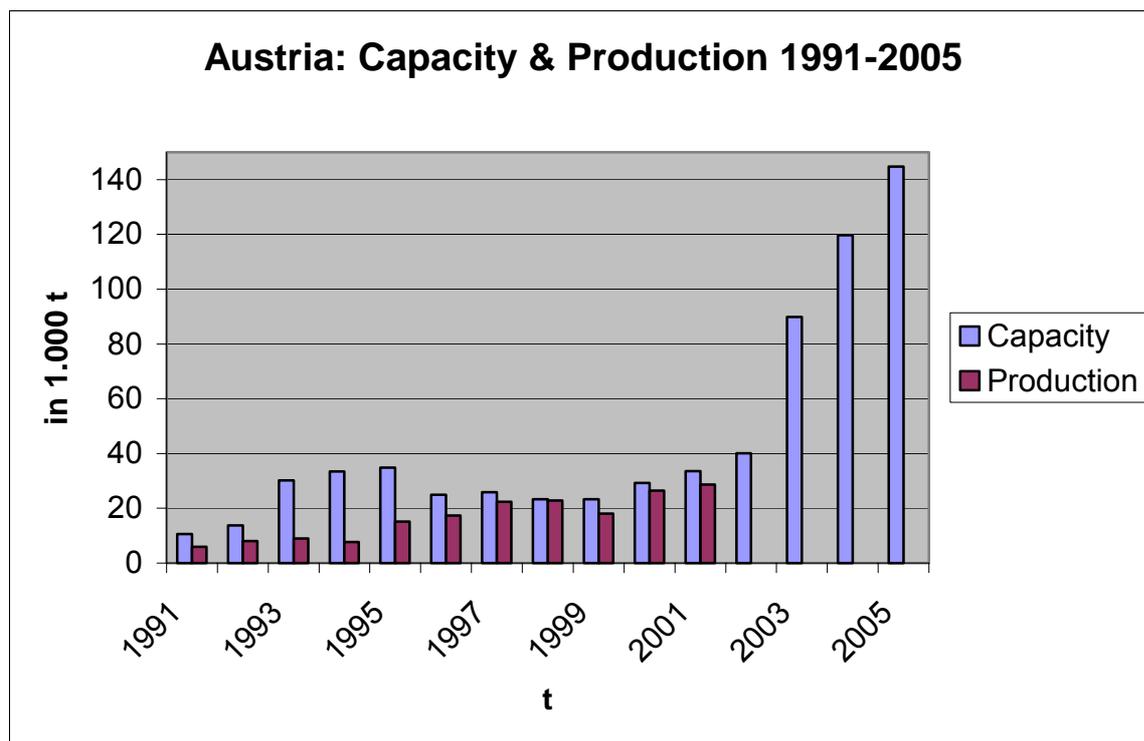
Presently there are 6 commercial production plants (ranked by capacity):

Name	Details
 Biodiesel Raffinerie GmbH	Capacity: 40 000 t/a Feedstock: Multi-feedstock, mainly recycled oil and fat  Website: <a href="http://www.energea.at">http://www.energea.at</a>
 Ölmühle Bruck Ges.m.b.H.	Capacity: 25 000 t/a (after initial 15 000 t at start-up) Start up: 10/1992 Feedstock: rapeseed oil, recycled frying oils Branch of Novaol recently acquired by Bunge  Website: <a href="http://www.novaol.it/english">http://www.novaol.it/english</a>
 Biodiesel Kärnten GmbH	Capacity: initially 25 000 t/a, to be increased to 50 000 t/a Start: June 2003 Feedstock: Multi-feedstock, mainly recycled oils  Website: <a href="http://www.biodiesel-kaernten.com/">http://www.biodiesel-kaernten.com/</a>
 Südsteirische Energie- und Eiweißherzeugungsgenossenschaft	Capacity: 6 000 t/a; Feedstock: rapeseed oil and recycled frying oil Farmers' co-operative  Website: <a href="http://www.seeg.at/">http://www.seeg.at/</a>
RME Treib- & Heizstoffherzeugung, Starrein	Capacity: 1 500 t/a Feedstock: rapeseed oil Farmers' co-operative A-2084 Starrein
 BAG Güssing	Capacity: 1 000 t/a Feedstock: rapeseed oil Farmers' co-operative  Website: <a href="http://www.bag-guessing.at">http://www.bag-guessing.at</a>

One further processing plant is in the start-up phase:

Name	Details
 BIOENERGY Erzeugungsgesellschaft	Capacity: 20 000 t/a In the start-up phase Website: <a href="http://www.bioenergy.co.at/">http://www.bioenergy.co.at/</a>

The development of capacity and actual production:



Capacity and production in Austria, 1991-2005

- **Marketing Strategy**

During the last 30 years, the share of diesel fuel increased with a strong growth in consumption from 42% to 68% of the overall transport fuel market. Biodiesel contributes presently with 0.7% to the supply of diesel.

The price for Biodiesel is in the range of 3 – 4 % below the price level of fossil diesel. From the very beginning Biodiesel was marketed as a 100% pure fuel. This opened a series of positive arguments to improve the acceptance by the consumer, but also by politicians, such as: reduction of exhaust emissions, biodegradability, lowest oral and dermal toxicity, high transport and handling safety.

Raiffeisen, the farmers' cooperative retail shops, offer Biodiesel on 25 sales points. AWI, a fuel discounter, is the main distributor in volume with over 23 fuel pumps followed by AVIA; in total 88 pumps are known to offer Biodiesel all over Austria.

Distributors	
Name	Details
 Lagerhaus	25 farmers´ cooperative pump stations offering Biodiesel throughout Austria. Website: <a href="http://www.lagerhaus.at/">http://www.lagerhaus.at/</a>
 AWI	23 pump stations offering Biodiesel. Website: <a href="http://members.eunet.at/awi-diskont/">http://members.eunet.at/awi-diskont/</a>
	13 pump stations offering Biodiesel. Website: <a href="http://www.avia.at/">http://www.avia.at/</a>
Fa. Rudolf Biodiesel Vertrieb	Family-owned fuel distribution company, shareholder in the new Biodiesel plant in Arnoldstein (Biodiesel Kärnten). Biodiesel distribution in Southern Austria.
 Austrian Mineraloil Company	Member of the standardisation group. No commercial activities in Austria, maintains a Biodiesel distribution system in Czechia. Website: <a href="http://www.omv.com">http://www.omv.com</a>

Concerning the market segment “public transport” the first field test were started in 1994 in Graz with 2 public buses (type STEYR SS 11 and MAN NL 202) running on Fatty-acid-methyl-ester (FAME), which was produced from recycled frying oil.

After the successful pilot test with two busses, eight additional busses were converted to Biodiesel in a common project of the Grazer Verkehrsbetriebe (public transport company of Graz) and the Department of Environmental Protection of the City of Graz, and an own filling station was installed. Due to the positive experience, the use of Biodiesel by the company was extended year by year.

For 25 busses with an annual consumption of approx. 600 000 litres, the emission savings are as shown below:

CO	CO <sub>2</sub>	NO <sub>x</sub>	HC	Soot	SO <sub>2</sub>
1,460 kg	1.250,000 kg	+/- 0	1,500 kg	510 kg	1,380 kg

**Annual reduction in emissions when 25 busses are filled up with Biodiesel**

In the year 2000 approx. 40 buses were running on Biodiesel made from recycled frying oils (originating from Mc Donald´s and other restaurants) and from that time on, the GVB accepts in their procurement policy only those buses, which are approved by the manufacturer for the use of Biodiesel (FAME).

The collecting systems for recycled frying oils have been constantly improved; the most efficient originated from Tyrol and this ATM-System “ÖLI™” is now licensed out to recycling management systems in Vienna and other Austrian federal provinces.

#### **4. Summary / Forecast**

Actual capacity analysis predicts that the indicative 2 % market share for biofuels for 2005 – as defined in the new European Union Directive for promotion of liquid biofuels – can be reached without any major difficulties.

Future total potential for high-yield rapeseed cultivation is at approx. 70 000 ha. Taking climatic conditions and the traditional farming structure into consideration this may result in a maximum potential of 154 000 t/a Biodiesel from rapeseed.

Additional feedstock supply is going to be secured by the extension of recycling oil collection, but may come also from South-East European sources along the cost-efficient transportation possibilities of the Rhine-Main-Danube-waterway.

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**Belgium**

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Back in 1992 the company DE SMET built and started up a pilot plant operating with Titanium-oxide as a catalyst; the project however was not continued.

In these early days the mineral oil company FINA offered Biodiesel under its trademark "FINAGREEN" and completed a few tests. FINA was purchased later on by TOTAL France.

The company SISAS operated a non-dedicated methyl-ester production site and provided sizeable quantities of methyl-ester to the European Biodiesel industry. There are however no specific activities for the time being.

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## Czech Republic



### 1. Introduction / History

In 1988 VÚZT - the Agricultural Research Institute in Prague - published the first pacesetter paper about Biodiesel in what was then the not yet separated state Czechoslovakia. In 1991 the Minister for Agriculture participated in the inauguration of the first Austrian industrial Biodiesel plant together with his Austrian colleague Franz Fischler, today the Agricultural Commissioner in the European Commission.

One year later the "Oleoprogram" was launched in order to initiate a national Biodiesel production by providing attractive subsidies for non-food rapeseed production.

In the initial years of this program returnable loans were granted by the Ministry of Agriculture of the Czech Republic for the creation of technical knowledge for rapeseed-oil-methylesters. In this framework 16 production facilities were supported and realised and in total a capacity of 63 500 t FAME /year was established between 1992 and 1996. Based on this support programme 67 200 t of FAME were produced in 2000, of which 93 % with government support.

After the expiration of this program in September 2001 a revised grant system was introduced. This modification led to a massive drop in Biodiesel consumption (total national consumption: -26,7 %) and a clear trend away from large-scale users to public filling stations.

### 2. Legislative Framework

- **Supportive Taxation Measures**

Since July 2001 Biodiesel blends are subject to a reduced excise tax, whereas Biodiesel 100% enjoys full tax exemption. The tax for the common blend of 31% Biodiesel is Kč 5,624.001 000 Lt (177.50 €) compared to Kč 8,150.00 (257.30 €) for fossil diesel. Additionally there is the possibility for total excise tax exemption for farmers when using Biodiesel blends. Additionally the value-added tax (VAT) for Biodiesel is reduced to 2% (instead of 22%).

- **Other Regulative Measures**

January 2001 a new Decree approved the installation of the SZIF (State Agricultural and Intervention Fund), which is purchasing rapeseed for non-food utilisation from contracted producers as well as on the free market at a determined minimum price.

The rapeseed is sold to 12 contracted oilseed processors at approx. 2/3 of the official market price. The price is calculated on the assumption that the final price of the blended fuel will be 95 % of the fossil diesel fuel. Total volume of rapeseed traded by SZIF amounts to 230 000 t/a (170 000 t/a from contracted suppliers).

### 3. Implementation

- **Supportive Institutions**

Name	Details
Sdruzeni pro Vyrobu Bionafty	The Czech Association for Biodiesel Production
 SZIF - State Agricultural Intervention Fund	State Agricultural Intervention Fund  Website: <a href="http://www.szif.cz/">http://www.szif.cz/</a>
<b>R&amp;D institutions</b>	
 VUZT - Research Institute of Agricultural Engineering	Supporting Biodiesel development from the very beginning in 1988.  Website: <a href="http://www.vuzt.cz">http://www.vuzt.cz</a>
 VUZE - Research Institute of Agricultural Economics	Website: <a href="http://www.vuze.cz">http://www.vuze.cz</a>
 CEU - Czech Environmental Institute	Provides information and expert support in the field of environmental protection, which involves carrying out research projects at national and international level.  Website: <a href="http://www.ceu.cz">http://www.ceu.cz</a>

- **Other sites of interest**

Site name	Details
	Including a list with more than 200 pump stations selling Biodiesel nation-wide  Website: <a href="http://www.biodiesel.cz">http://www.biodiesel.cz</a>

- **Feedstock Supply**

Main feedstock is rapeseed with small amounts of sunflower and soybean.

Indicator	Unit	1994/ 1995	1995/ 1996	1996/ 1997	1997/ 1998	1998/ 1999	1999/ 2000	2000/ 2001	2001/ 2002
Harvested Area	ha	189 913	252 675	226 533	227 310	264 300	348 949	323 842	343 004
Rapeseed production	t	451 628	662 176	520 572	560 509	680 216	931 053	844 428	974 131

**Rapeseed production in the Czech Republic 1994 - 2001**

- **Quality Management**

Biodiesel is offered according to the Czech standard CSN 65 6508 "Motor fuel - Fuel for Diesel engines with rape oil methylesters content above 30 % - technical requirements and testing methods", edited in August 1998.

With respect to the Regulation No. 227/2001 of the Ministry of Industry and Trade of 22.6.2001 determining requirements for the road vehicles transport and method of monitoring of their activity, the Czech Trade Inspection removes and evaluates twice a year (summer/winter) a minimum of 100 samples of the blended fuel and FAME for quality control.

As soon as accepted the European standard EN 14214 will substitute the current standard for FAME. The FAME quality will be determined according to the CSN EN 14214.

The blended fuel quality with 31% vol. share of FAME with respect to the CSN 65 6508 revision will be determined by the CSN 65 6508/Z1.

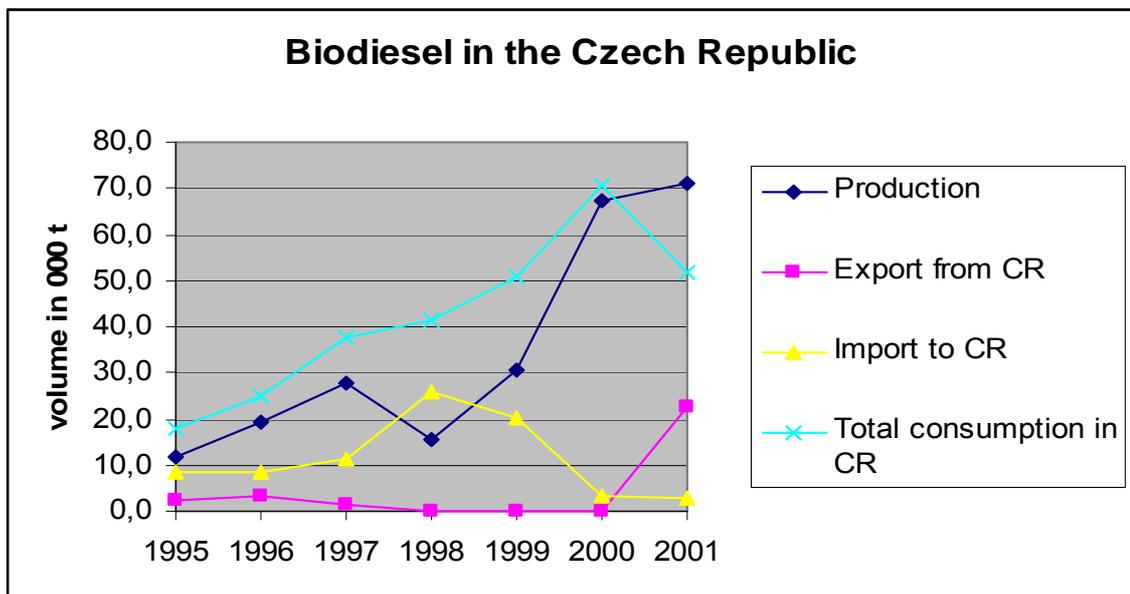
- **Production Development**

Name	Description
	Biodiesel plant Olomouc: capacity 39 000 t Biodiesel plant Mydlovary: capacity 13 000 t The biggest oil seed processing company and the dominant producer of edible plant oils and fats on the Czech market Website: <a href="http://www.setuza.cz">http://www.setuza.cz</a>
AGROPODNIK - joint stock company	Biodiesel plant in Jihlava – Dobronín: capacity 53 000 t
	Capacity: 4 500 t/a Start: 4/2002 Feedstock: rapeseed oil Brand name: "A-mix" Website: <a href="http://www.agrochem.cz/">http://www.agrochem.cz/</a>
 Biona Jersin	Start: 1996 Website: <a href="http://www.biona.cz/">http://www.biona.cz/</a>
	Biodiesel brand name: Setadiesel Co-operation with Setuza Website: <a href="http://www.seta.cz/">http://www.seta.cz/</a>

	<p>Start: 1994</p> <p>Biodiesel brand name: </p> <p>Website: <a href="http://www.adw.cz">http://www.adw.cz</a></p>
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This is a representative list only, altogether there are 14 plants with a total capacity of about 70 000 t/a of rape methyl ester; one further plant is in planning stage.

The largest producer by far in the country is Setuza which processes about 150 000 t/a of rapeseed into approx. 50 000 t/a of RME.



FAME production, import, export and consumption / Czech Republic 1995-2001

Realistic estimations define approx. 120 000 t/a as the maximum of possible national Biodiesel production.

- **Marketing Strategy**

Biodiesel is offered as a 31 % (min.) - 36 % (max.) blend with fossil diesel, but other blends are available too. Public filling stations are the main distributors; currently there are more than 200 Biodiesel stations nationwide. In 2000 total sales of Biodiesel blends with 31 % of FAME were 227 100 t representing an impressive market share of 9.7 % of total diesel fuel consumption in the Czech Republic.

#### 4. Summary / Forecast

The political intention to support a sustainable transport energy system led from initial farmers' co-operative small scale plants to a well established large scale industry.

The growing demand for the blended fuel and transformed economic conditions have become an impulse to the extension of existing capacity and to construction of new facilities. Admittedly the maximum of feedstock supply (in consideration of crop rotation) is almost reached.

The experiences of the last decade have shown that special emphasis has to be put on quality management taking into consideration the whole supply chain, which are producers, trade organisations and enterprises, transport and storage and final sale at the filling stations. Also there are negotiations for an additional blend to be introduced to the market (a mixture of fossil diesel fuel with 5% of FAME as a lubricant additive.)

In order to reanimate the national market the State Agricultural Intervention Fund (SZIF) decided in Dec 2002 to introduce additional financial incentives leading to further price advantages from presently 5% up to 10%.

## Denmark



### 1. Introduction / History

Only restricted Biodiesel initiatives can be observed in Denmark, such as initial Biodiesel tests in the early 90's with the HT-bus company of Copenhagen.

The Danish Biodiesel initiative was started by the family-owned company Emmelev Mølle on the island of Fyn by establishing an oil mill with a capacity of 160 000 t seed for crushing rapeseed, which finds excellent growing conditions all over Denmark. Having evaluated market opportunities in the European Union the construction of an integrated Biodiesel production was started as well.

The fourth and latest Danish energy plan ("Energi 21") of 1996 established the objective to reduce by 50 % the 1998 greenhouse gas emissions by 2030. Biodiesel's greenhouse gas reduction potential was however evaluated as being not significant enough. Therefore Biodiesel for use in the transport sector did not get any political support and tax exemption so far..

### 2. Legislative Framework

- **Supportive Taxation Measures**

There is a complex tax incentive system in place. Denmark and biofuels are taxed according to their final usage:

- For heating oil: full tax exemption.
- As engine fuel, biofuel is taxed like the corresponding fossil fuel which is substituted. This means that Biodiesel has to be taxed like fossil diesel with low sulphur levels, which is 2.48 DKK/liter in mineral oil tax with additional 0.27 DKK/litre in greenhouse gas tax (1 EURO = 7.45 DKK).

This leads to the paradox situation that Biodiesel as engine fuel for the transport sector is not tax exempt, whereas it is if used for heating boilers.

### 3. Implementation

- **Supportive Institutions**

Name	Details
<b>R&amp;D institutions</b>	
 Energy Centre Denmark	Established in 1991 by five founding parties: Danish Energy Agency, the Danish Association of Consulting Engineers, the Federation of Danish Industries, the Danish Technological Institute (DTI) and RISØ National Laboratory.  Website: <a href="http://www.ecd.dk">http://www.ecd.dk</a>

- **Production Development**

Name	Details
 EMMELEV MØLLE A/S	Start: 2001 Capacity: 30 000 t/a Feedstock: rapeseed oil The first and so far the only commercial Biodiesel producer.  Website: <a href="http://www.emmelev.dk">http://www.emmelev.dk</a>

- **Feedstock Supply**

As proven by neighboring Germany rapeseed finds excellent growing conditions in Northern Europe and should therefore represent the ideal feedstock source for Denmark. Knowing the highly developed environmental conscious attitude of the Danish citizen the collection of recycling oils should represent an additional and attractive feedstock source.

- **Quality Management**

Present Biodiesel production takes orientation on the German Biodiesel standard DIN E 51606 and the prEN 14214, in order to succeed in export markets.

- **Marketing Strategy**

Because of lack of political support and tax discrimination the whole production volume is exported and successfully sold to neighbouring countries.

#### 4. Summary / Forecast

The political environment was and continues to be not in favour of the production and market introduction of Biodiesel. With the new European Union Directives in place the potential is there to scale up existing Biodiesel production capacities rather quickly.

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**France**

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**1. Introduction / History**

It was in the mid-80s that France's oil -producing and –processing industry was looking for new markets in order to promote rapeseed oil that was underrepresented in the food-market at European level.

From 1991 to 1995, a development program with the participation of all stakeholders involved figured out the most favourable way to produce, distribute and use Biodiesel. The stakeholder forum included:

- the vehicle industry: Renault, Peugeot-PSA;
- the oilseed farmers' organisation
- the oil-processing industry,
- the mineral oil-industry: Elf, Total;
- the Ministries of Agriculture and Industry;
- the environment and energy agency: ADEME;
- public transport companies.

As a consequence a Biodiesel production programme including R&D work and an agreement to incorporate a blend of up to 5% Biodiesel with fossil diesel was started.

After the first pilot plant had been established in Compiègne and Biodiesel production and application experience had been collected the next step to larger production units was made.

- 1993: Demonstration plant initiation in Compiègne
- 1994: NOVAOL adapting two sites (Péronne et Verdun) for Biodiesel production
- 1995: Start-up of the Grand Couronne- site of a large oil mill near Rouen with 150 000 t/a of RME
- 1997: Reaching a 250 000 t/a total production level
- 1998: Decline of Biodiesel consumption due to the reduction of mandatory set- aside land
- 2000: authorized state quota increased to 317 500 t/a

**2. Legislative Framework****• Supportive Taxation Measures**

Full tax exemption is granted for an established state quota of 317 500 t/a today, which is going to be increased by a further 70 000 t as a next step.  
For 2004 the tax exemption is going to be reduced to € 330.00 / m<sup>3</sup>.

### • Other Regulative Measures

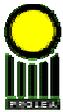
In order to benefit from tax incentives, Biodiesel has to be produced in one of the following certified production units denominated through public invitation to tender at European level. The following companies have acquired a share within the fixed quota:

Plant location	Capacity (t/a)	Quota 2002 (t/a)
Diester Grand-Couronne (F)	250.000	180.500
Diester Compiègne (F)	100.000	60.500
Novaol Verdun (F)	33.500	33.500
Diester Boussens (F)	40.000	33.000
ADM Connemann Leer (Germany)	100.000	10.000
Total	523.500	317.500

Authorized production quota (tax exempt)

### 3. Implementation

#### • Supportive Institutions

Name	Details
 PROLEA	The major professional agriculture association, gathers all professionals of a structured oil yielding activity  Website: <a href="http://www.prolea.com">http://www.prolea.com</a>
 FOP	Represents all producers of oilseed and high-protein Crops  Website: <a href="http://www.prolea.com/fop">http://www.prolea.com/fop</a>
 SOFIPROTEOL	Prolea's financial branch, owner of the Diester trademark.  Website: <a href="http://www.prolea.com/sofi">http://www.prolea.com/sofi</a>
  „Partenaires Diester“ – formerly known as „Club des Villes Diester“	Community of public and commercial fleets using Biodiesel  Website: <a href="http://www.villesdiester.asso.fr">http://www.villesdiester.asso.fr</a>

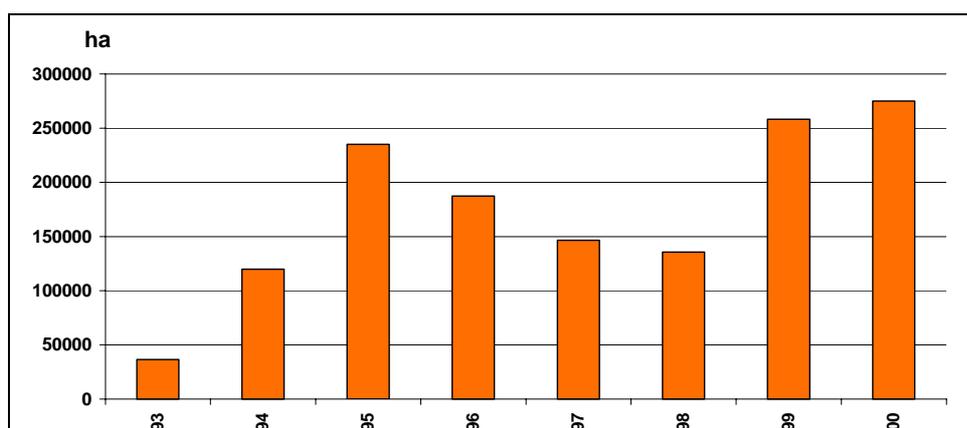
 <p>ADEME- Agence de l'Environnement et de la Maitris de l'Energie/ French Agency for Environment and Energy Management</p>	<p>Closely involved in implementing the government's environment and energy policies. Main focus on waste economy, air pollution and energy management</p> <p>Website: <a href="http://www.ademe.fr">http://www.ademe.fr</a></p>
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### R & D institutions

 <p>IFP-Institut Français du Pétrole / French Petrol Institute</p>	<p>Developed one of the first transesterification process of vegetable oils as transport fuel: the ESTERFIP-process; a new continuous process using a heterogeneous catalyst in fixed-bed reactors looks promising.</p> <p>Website: <a href="http://www.ifp.fr">http://www.ifp.fr</a></p>
 <p>ONIDOL</p>	<p>Interprofessional oil Association; Biodiesel tests in captive fleets, different studies</p> <p>Website: <a href="http://www.prolea.com/onidol">http://www.prolea.com/onidol</a></p>
 <p>CETIOM</p>	<p>Interprofessional Technical Centre of Oil &amp; Technical centre for agricultural production</p> <p>Website: <a href="http://www.cetiom.fr">http://www.cetiom.fr</a></p>

### • Feedstock Supply

Today, the surface for the cultivation of rapeseed for Biodiesel production averages approximately 300 000 ha; an enormous development as the surface grew eightfold in less than 10 years.



Harvest fluctuation of rapeseed for Biodiesel usage, 1993-2000

As we can see above, there has been a considerable reduction in land cultivation for Biodiesel purposes from 1996 to 1998. This was caused by a reduction of the percentage of obligatory non-food set-aside-land in those years. With renewed increase of the minimum rate, production increased again.

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Set-aside land (%)	15	15	12	10	5	5	10	10	10	10

Obligatory set-aside land, % of total acreage

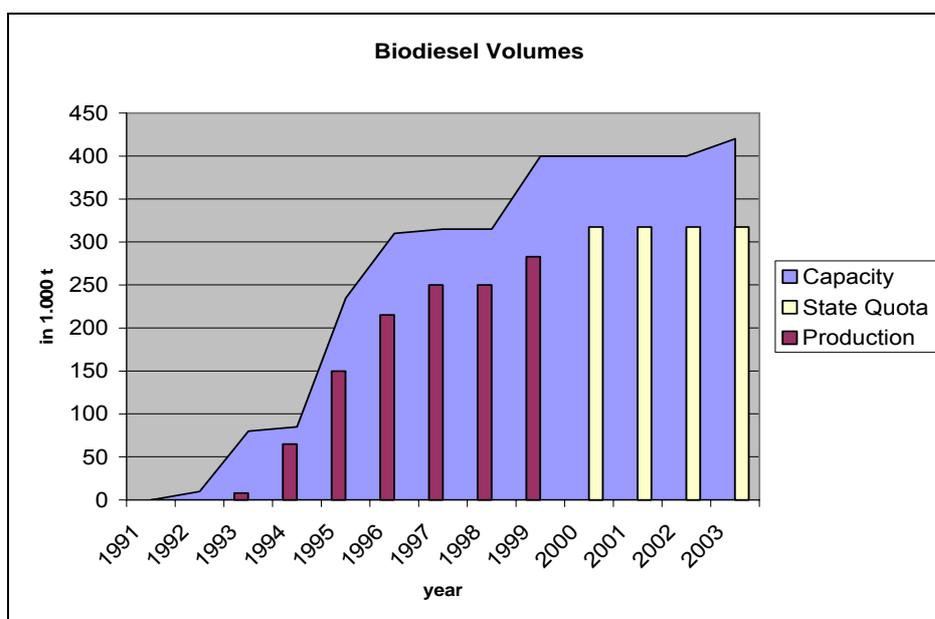
### • Production Development

Company	Details
 Diester Industries	Capacity: 390 000 t/a (Grand-Couronne: 250 000 t/a, Compiègne: 100 000 t/a, Boussens: 40 000 t/a) Feedstock: rapeseed oil with sunflower to a minor extent (only in Boussens) Connected to Prolea, also engaged in Biodiesel production in Germany (Natur Energie West, Marl)
 Bunge Ltd. Global food, commodity and agribusiness company.	Capacity: 33 500 t/a (Verdun) Feedstock: rapeseed oil Bunge took over Cereol (and its Biodiesel branch Novaol) in November 2002 Website: <a href="http://www.bunge.com">http://www.bunge.com</a>

The capacity of the four French production plants has reached more than 420 000 t/a of Biodiesel:

- Grand-Couronne (250 000 t/a): The biggest dedicated Biodiesel production plant in the world. In 1995 Grand Couronne started its production with impressive 120 000 t/a, later expanding to 180 500 t/a and to 250 000 t/a in the last step.
- Compiègne (100 000 t/a): The first small scale pilot plant built with the technology developed by the Institut Francais du Petrole (IFP) began commercial production of 20 000 t/a in 1993, a further expansion is planned.
- Verdun (33 500 t/a): an adapted chemical plant that started production in 1995.
- Boussens (40 000 t/a): A non-dedicated methyl-ester plant.

Total authorized production capacity for French producers amounts to 317 500 t/a, but effective production is higher allowing exports of approx. 50 000 t in 2002.



France's Biodiesel volumes 1991 - 2003

- **Marketing Strategy**

Biodiesel is marketed along 2 different marketing strategies:

1. The largest volume of Biodiesel is blended into fossil diesel up to 5% in 7 mineral oil refineries and is sold to the general public without any further differentiation. The final Biodiesel content can vary and is not declared at the pump. So Biodiesel remains unrecognized for the customer, to the car dealer as well as to the car repair shop.
2. The second strategy is to promote a 30% Biodiesel blends within the activities of the "Partenaires Diester" to large transport fleets. The following cities are participating with their bus fleets:

Name	Start	Type, number of vehicles	RME-blend
AGEN	1991	22 buses	30%
ALENCON	1995	10 PL, 10 VL and 18 buses	20%
AMIENS	1992	47 (VL, VU, PL)	30%
ANGOULEME	1993	12 buses	30%
BORDEAUX	1992	10 buses	100%, 30%
CAEN	1993	180 buses	30%
CAHORS	1993	36 (PL, VL, VU)	5%, then 30%
Chalon-Sur-Saone	1993	36 buses	5%
CHELLES	1994	35 (buses and VU)	5%
CRETEIL	1994	78 vehicles (all types)	30%
DUNKERQUE	1992	95 buses	5%
EPERNAY	1994	50 buses and VL	30%
EVREUX	1994	40 buses	30%
GRENOBLE	1992	60 buses	30%
LA ROCHELLE	1993 and 97	87 buses	5%, then 30%

LE HAVRE	1996	441 (all types)	10%
LAON	1992	19 buses	30%
MONTAUBAN	1992	3 buses	30%
MULHOUSE	1992	8	5%
NANCY	1993	20, then 180 buses	30%, then 20%
PALaiseAU	1996	50 (PL, VL, VU, cars)	5%as a start
PARIS	1992	120 PL and 1 600 VL	30%
PAU	1992	87 TCP and 8 VU	30%
ROANNE	1993	45 buses and 2 VU	5%, then 20%
ROUEN	1991	200 buses and 20 VL	30%
SALON DE PROVENCE	1994	89	5%
SARREGUEMINES	1994	30	5%
SOISSONS	1996	16 buses	5%
STRASBOURG	1992	390 PL, 106 VU, 338 engines	30%
VALENCE	1993	75 buses	5%

VL= light vehicle VU= staff car PL= heavy goods vehicle TCP= Passenger transport vehicle with more than 9 seats

In order to widen the scope of membership, the „Club des Villes“ was re-organized and re-named to „Partenaires Diester“ in March 2003, which allows large commercial fleets to take advantage of all the supportive measures of the French Biodiesel industry as well.

Distributors	
Name	Details
 <b>TOTAL</b> TOTAL France	<p>France’s biggest mineral oil company; changed its name from TotalFinaElf to “Total France” after several mergers.</p> <p>The largest volumes of Biodiesel are used by Total for blends with fossil Diesel.</p> <p>Website: <a href="http://www.total.com">http://www.total.com</a></p>
 Shell France	<p>Shell started using bio-esters to produce blends with diesel at its Petit Couronne refinery in 1995.</p> <p>Shell customers in France have driven over half a billion miles on up to 5% Biodiesel blends, that conform to the European standard (EN 590).</p> <p>Website: <a href="http://www.shell.com">http://www.shell.com</a></p>

#### **4. Summary / Forecast**

For more than fourteen years, France has been developing biofuels (Biodiesel and Bioethanol). Its unique industry structure represented by a couple of big producer and a joint marketing strategy combined with a solid legal framework promoting Biodiesel marked the impressive development of this industry.

Today, biofuels production is by far the most important agricultural alternative on non-food set aside acreage with crops like rapeseed and sunflower for Biodiesel and sugarbeet and wheat for Bioethanol production.

To achieve the 2% target by 2005 would require the cultivation of oilseeds on approximately 440 000 ha, which appears to be a realistic figure.

It is expected that adequate investments for further expansion of Biodiesel production capacity will take place in order to reach the market shares as defined by the European Directive.

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**Germany**

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**1. Introduction / History**

In 1982 initial trial work was completed at the Institute for Agricultural Engineering at the FAL in Braunschweig on tractor diesel engines. In 1990 the UFOP (Union for the Promotion of Oilseed- and Protein plants) as an alliance between farmers and oil-seed breeders was founded, which organization developed to the strongest Biodiesel promoter in Germany. Initial supplies of RME for Biodiesel trials were produced by HENKEL in a non dedicated plant. In 1991 the first Biodiesel production started at the Oelmühle Leer Connemann in a small-scale dedicated pilot plant, which was financially supported by the European Union-programme THERMIE.

The agrarian reform of 1992 – the reform of EU’s Common Agricultural Policy CAP – represented the basis of new markets for vegetable raw materials as it encouraged the production of renewable raw materials for non food uses (bio-fuels, starch, fibres, etc.), in particular on set aside land.

In 1995 Oelmühle Leer Connemann started its commercial scale Biodiesel production with a total capacity of 80 000 t/a based on an own process technology. In the same year the CEO of the VOLKSWAGEN AG, Dr. Ferdinand Piëch, declared the full support of Biodiesel by assuring the provisions of warranties for nearly all diesel models of the group including the brands AUDI, SEAT, SKODA and VOLKSWAGEN.

In the following year, the marketing of “leaded petrol” was prohibited by law. More than thousand tanks in public fuel pump stations were open for replacement and Biodiesel was adopted as an attractive option by more than 600 free public fuel pump stations within a few months.

In September 1997 the DIN fuel standard DIN E 51.606 FAME was released.

1998 brought a record-low price for crude oil of 9 US\$/barrel combined with high price levels for vegetable oils and a set-aside percentage of only 5% as a massive peril for the Biodiesel industry that resulted in poor economic performance that year.

In 1999 rising crude oil prices as well as the government’s decision to introduce a new ecologically justified tax (with Biodiesel being exempt) attracted new producers and importers, some of them selling Biodiesel of inferior quality thus creating severe mobility problems for customers.

In order to re-establish and assure a high quality image for Biodiesel the AGQM (Arbeitsgemeinschaft für Qualitätsmanagement or Working Group for Quality Management) was founded.

From 1999 onwards increasing crude oil prices lead to a recovery of the Biodiesel market; together with a change of the agricultural policy in favour of non-food oil-seeds and therefore sufficient supply of feedstock as well an increasing tax incentives a strong development in Biodiesel production capacity could be observed.

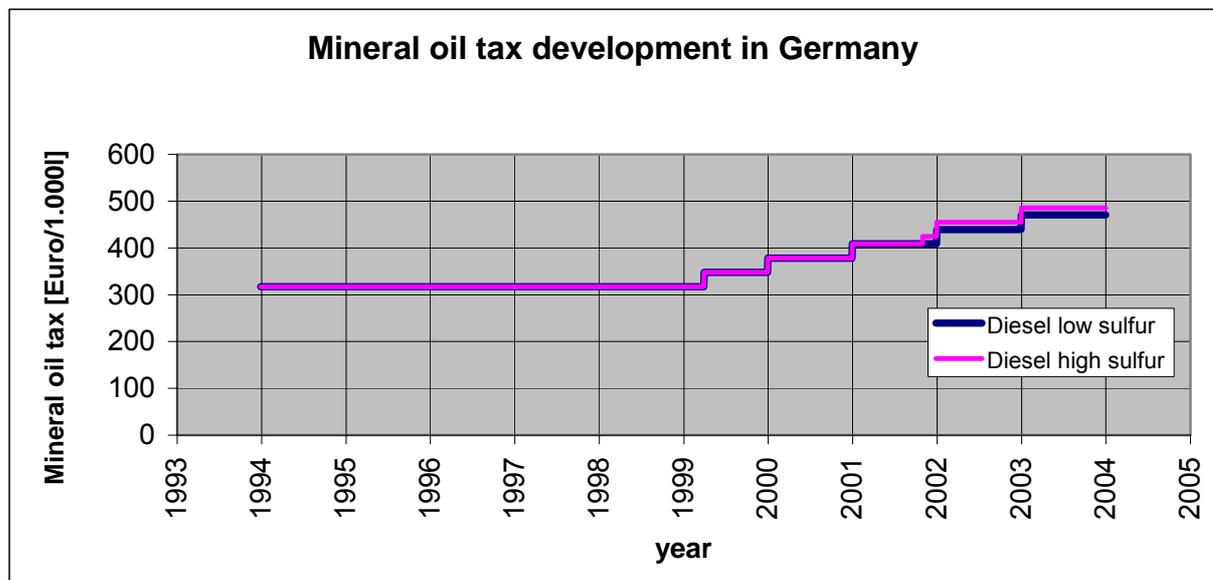
## 2. Legislative Framework

- **Supportive Taxation Measures**

### Mineral-oil tax:

German law defines that mineral-oil taxation applies only to mineral-oil based fuels; consequently Biodiesel enjoys full detaxation since the very beginning.

On June 7<sup>th</sup> 2002 the German Bundestag had his final reading of the new law for the tax relief for biofuels. It was endorsed by the Bundesrat on June 21<sup>st</sup> and will extend the tax exemption until December 31<sup>st</sup> 2008.



**Development of mineral oil tax for fossil diesel in Germany**

The scheduled rise in the mineral oil tax for diesel and other fossil fuels will lead to a significant price advantage of Biodiesel compared with the fully taxed fossil diesel.

### Ecological tax (Eco-tax):

From April 1999 onwards this climate change motivated additional tax will be added to the mineral-oil tax and increased step by step. Biodiesel as a greenhouse gas saving product is exempted from this tax.

- **Other Regulative Measures**

In contrast to tax legislation in France and Italy there is no restrictive quota in place and hence no upper limit for the production of Biodiesel.

### 3. Implementation

- **Supporters**

Name	Details
 <p data-bbox="148 616 547 719">Verband Deutscher Biodieselhersteller / Association of German Biodiesel producers</p>	<p data-bbox="592 421 1364 524">Founded end 2002, representing presently 12 producers with an overall production capacity of 810 000 t/a (77% of national capacity)</p> <p data-bbox="592 616 1150 645">Website: <a href="http://www.biodieserverband.de/">http://www.biodieserverband.de/</a></p>
 <p data-bbox="148 981 552 1122">Union zur Förderung von Öl- und Proteinpflanzen/ Union for the Promotion of Oilseed- and Protein plants</p>	<p data-bbox="592 730 1342 797">Founded in 1990 as an association between farmers' representatives and oilseed-breeders.</p> <p data-bbox="592 804 1350 907">UFOP's key objective is the market development of locally produced vegetable oils for the food and non-food markets.</p> <p data-bbox="592 913 1358 1055">Main activities: support modern breeding and cropping (precision farming), R&amp;D for new applications, marketing initiatives, agricultural policies and lobbying, regular stakeholders' contacts and public relation.</p> <p data-bbox="592 1061 1334 1128">The financial concept is similar to the "Check-off-Dollar"-model of the American Soybean Association.</p> <p data-bbox="592 1178 991 1207">Website: <a href="http://www.ufop.de/">http://www.ufop.de/</a></p>
 <p data-bbox="148 1391 560 1494">VDÖ – Verband Deutscher Ölmühlen / German Oilseed Crushing Association</p>	<p data-bbox="592 1223 1358 1469">Represents 20 members with activities in the oilseed crushing and oil refining business with a total crushing performance of 8,652.000 t of seed (rapeseed, soybean, sunflower, linseed, castor beans) in 1999. The following members have taken a stake within the Biodiesel industry: ADM (Archer Daniel Midlands), Cargill, Cereol (now Bunge), C.Thywissen GmbH, a.o.</p> <p data-bbox="592 1514 1078 1543">Website: <a href="http://www.oelmuehlen.de/">http://www.oelmuehlen.de/</a></p>
 <p data-bbox="148 1861 552 1919">AGQM/ Working Group Quality Management</p>	<p data-bbox="592 1597 1350 1664">Founded in 12/1999 as Arbeitsgemeinschaft für Qualitätsmanagement (AGQM).</p> <p data-bbox="592 1671 1350 1738">Main objective: establish a quality control system in order to assure Biodiesel fuel quality all over Germany.</p> <p data-bbox="592 1744 1326 1812">Activities: Field quality control systems, quality management training, promotion of high quality Biodiesel.</p> <p data-bbox="592 1861 1126 1890">Website: <a href="http://www.agqm-biodiesel.de/">http://www.agqm-biodiesel.de/</a></p>

## R & D institutions

 Institute of Technology and Biosystems Engineering	Focus: Diesel engine bench and non-stationary operation tests for performance and emissions. Organising Biodiesel conferences.  Website: <a href="http://www.tb.fal.de/">http://www.tb.fal.de/</a>
 IFEU - Institut für Energie- und Umweltforschung Heidelberg	Institut für Energie- und Umweltforschung Heidelberg / Institute for Energy- and Environment Research. Focus: Biodiesel ecology Life Cycle Assessment and Eco-balance studies.  Website: <a href="http://www.ifeu.de">http://www.ifeu.de</a>
 Ifo-Institut / Institute for economic research in Munich	In its up to date study "Total economic assessment of oil seed rape cultivation for Biodiesel production", the institute came to the conclusion that the Biodiesel production branch secures and creates some 19 000 jobs in agriculture, the processing of raw materials and the marketing of Biodiesel.  Website: <a href="http://www.ifo.de">http://www.ifo.de</a>
 FNR – Fachagentur für Nachwachsende Rohstoffe (Agency for Renewable Raw Materials) Gülzow	The FNR is the project platform for the Federal Ministry for Consumer Protection, Food and Agriculture (BMVEL) and supports R&D and market introduction actions in the sector of regrowable raw materials.  Website: <a href="http://www.nachwachsende-rohstoffe.de">www.nachwachsende-rohstoffe.de</a> or <a href="http://www.fnr.de">www.fnr.de</a> ;

### • Feedstock Supply

Rapeseed oil is by far the dominating feedstock source, as specifically in Northern Germany rapeseed finds ideal growing conditions. There is growing interest regarding recycled oil as feedstock basis; one company (Saria) is producing Biodiesel from recycled animal fats.

The potential rapeseed production area is about 2 Mio. ha (11 Mio. ha total arable land). Considered that about half of this area is used for food rapeseed oil, about 1 Mio. ha is available for industrial rapeseed oil. This area could substitute 5-7 % of the present fossil diesel consumption (27.5 Mio t). The European Agricultural Policy established in the Agenda 2000 an obligation to set-aside land accounting for 10 % of the arable land, which represents approximately the potential area mentioned above (over 1 Mio. ha set-aside).

The raw material price may be influenced by further progress in breeding for higher oil contents and by higher yields of beyond 2.9 t oil/ha achieved by new breeds and precision farming.

## • Quality Management

With the Austrian standard ON C 1190 for RME (1991) as a model, the German standard DIN V 51 606 for PME (plant-oil-methyl-esters) was published in June 1994. In September 1997 a working group developed DIN E 51606 for Fatty-acid-methyl-ester (FAME), the most elaborate Biodiesel standards at that time and still valid today, which is now going to be replaced by the European DIN EN 14214 in 3<sup>rd</sup> quarter 2003.

With the objective of establishing a strict quality control system the AGQM was formed in December 1999. Main Activities consist in taking samples at public pumps and having them analyzed by independent laboratories. If the sample meets the DIN-standard a quality seal is awarded, which can be promoted and used visually as a signal of assured quality towards the end-user. If the standard is not met the dealer is informed, may be listed as an insecure supplier and the quality seal will be withdrawn. Training courses in quality management are offered and a regular dialogue with the vehicle industry is taking place.

## • Production Development

There are 23 Biodiesel plants in Germany with a total installed production capacity of 1.056,000 t/a (ranked by current production capacity):

Company	Details
  Ölmühle Hamburg AG	Capacity: 120 000 t/a Start: 09/2001 Feedstock: rapeseed oil  Website: <a href="http://www.oelag.de">http://www.oelag.de</a>
  Ölmühle Leer Conne-mann GmbH & Co KG	Capacity: 100 000 t/a Start: 09/1996 Feedstock: rapeseed oil  Website: <a href="http://www.biodiesel.de">http://www.biodiesel.de</a>
Mitteldeutsche Umesterungswerke Bitterfeld	Capacity: 150 000 t/a Start: 09/2001 Feedstock: rapeseed oil Website: <a href="http://www.Sauter-Gruppe.de">http://www.Sauter-Gruppe.de</a> <a href="http://www.muw-biodiesel.de/">http://www.muw-biodiesel.de/</a>
 Natur Energie West	Capacity: 100 000 t/a Start: 04/2002 Feedstock: rapeseed oil Website: <a href="http://www.c-thywissen.de/new/marl.htm">http://www.c-thywissen.de/new/marl.htm</a> In co-operation with Diester Industries, France and Bunge <a href="http://www.bunge.com">http://www.bunge.com</a> and <a href="http://www.cereolworld.com/uk/home.cfm">http://www.cereolworld.com/uk/home.cfm</a>

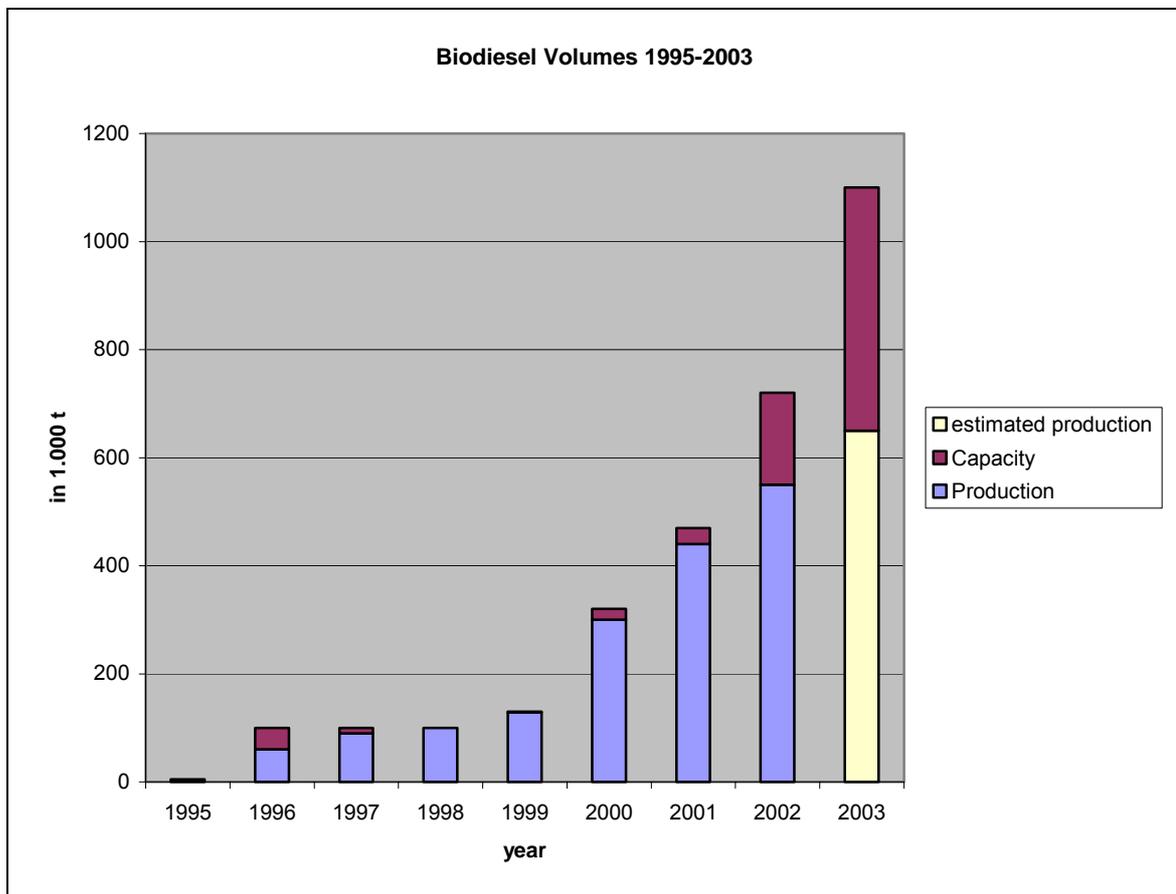
 <p>NEVEST NEW ENERGY AG</p> <p>Biodiesel Schwarzheide GmbH</p>	<p>Capacity: 100 000 t/a, 30 000 t/a pharma-glycerine Start: 10/2002 Feedstock: rapeseed oil Website: <a href="http://www.basf.de/basf/html/d/datfakt/gruppge/schwarzheide/invest">www.basf.de/basf/html/d/datfakt/gruppge/schwarzheide/invest</a></p>
<p>Rheinische Bioester GmbH</p>	<p>Capacity: 100 000 t/a Start: 12/2002 Feedstock: rapeseed oil <a href="http://www.rbe-neuss.de">http://www.rbe-neuss.de</a></p>
 <p>Campa Biodiesel GmbH</p>	<p>Capacity: 75 000 t/a Start: 01/2000 Feedstock: rapeseed oil Website: <a href="http://www.campa-biodiesel.de/">http://www.campa-biodiesel.de/</a></p>
 <p>Biodiesel Wittenberge GmbH</p>	<p>Capacity: 60 000 t/a Start: 08/1999 Feedstock: rapeseed oil Website: <a href="http://www.cargill.de">http://www.cargill.de</a> With Cargill as shareholder</p>
 <p>BIO-ÖLWERK MAGDEBURG</p>	<p>Capacity: 50 000 t/a Start: 03/2003 Feedstock: rapeseed oil Website: <a href="http://www.bio-oelwerk-md.de">http://www.bio-oelwerk-md.de</a></p>
 <p>Thüringer_Methylesterwerke GmbH &amp; Co. KG</p>	<p>Capacity: 45 000 t/a Start: 01/2002 Feedstock: rapeseed oil, (recycled frying oils, animal fats) Website: <a href="http://www.tme-biodiesel.de/">http://www.tme-biodiesel.de/</a></p>
<p>Petrotec GmbH</p>	<p>Capacity: 35 000 t/a Start: 05/2002 Website: <a href="http://www.petrotec.de">http://www.petrotec.de</a></p>
<p>EOP Elbe Oel AG</p>	<p>Capacity: 30 000 t/a Start: 2/2003 D-16928 Falkenhagen, Am Hünengrab 9</p>
<p>Biodiesel Kyritz GmbH</p>	<p>Capacity: 30 000 t/a Start: 3/2003 Feedstock: rapeseed oil D-48527 Nordhorn, Alfred-Mozer-Str.61</p>
 <p>SARIA®</p> <p>SARIA Bio-Industries GmbH &amp; Co. Verw. KG</p>	<p>Capacity: 12 000 t/a Start: 10/2001 Feedstock: animal fats, recycled and rapeseed oil</p>

	Website: <a href="http://www.saria.de">http://www.saria.de</a>
Biodiesel Bokel GmbH	Capacity: 10 000 t/a Start: 09/2002 D-29365 Sprakensehl-Bokel, Bodenteicherstr. 3
Kartoffelverwertungsgesellschaft Cordes & Stoltenburg GmbH & Co.	Capacity: 10 000 t/a Start: 5/2003 Website: <a href="http://www.kvg-schleswig.de">http://www.kvg-schleswig.de</a>
Hallertauer HopfenVerwertungsgesellschaft	Capacity: 8 000 t/a Start: 04/1995 Feedstock: rapeseed oil D-84048 Mainburg, Auhofstr.16
 Landwirtschaftliche Produktverarbeitungs GmbH	Capacity: 5 000 t/a Start: 04/1998 Feedstock: rapeseed oil Website: <a href="http://www.adib.de/">http://www.adib.de/</a>
PPM Umwelttechnik GmbH & Co.KG	Capacity: 5 000 t/a Start: 11/2001 Feedstock: rapeseed oil
 BioWerk Sohland GmbH	Capacity: 5 000 t/a Start: 07/2002 Website: <a href="http://www.biowerk-sohland.de/">http://www.biowerk-sohland.de/</a>
BioWerk Kleisthöhe GmbH	Capacity: 5 000 t/a Start: 02/2003
BKK Biodiesel GmbH	Capacity: 4 000 t/a Start: 12/2001 Feedstock: rapeseed oil
Verwertungsgenossenschaft Biokraftstoffe	Capacity: 2 000 t/a Feedstock: rapeseed oil Start: 04/1996

Additionally it is reported that there are 3 more plants under construction with a total capacity of 240 000 t/a, which at time of publishing this study may have increased by one or the other Biodiesel production plant.

Company	Details
 Marina Biodiesel GmbH & Co.KG	Capacity: 100 000 t/a Website: <a href="http://www.marina-biodiesel.de/">http://www.marina-biodiesel.de/</a>
 NEVEST AG, Rostock	Capacity: 100 000 t/a Feedstock: rapeseed oil In co-operation with BASF Website: <a href="http://www.nevest.de">http://www.nevest.de</a>
Rapsveredelung Vorpommern GmbH	Capacity: 40 000 t/a

With an anticipated Biodiesel production capacity of around 1.1 million tonnes, the total capacity will have increased more than tenfold since 1998, but actual production is lagging behind:



Biodiesel volumes in Germany, 1995 - 2003

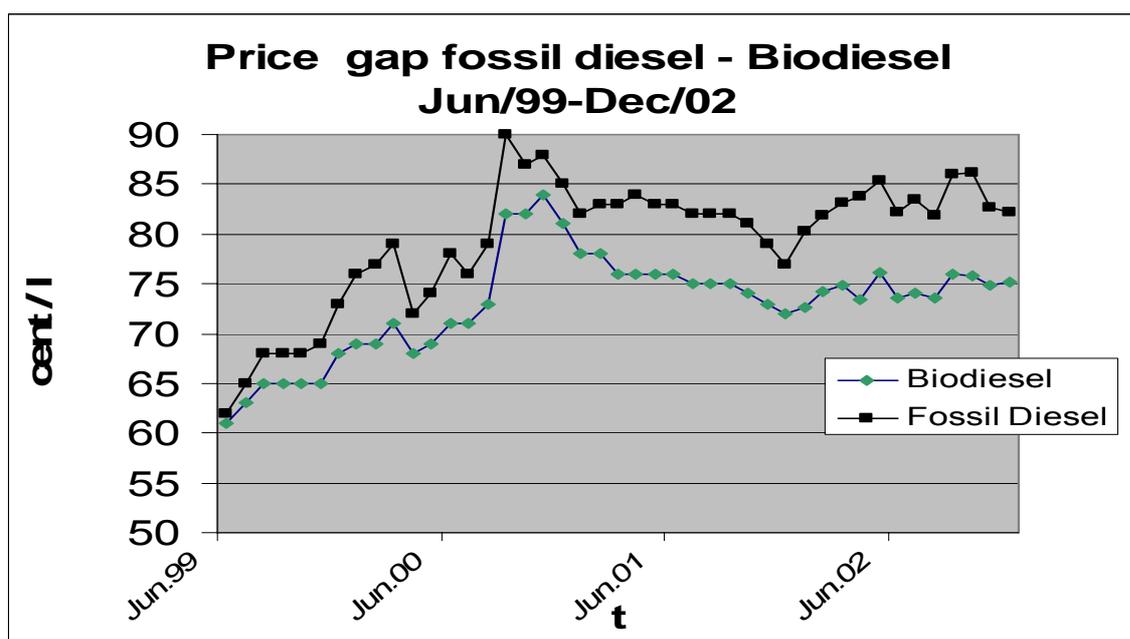
- **Marketing Strategy**

The main characteristic of Germany is to market 100% pure Biodiesel which is on sale in Germany at over 1 500 public filling stations.

For the so-called “free stations”, Biodiesel has become an important supplementary product for survival in the tough competition between filling stations. Therefore the marketing of Biodiesel through the public filling station network will be extended in the future. The high quality of Biodiesel is promoted at the pump with a quality seal, and hand-out folders provide detailed information to the private customer.

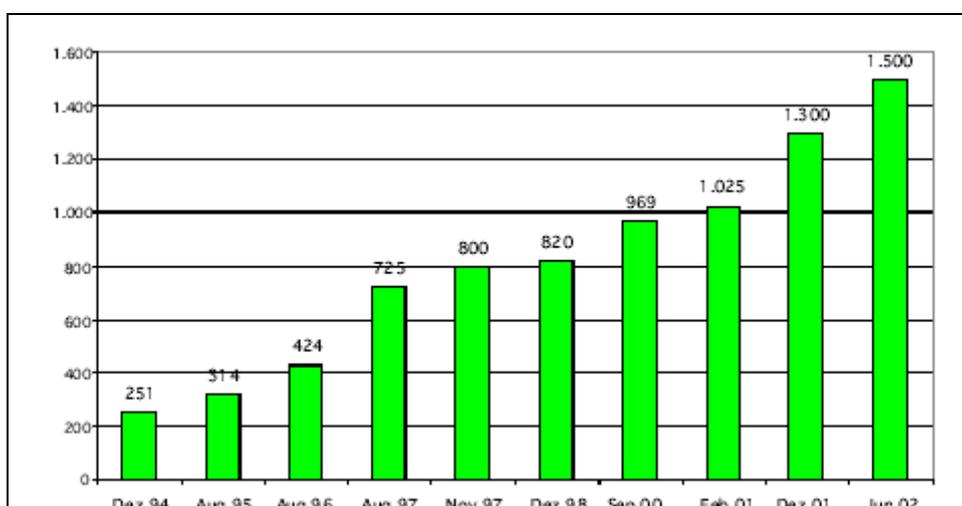
Additionally Biodiesel was promoted for specific market segments such as taxi fleets, public transport in buses (e.g. the city of Heinsberg), pleasure boats on Lake Constance and forestry machinery

One main drive for initial demand was certainly the cost savings realised when switching from fossil diesel to Biodiesel, which is an attractive argument for the long-distance trucks. Since then, the price gap has increased even further.



Price gap fossil diesel – Biodiesel, Germany, 1999-2002

In 2003 more than 1700 filling stations (every 10<sup>th</sup> station) offered Biodiesel



Development of the Biodiesel filling station network in Germany, 1994-2002

This leads to an average distance between to Biodiesel selling petrol stations of about 23 km, and realistically estimated there is potential for a further 1 000 petrol stations. An indicative list of petrol stations grouped by region and postal code can be found at: <http://www.ufop.de>.

Approximately 30 % of the Biodiesel is distributed through the public filling station network and 70 % through major customers (truck fleets), or the operators of public transport fleets and taxi companies etc.

#### **4. Summary / Forecast**

Nationally, enough production capacity has been set up to satisfy customer needs. However, as the sales development is not keeping step with the growth of capacity, surplus demand will lead to increasing competition amongst producers. This has lead already to a price advantage for vehicle owners in comparison with fossil diesel fuel.

On international level the production capacity of more than 1 Mio. t/a of biofuel leads to an excellent supply position in the European Union; the target quantities stipulated in the Directive can be fulfilled without difficulty.

However with the existing national quota rulings in many potential target countries and increased production activities in neighbouring countries (i.e. Poland) in mind, it seems difficult that German Biodiesel manufacturers and wholesalers will be able to take advantage of their supply position and consolidate their role as Biodiesel exporters.

The future of the German Biodiesel industry will mainly depend on the stable development of national demand. With the aim to support this objective UFOP and the AGQM promoted a separate Biodiesel producers' association that was finally founded in November 2002 as the VDB (Verband Deutscher Biodieselhersteller or Association of German Biodiesel producers).

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**Greece**

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In recent years the privately owned mineral oil company ELINOIL participated in 2 ALTENER-projects studying the potential production and marketing of Biodiesel.

The Technical University in Athens provided technical support for these projects with the objectives to investigate the technical feasibility of Biodiesel in Greece.

In another ALTENER-project the Energy Agency at Heraklion investigated the potential of recycled oil to be used for producing Biodiesel on the island of Crete. This project was completed in cooperation with the Austrian Biofuels Institute.

According to latest communication ELINOIL is in the middle of planning and constructing a Biodiesel production plant at a harbour site in Greece

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**Hungary**

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In the early 90ies, a Biodiesel production plant with an intended capacity of 18.000 t was built in Babolna in Western Hungary, but it never started actual production.

Later on a a state programme existed for the development of a rather large number of small-scale Biodiesel production sites distributed all over the country, but it was never implemented.

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**Ireland**

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The national agricultural research organisation TEAGASC, with its centre at Oak Park in Carlow, initiated first trials around 1992 and was the driving force for further development.

Small scale laboratory production of Biodiesel from a variety of different feedstock sources, including animal fat, for trial purposes was completed at TEAGASC and tested in small scale engine trials and bus fleet tests.

## Italy



## 1. Introduction / History

The Biodiesel production in Italy was initiated in 1992 within a European project of Italian and French participants, which was co-financed by the European Commission. Production was started with some smaller existing but non-dedicated methylester plants in Northern Italy, followed by the big-scale dedicated plant in the harbour of Livorno. This production site was constructed by Novaol – then an affiliate of Cereol – and is processing both rapeseed and sunflower oil of fully refined quality.

In 1994 Biodiesel was fully tax exempt without any volume limitations. One year later the Italian Government modified the law and introduced a quota of 125 000 t Biodiesel for tax exemption. Nevertheless production in 1998 was still less than 90 000 t/a with most of the volume being used as heating oil enjoying the same tax exemption while quality demands and distribution cost being lower. An increasing production trend has been recorded in the last four years.

## 2. Legislative Framework

### • Supportive Taxation Measures

The last finance act of 2001 extended the tax exemption to 300 000 t/a of FAME (for application as Biodiesel as well as heating oil) thereby improving the competitive position of FAME. This regulation will expire in 2004 but the Ministry of Finance still has to approve the prolongation of this tax advantage. Additional production exceeding this quota is fully taxed and not competitive with fossil diesel.

### • Other Regulative Measures

According to the current regulations, up to 5% of Biodiesel can be blended into heating oil and up to 25% Biodiesel into fossil Diesel for transportation.

## 3. Implementation

### • Supportive Institutions

Name	Details
 ASSOBIDIESEL <small>ASSOCIAZIONE ITALIANA PRODUTTORI BIODIESEL</small> Assobiodiesel	Producers association including all 7 Biodiesel producers  Website: <a href="http://www.assobiodiesel.it">http://www.assobiodiesel.it</a>
 ITABIA Associazione Italiana per le Biomasse	Italian Biomass Association - working group on Biodiesel  Website: <a href="http://www.itabia.it">http://www.itabia.it</a>

R & D institutions	
 CTI - Comitato Termotecnico Italiano	Italian Thermotechnical Committee Energy and Environment: Leading a project called "Agriculture for the city", in which Biodiesel is tested (emissions, toxicity, mutagenicity, efficiency) for heating purposes.  Website: <a href="http://www.cti2000.it/">http://www.cti2000.it/</a>
 ENEA - Ente Per Le Nuove Tecnologie, L'Energia E L'Ambiente	Italian National Agency for New Technology, Energy and the Environment: Government agency responsible for the areas of new technology, energy and the environment  Website: <a href="http://www.enea.it">http://www.enea.it</a>

- **Feedstock Supply**

The main feedstock is rapeseed oil, which is mainly imported from Germany and France, but also locally produced sunflower oil is used for Biodiesel production. Additionally the use of recycling oils is considered.

- **Quality Management**

Based on the CUNA standard NC 635-01 developed in 1993 the UNI standard was published, which is going to be replaced by the new CEN-standard EN 14214.

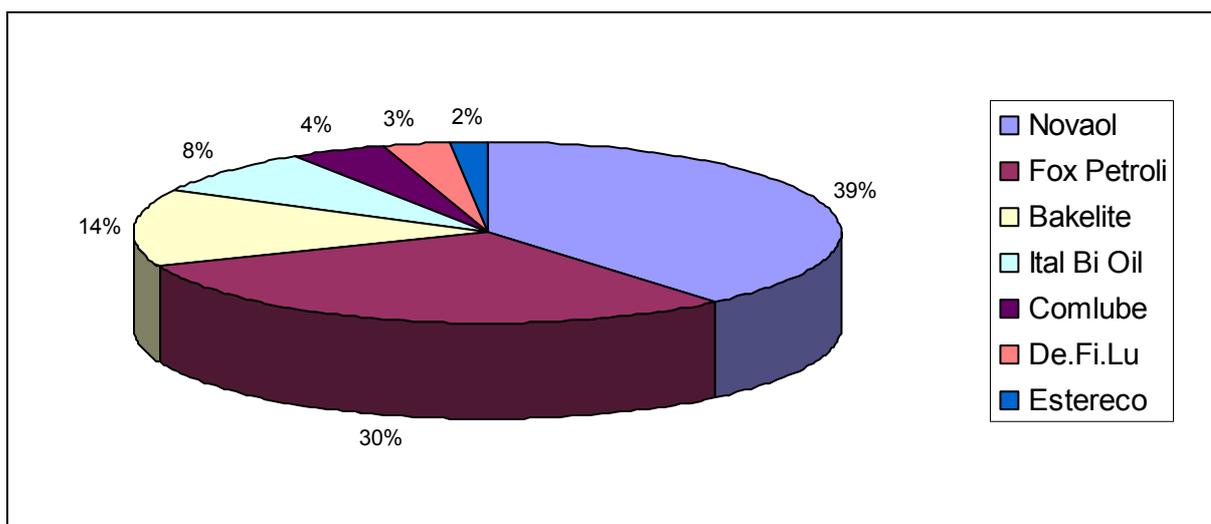
- **Production Development**

Presently there are 7 companies producing Biodiesel (ranked by size):

Company	Details
 Novaol Group	Capacity in Livorno: 60 000 t/a, to be doubled by June 2004. (Total Novaol Group capacity: 250 000 t/a in 2004) Start: 1992 Feedstock: neutralised rapeseed, sunflower and as well other oils Brand name:  The largest Biodiesel producer is a subsidiary branch of Cereol, which was acquired in December 2002 by Bunge Website: <a href="http://www.novaol.it">http://www.novaol.it</a>
 Bakelite AG	Capacity: 220 000 t/a Start: 1995 (location: Solbiate Olona) Production in 2002: 60 000 t Branch of the German company Website: <a href="http://www.bakelite.it">http://www.bakelite.it</a>
 Fox Petroli	Capacity: 80 000 t/a and start in 1996 Brand name: "Bio-Fox" Feedstock: rapeseed oil Website: <a href="http://www.biofox.com">http://www.biofox.com</a> <a href="http://www.foxpetroli.com/">http://www.foxpetroli.com/</a>

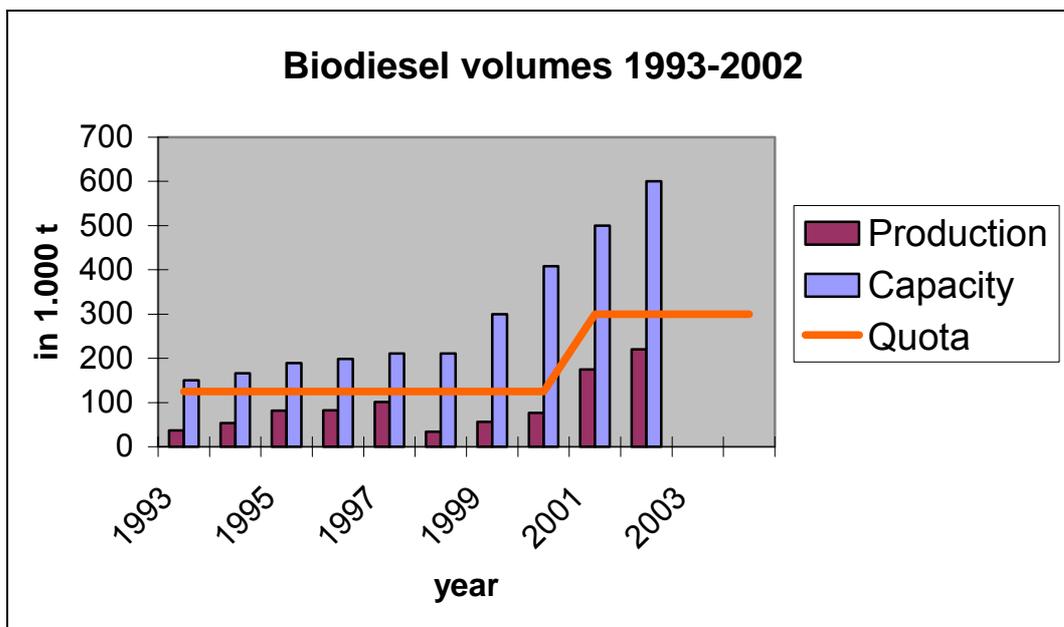
 ItalBiOil	Capacity: 80 000 t/a Brand name: <b>Ital Bio Diesel®</b> Website: <a href="http://www.italbioil.com/">http://www.italbioil.com/</a>
 Comlube	Capacity: 40 000 t/a Start: 1992 Brand name: "Sun-Diesel" Website: <a href="http://www.comlube.it/">http://www.comlube.it/</a>
 De.fi.lu	Capacity: 35 000 t/a  Website: <a href="http://www.biodiesel.it">http://www.biodiesel.it</a>
 Estereco	Capacity : 35 000 t/a Start: 1993 Production: estimate for 2003: 20 000 t/a Brand names: "Bio-power V100" & "G1" Website: <a href="http://stcgroup.com/estereco">http://stcgroup.com/estereco</a>

The estimated share in national production:



Producer's contributions to national production in Italy

In 2002 production was 220 000 t of Biodiesel with an overall production capacity of 600 000 t/a; due to the constant market situation there are no additional capacity investments planned in the short term.



Italian Biodiesel capacity and production 1993-2002

- **Marketing Strategy**

Fatty-acid-methyl-ester has found its main market segment in the heating oil market as there are lower distribution cost and lower quality requirements than in the diesel fuel market at equal taxation level and tax exemption rates compared to fossil diesel fuel for the transport sector.

Recently several producers have enlarged their marketing activities to position Biodiesel in the transport sector as well, where a blend of up to 5% Biodiesel with fossil diesel is used in large fleets. Novaol has furthermore launched a project called “one hundred cities on sunflower” with the aim to promote a 30% blend Biodiesel in public transport, as already successfully used in France.

In order to promote the individual company product several brand names are in use; e.g.: “Diesel-Bi”, “Bio-Fox”, “Ital Bio Diesel”, “Sun-Diesel”, „Bio-Power V 100“.

The municipal transport fleets of Milano, Ravenna and Pesaro have declared their intention to switch to Biodiesel.

#### 4. Summary / Forecast

Overall activities in Italy have been limited so far to utilise Biodiesel mainly in the heating oil segment and not in transportation as exercised in all other European countries.

With the new Directives of the European Commission in place the well established and experienced Italian Biodiesel producers are in the middle to reconsider their marketing strategy in order to fully exploit the new market opportunities in the transport sector.

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**Lithuania**

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Triggered by intensive research and development at the University of Agriculture in the capital of Kaunas detailed and valuable studies were completed and trial production was initiated as well.

The University intends to participate in an ALTENER-project and test Biodiesel produced from a wide variety of feedstock sources in the bus fleet there.

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**Malta**

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The Austrian Biofuels Institute visited one oleo-chemical company in La Valetta, which is producing 6 000 t/a of Biodiesel of not fully analysed quality and which is sold as an additive to fossil diesel in 5 litre jerry cans. There are considerations to expand the Biodiesel production on Malta.

The Laboratory of Molecular Genetics of the University of Malta completed initial trial work on the production of oil from seawater algae, which were grown in experimental water containers. This could become a new feedstock source for Biodiesel production.

## The Netherlands



Until now, the government's negative attitude towards Biodiesel has inhibited any development.

Nevertheless, the first commercial plant of ATEP Nederland B.V., located in Kleefse Waard near Arnheim, should be in operation by 2004 with an impressive production capacity of 100 000 t/a. Most probably Biodiesel is going to be produced for export purposes until the Netherlands have defined national biofuels legislation.

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**Norway**

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The company HABIOL – Hadeland Bio-Olje A/S – has for many years been the driving force for introducing Biodiesel on the Norwegian market.

So far Biodiesel is imported for test marketing and sold at 18 fuel pumps of the mineral oil company HYDRO-TEXACO.

An ALTENER-project tested Biodiesel in the bus fleet operating along the Sognefjord; this trial was run in cooperation with BLT-Austria.

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**Poland**

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In 1996 a small pilot plant built by the IBMER-institute in Warsaw went into operation producing Biodiesel for national trial projects.

Although one can observe a very intensive market preparation phase there is no Biodiesel produced in Poland yet as president Kwasniewski vetoed the recent and excessively ambitious draft legislation. Since July 2003 however the new and more moderate Biodiesel development legislation passed all hurdles and an intensive investment phase can be expected in the coming months.

With the background of excellent growing conditions for rapeseed as preferred feedstock and existing powerful investors it is expected that Biodiesel can reach market shares of 3 – 4 % within the next 2 – 3 years.

## Slovakia



### 1. Introduction / History

Already in 1991, under the former federal system of the Czechoslovakian Government, an oleo-programme was launched, which was supported by initiatives for process development and quality control at the University of Bratislava.

The first small scale plant went into operation in 1992 followed by additional production facilities for rapeseed methyl ester (RME) as developed by small and medium entrepreneurs.

In 2001 total production capacity amounted to more than 127 000 t Biodiesel, but changes in tax exemption legislation paralysed the whole Biodiesel production at the end of 2001.

### 2. Legislative Framework

- **Supportive Taxation Measures**

In the initial law of 1993 (Act No. 316) the excise duty for fossil diesel fuel was 14,600.00 SKK/t (349.80 €), whereas for Biodiesel blend fuel (31% RME + 69% fossil diesel) the excise duty was set at a very low level of only 3,000.00 SKK/t (71.90 €), providing a detaxation bonus not only for the Biodiesel share, but also for the fossil diesel share in the blended fuel, which became very attractive in the market place. This triggered a very fast expansion of the Slovakian Biodiesel capacity.

Since January 2002 however a new law (Act No. 239/2001) ceased this preferential treatment of the Biodiesel blend by increasing the excise duty for fossil diesel share significantly while maintaining full tax exemption for the Biodiesel share. As a result Biodiesel production was no longer profitable and production declined quickly.

In the meantime the Ministry of Agriculture prepared a new legislative programme for Biodiesel and Bioethanol production and their use as motor fuels with the intention to revitalise the Biodiesel market by regulating a mandatory Biodiesel market share of 5% by 2005, which did not get the approval of the Ministry of Finance so far.

- **Other Regulative Measures**

As part of the integration process of the Slovak Republic into the EU internal market, ensuring sufficient production volume of motor biofuels will be among the tasks listed in the Energy Chapter.

### 3. Implementation

- **Supporters**

Name	Details
 Slovak Biomass Association	A supportive organization for the development of renewable energy of biomass with a subsection for liquid biofuels including Biodiesel producers  Website: <a href="http://www.skbiom.sk/">http://www.skbiom.sk/</a>
<b>R &amp; D institutions</b>	
 Slovnaft VURUP / Research Institute of Petroleum and Hydrocarbon Gases	Established in 1952; today, it is a member of Slovnaft, the national refining and petrochemical company. Applied research in petrochemistry and Biodiesel.  Website: <a href="http://www.vurup.sk">http://www.vurup.sk</a>
 EC Bratislava	Established in 1993 as the national institution within the THERMIE Programme of the European Commission; promoting the rational use of energy and the utilisation of renewable sources of energy.  Website: <a href="http://www.ecbratislava.sk">http://www.ecbratislava.sk</a>
Slovak Technical University: Faculty of chemical and food production	Research institute of the Slovak Technical University focusing on Biodiesel research and process technology development. Contact person: Jan Cvengros, Doc. Dipl.-Ing.  Website: <a href="http://www.chtf.stuba.sk">http://www.chtf.stuba.sk</a>

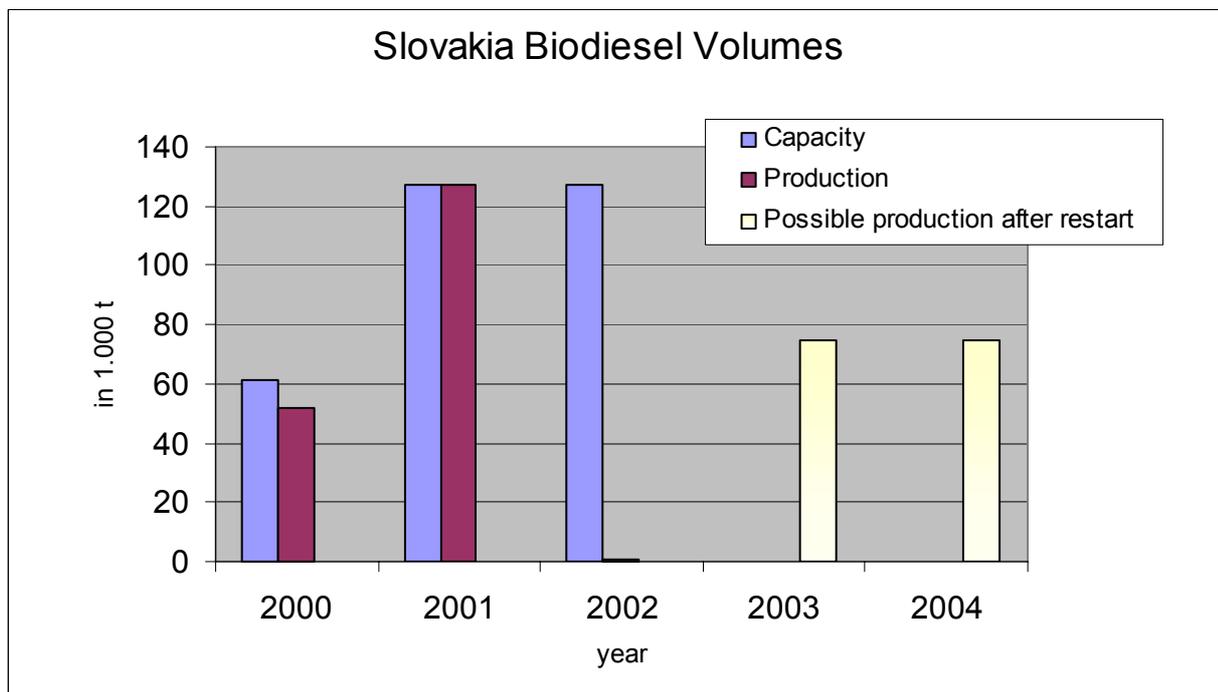
- **Production Development**

Name	Details
 Ekoil Biodiesel	Capacity: 51 000 t Ekoil is Slovakia's biggest producer, marketing its own process technology in Slovakia and abroad.  Website: <a href="http://www.ekoil.sk">http://www.ekoil.sk</a>
 Slovakofarma	Capacity: non-dedicated production 2001: 30 000 t Pharmaceutical company  <a href="http://www.slovakofarma.sk">http://www.slovakofarma.sk</a>

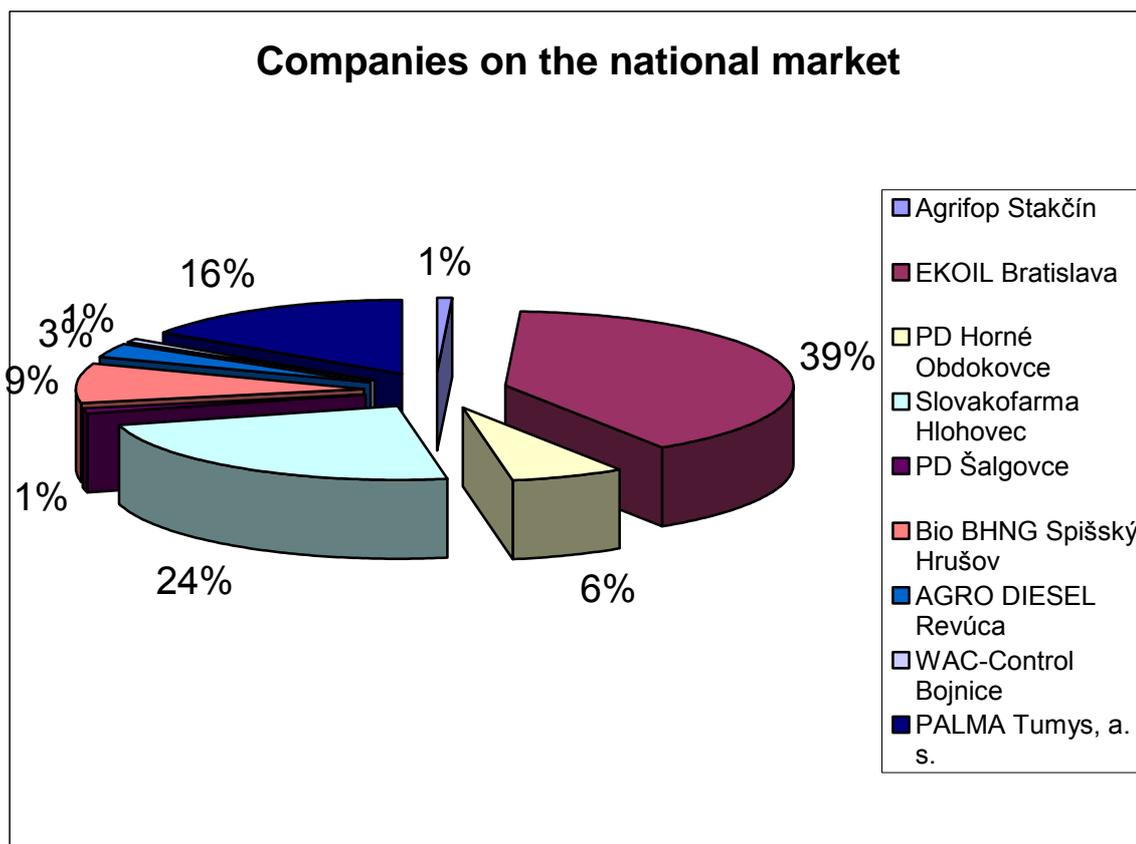
 <p>Palma</p>	<p>Capacity: 20 000 t                  Processing Biodiesel in a dedicated plant; (also manufacturing fats, oils, household chemistry, soaps and syrups)</p> <p>Website: <a href="http://www.palma.sk">http://www.palma.sk</a></p>
<p>Remaining: 6 producers</p>	<p>Total capacity: 26 000 t                  Small capacity producers</p>

Two different Biodiesel production concepts can be observed in Slovakia:

- Small capacity units with a production capacity of 500 – 5 000 t/a;
- large industrial scale units with a capacity of 10 000 – 50 000 t/a



**Biodiesel capacity & production, Slovakia 2000-2002**



Market shares by company, Slovakia 2001

- **Feedstock Supply**

Most of the plants process rapeseed oil with a minor share of sunflower oil and soy-bean oil as well.

- **Marketing Strategy**

Biodiesel was primarily sold as a 30% (RME) / 70% (fossil Diesel) blend with the main market segment in the agriculture and forestry industry, as tax relief has been made only for these two sectors; a small share was sold as pure RME.

#### 4. Summary / Forecast

After an impressive start within the former Czechoslovakian Republic, which was continued after the separation in the Slovak Republic, there was no Biodiesel fuel sold on the Slovakian market since January 2002, as the legal situation became quite restrictive.

Any further legislative development will be determined however by the adaptation of the Slovak law system to EU legislation and hence it is expected that existing Biodiesel capacities will come on stream again very soon.

The realistic production capacity of Biodiesel after an expected law modification and re-launch of the production is estimated to be at the level of approx. 75 000 t/a.

## Spain



## 1. Introduction / History

Beginning in 1999 a few initiatives for the development of Biodiesel were recognised:

1. In an announcement of 13<sup>th</sup> of November 2000, the Ministry of the Environment of Catalonia published through the Catalan Waste Agency "Junta de Residus" a call for tender for the development of the Biodiesel production. The two companies selected were "BIONET EUROPA, SL" (located in Reus) and "STOKS DEL VALLÈS, SA" (located in Montmeló). The "Junta de Residus" is going to contribute to the financing of each project as long as the established terms were fulfilled.
2. Based on the Royal Decree Law (RDL) 6/2000, a Commission for Studying the Use of Biofuels was created to analyse the sector and the impact on the Spanish economy with the involvement of relevant stakeholders.
3. On a national level the Spanish Promotion Plan for Renewable Energies was setting an objective to produce a volume of 100 000 t Biodiesel /a for the period from 1999 to 2010.

## 2. Legislative Framework

### • Supportive Taxation Measures

The main issues related to Biodiesel production as far as legal framework is concerned are linked to the possibility of a tax exemption for the Biodiesel produced. Within the actual framework (Act 38/1992, Act 40/1995 and RD 1165/1995) this exemption is valid only for pilot projects for the technical development of environmental friendly products and it lasts for five years.

## 3. Implementation

### • Supportive Institutions

Name	Details
 Institut Catala d'Energia / Energy Institute of Catalonia	Created in 1991 by the Catalan Parliament, the primary objective is to increase public awareness regarding energy efficiency and the implementation of renewable energy sources  Website: <a href="http://www.icaen.es/">http://www.icaen.es/</a>
 Instituto para la Diversificación y Ahorro de la Energía / Institute for Energy saving and diversification	Founded in 1974 and connected to the Finance Ministry, its main focus is on investment, promotion and dissemination of renewable and efficient energy projects; also engaged in product development and assessment.  Website: <a href="http://www.idea.es/">http://www.idea.es/</a>

 EVE- Ente Vasco de la Energia / Basque Energy Agency	Implementing the energy policies of the Basque government.  <a href="http://www.eve.es/">www.eve.es/</a>
 Asociacion de Productores de Energias Renovables / Association of renewable energy producers	Created in 1987, representing more than 200 small and medium-size corporations; co-ordinating research, legal advice and negotiations on a national and international level.  Website: <a href="http://appa.es">http://appa.es</a>
 Energia Hidroeléctrica de Navarra	A group of companies dedicated to the promotion, construction and operation of renewable energy sources.  Website: <a href="http://www.ehn.es">http://www.ehn.es</a>

- **Feedstock Supply**

Nearly all plants in operation and in planning phase will rely primarily on recycled oils and fats as their main feedstock. In order to meet all their feedstock demand sufficiently the establishing of an efficient and safe logistic system for collecting all suitable recycled oils and fats in a clean way is the key condition for success.

- **Production Development**

Currently there is one plant operating and three more are under construction:

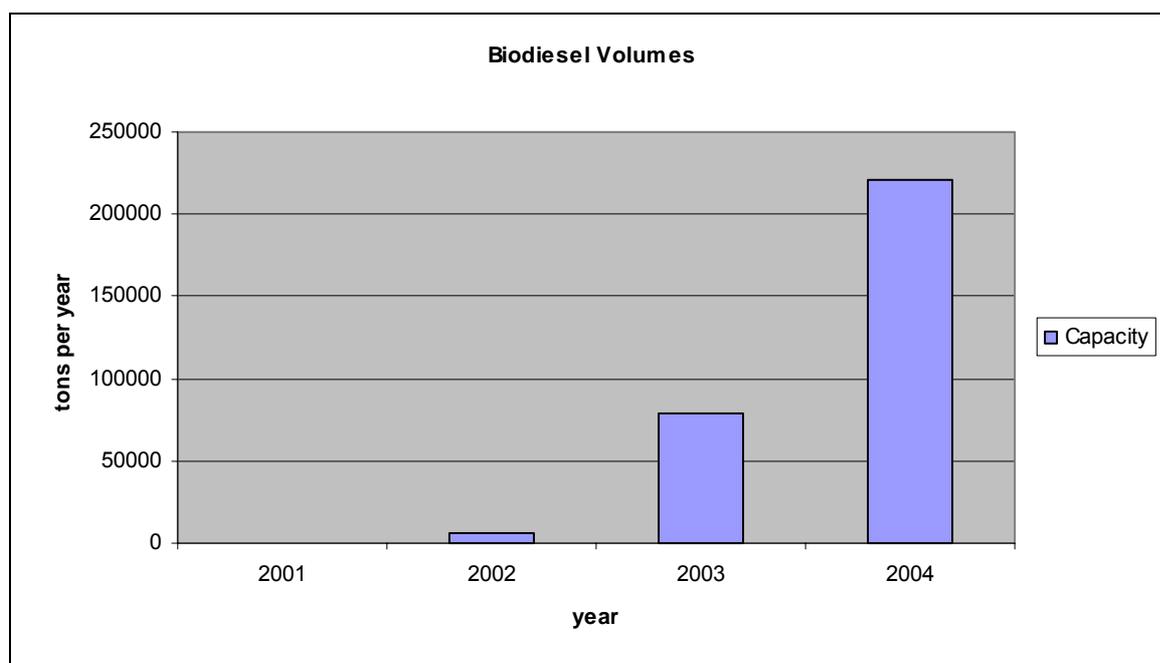
Name	Details
 Stocks del Valles, Catalonia	Capacity: 6 000 t, can be extended to 18 000 t in a second phase Start: 2002 Feedstock: recycled frying oil  Website: <a href="http://www.icaen.es/">http://www.icaen.es/</a>
 Biodiesel-IDAE	Capacity: 5 000 t Start: In construction Feedstock: recycled frying oil  Website: <a href="http://www.idea.es">http://www.idea.es</a>
 Bionor Transformación	Capacity: 18 000 t Start: In construction Feedstock: recycled frying oil  Website: <a href="http://www.eve.es">http://www.eve.es</a>
 Bionet Europa	Capacity: 50 000 t Start: In construction Feedstock: recycled frying oil  Website: <a href="http://www.idea.es/">http://www.idea.es/</a>

Two more plants are in design stage:

Name	Details
 Biocarburants de Catalunya	Capacity: 100 000 t Website: <a href="http://www.icaen.es">http://www.icaen.es</a>
 Biodiesel-Caparroso	Capacity: 30 000 t Website: <a href="http://www.ehn.es">http://www.ehn.es</a>

Additionally there are a few small-scale pilot and research plants planned or in operation (Minano, Madrid, Gijon).

If all planned projects are implemented, the following capacity development can be anticipated:



Biodiesel Volumes, Spain 2001-2004

- **Marketing Strategy**

The plants built or under construction right now in Spain will sell Biodiesel to public transport companies in order to be used in bus fleets, e.g. in the municipality of Mataró.

Nevertheless, since February 2003 it is also possible to buy B-30 (70% fossil diesel, 30% Biodiesel) at the first pump station supplying Biodiesel. The company Petromiralles is planning to extend Biodiesel sales to five more pump stations soon.

Distributors	
Name	Details
 Petromiralles	Company with the first pump station nation-wide offering B-30  Brand: Website: <a href="http://www.petromiralles.com">http://www.petromiralles.com</a>

#### 4. Summary / Forecast

The Commission for Studying the Use of Biofuels released some conclusions, which include the measures needed for developing the Biodiesel sector in Spain. The most important ones are:

1. Tax exemption for biofuels is taking into account the limits allowed by the European and Spanish laws. This measure depends on the appropriate implementation of the directives for the promotion of biofuels and the taxation of energy products.
2. Grants for the investments.
3. Supporting energy crops used to produce Biodiesel.
4. Establishing a logistic system for collecting suitable recycled frying oils and fats used as valuable feedstock for Biodiesel production.

These recommendations represent a useful instrument for the development of the Biodiesel sector. As the list of all Biodiesel projects shows, the actual trend for the development of Biodiesel is more successful than expected. This could be triggered by exaggerated expectations in using significant volumes of recycled frying oils.

Nevertheless, the objectives as set by the Promotion Plan (100 000 t/a for the period from 1999 to 2010) have not been revised so far.

## Sweden



### 1. Introduction / History

In spite of impressive activities for the market introduction of Bioethanol as biofuel for petrol engines by the Swedish Ethanol Development Foundation the position of Biodiesel is rather weak and had not found similar strong political support so far.

The production of RME was started in the late 80's by small scale production plants run by farmers. In this period a considerable tax reduction was obtained reaching a level of 0.36 €/l in the late 90's. During this time the following companies had received tax dispensations:

Västerviks Kemi AB	8	800
	t/a	
Fred Holmberg & Co	1	700
	t/a	
Agro Oil AB	4	400
	t/a	
Preem Petroleum AB	4	400
	t/a	
Sv Ecobränsle AB	10	560
	t/a	

This tax exemption ended in 2001. From then onwards new tax regulations had to be renegotiated on an annual basis.

Today there is only one Biodiesel production facility left, which is located in Knislinge in southern Sweden.

### 2. Legislative Framework

#### • Supportive Taxation Measures

The annually determined Biodiesel quota for 2001 was 21 120 t (24 000 m<sup>3</sup>), but only approx. 7 000 t were utilised. The quota for 2002 was fixed at the same level, and it is expected that the quota for tax-exempt Biodiesel is going to be increased for 2003. Within this quota Biodiesel receives full tax exemption if it is used either as a 100 % pure fuel or as a low blend of maximum 2 % into fossil Diesel.

The excise duty on mineral oils is composed of two elements, namely an energy tax and a greenhouse-gas tax. Sweden currently applies different excise duty rates on both petrol and diesel fuels according to environmental standards. Additionally the greenhouse-gas tax share remains unchanged under the different environmental classes and amounts to SEK 1.46 (€ 0.16) for petrol and SEK 1.80 (€ 0.20) for fossil diesel.

This greenhouse-gas tax charged on petrol or diesel fuel can be lowered or reduced according to the extent to which fuels with lower greenhouse-gas emissions replace petrol or diesel fuel. This measure will be effective from 1 January 2003 onwards or at a later date to be determined by the Government when approval has been obtained from the EU. It will end on 31 December 2007.

### 3. Implementation

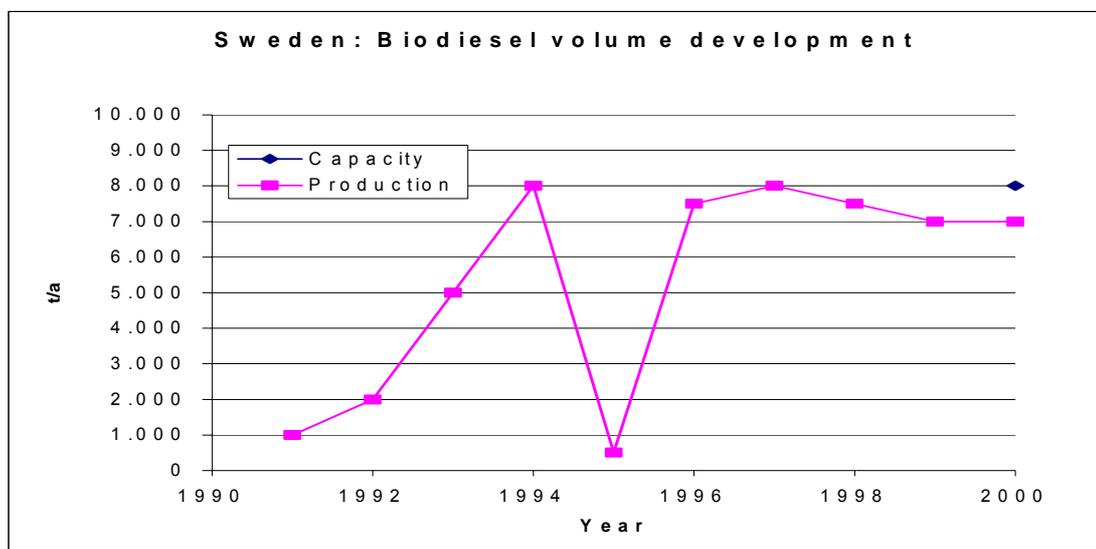
- **Supportive Institutions**

Name	Details
 STEM- Swedish Energy Agency	STEM's key function is to support the implementation of the Swedish Government's energy policy  Website: <a href="http://www.stem.se">http://www.stem.se</a>

- **Production Development**

Name	Details
 Svenska Ecobrånslé AB	Capacity: 8 000 t/a Start: October 2000  Website: <a href="http://www.ecobransle.se">http://www.ecobransle.se</a>

Currently there is only the company Svenska Ecobrånslé AB producing and offering Biodiesel for the Swedish market. There are intentions to increase capacity to 18 000 t in the near future. A further production plant with a production capacity of 26 400 t/a is in design stage.



- **Feedstock Supply**

Currently rapeseed is the standard feedstock used, but trials were made also with linseed, lard and recycled frying oils.

- **Quality Management**

The Swedish standard SS 1554 36 is the basis for quality assurance. It is expected that the new European standard EN 14214 is going to be adopted in 3<sup>rd</sup> quarter 2003.

- **Marketing Strategy**

The Biodiesel distributed by Ecobränsle is marketed by oil companies, both as a low blend (at public pump stations) and as a 100 % Biodiesel (mainly used in specific companies' vehicle fleets).

In the past about 80% of the production was applied as 100% pure Biodiesel and 15% as a 2 %-blend with fossil Diesel, while a very minor share was used as chemical solvent for paints.

Distributors	
Name	Details
	Distributor & marketer of Biodiesel products, owner of Svenska Ecobränsle  Website: <a href="http://www.agrol.se/">http://www.agrol.se/</a>

#### 4. Summary / Forecast

Sweden has tried already many routes of emission reduction in the transport sector and was among the first European states to introduce a low-sulphur Diesel fuel (MK1).

There exists also established experience in the use of renewable biofuels in the form of Bioethanol-blended fuels for the petrol engine (e.g. demonstration fleet of Flexible-Fuel-Vehicles as sponsored by Ford).

As Southern Sweden offers ideal growing conditions for rapeseed there is substantial potential for Biodiesel production from Swedish oilseeds, which could be further increased by imports of East European feedstock.

Concerning supportive legislation there are new regulations in force, which authorise a differentiated rate of greenhouse-gas tax on greenhouse-gas reducing fuels thus representing a good framework for expanding activities also in the Biodiesel market.

## Switzerland



### 1. Introduction / History

After first research activities in the early 90's by various Swiss institutes (e.g. FAT, EMPA), a small but constant production of 2 000 t Biodiesel was established.

### 2. Legislative Framework

- **Supportive Taxation Measures**

Fuels produced in pilot- and demonstration plants from renewable raw materials are exempt from mineral oil tax. Tax exemption is granted by the Finance Department upon application. In order to promote the use of renewable raw materials, there is a price subsidy for oilseeds (rapeseed, sunflower) being processed in pilot and demonstration plants.

### 3. Implementation

- **Supportive Institutions**

Name	Details
<b>R &amp; D institutions</b>	
 Swiss Federal Laboratories for Materials Testing and Research Laboratory for I.C. Engines	Early emission trials in heavy duty engines with RME published already in 1992.  Website: <a href="http://www.empa.ch">http://www.empa.ch</a>
 FAT TÄNIKON / Federal Research Station for Agricultural Economics and Engineering-	Early R&D work discontinued because of lack of commercial realisation.  Website: <a href="http://www.sar.admin.ch/fat">http://www.sar.admin.ch/fat</a>

- **Production Development**

Name	Details
 Eco Energie Etoy	Capacity 2 000 t/a Start: 1996 Feedstock: rapeseed oil Website: <a href="http://www.ecoenergie.ch">http://www.ecoenergie.ch</a>

Presently there are no new Biodiesel plants in consideration.

- **Feedstock Supply**

Mainly rapeseed oil is used with limited amounts of sunflower oil. From the 300 000 ha arable farmland, approximately 20% could be cropped with rapeseed which represents a fossil diesel substitution rate of 4%. The medium-term substitution potential is approx. 36 000 t/a.

- **Quality Standards**

German DIN V 51606 is used as standard for the time being.

- **Marketing Strategy**

Biodiesel is sold in two ways:

- directly to agricultural co-operatives,
- to a Swiss petrol distributor that is selling Biodiesel at 5 public filling stations (all in the Bern district) where it is offered 100 % pure fuel.

Some transport companies use it as “Combi-Diesel”, which is a 30% blend with fossil diesel.

The glycerine produced is exported to Germany for further processing and usage in the chemical and pharmaceutical industry.

Biodiesel is marketed at a price level of approx. 10 % lower than fossil diesel.

Distributors	
Name	Details
 <p>Flamol</p>	<p>Mineral oil company offering Biodiesel</p> <p>Website: <a href="http://flamol.ch/raps">http://flamol.ch/raps</a></p>

#### 4. Summary / Forecast

Total consumption of fossil diesel fuel in Switzerland averages to 1 200 000 t/a, the Biodiesel market share is less than 0.2 % so far, and most probably will stay there for the next years to come.

## United Kingdom



### 1. Introduction / History

A first trigger was set by television documentation for Biodiesel, produced by BBC in Austria in October 1991. Soon after a study group of stakeholders visited Austria and in 1992 the British Association for Biofuels and Oils (BABFO) was founded as a Biodiesel promoting agency.

A first report “Rationale and Economics of a UK Biodiesel Industry” was compiled by the Scottish Agricultural College (SAC) and the Austrian Biofuels Institute in January 1994, followed by initial production of Biodiesel by the company Chemoxy International for the East Durham Biodiesel Working Group a few months later for use in experimental field trials of alternative fuelled vehicles.

While there was progress for developing Biodiesel by setting appropriate steps for fuel production and vehicle field testing there was no progress achieved in adapting the taxation system as already practised in many other European countries.

The Budget Statement in 1997 declared on the one hand “The Government places a high priority on the use of the tax system to deliver environmental objectives” but the environmental advantages of Biodiesel did not find adequate attention on the other hand. In 1999 taxation rates had the following structure:

Fuel type	Tax (pence per litre)
Aviation turbine fuel	0 ppl
Unleaded Petrol	48.82 ppl
Ultra low sulphur diesel (ULSD)	48.82 ppl
High Octane unleaded Petrol	50.89 ppl
DERV (including Biodiesel) *	51.82 ppl

\* DERV = diesel engine road vehicle

#### UK: Excise Duty on Transport Fuels (in ppl- pence per litre)

This taxation policy seemed to be influenced by a study of ETSU (Energy Technology Support Unit / Harwell Laboratory) for the British Department for Trade and Industry in 1996, which concluded that Biodiesel advantages would be neglectable.

In this study however Methyl-esters of undefined and therefore questionable quality were used in just a few vehicles and presented data were highly contradictory to well established experience in other European countries and the USA.

Finally, a new duty rate for Biodiesel of 25.82 pence per litre (ppl) was introduced, which follows the European trend and may trigger a catch-up phase of the emerging Biodiesel industry in the United Kingdom.

## 2. Legislative Framework

### • Supportive Taxation Measures

The new duty rate for Biodiesel of 25.82 ppl (419.63 € per 1 000 litres) came into effect on July 26<sup>th</sup> 2002. This is a cut of 20 ppl (with proportionate rebates for blends) compared to ULSD currently taxed with 45.82 ppl (744.68 € per 1 000 litres).

Requested level of fuel excise duty derogation for Biodiesel as a road transport fuel is 40 ppl which would ensure the adequate promotion of large-scale production of Biodiesel.

## 3. Implementation

### • Supportive Institutions

Name	Details
 <p>BABFO British Association for Biofuels and Oils</p>	<p>Promotion of transport fuels and oils from renewable sources; achieve Government support for required tax exemption for Biodiesel, support for establishing a Biodiesel industry</p> <p>Website: <a href="http://www.biodiesel.co.uk/">http://www.biodiesel.co.uk/</a></p>

### R & D institutions

 <p>SAC Scottish Agricultural College</p>	<p>Specialized in research, consultancy and higher education in agriculture and the land based industries, especially in cropping rapeseed. Member of BABFO</p> <p>Website: <a href="http://www.sac.ac.uk">http://www.sac.ac.uk</a></p>
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Other sites of interest:

Site name	Details
ABI- Allied Biodiesel Industries	<p>Association of small and medium enterprises producing Biodiesel from recycled frying oil.</p> <p>Website: <a href="http://www.ukbiodiesel.biz">http://www.ukbiodiesel.biz</a></p>
BD filling stations	<p>Listing 70 outlets offering Biodiesel nation-wide</p> <p>Website: <a href="http://www.biodieselfillingstations.co.uk/">http://www.biodieselfillingstations.co.uk/</a></p>
	<p>Media coverage providing comprehensive basic information about Biodiesel</p> <p>Website: <a href="http://www.channel4.com/apps26/4car/jsp/main.jsp?lnk=250&amp;storyid=1245">http://www.channel4.com/apps26/4car/jsp/main.jsp?lnk=250&amp;storyid=1245</a></p>
UK Biodiesel discussion forum	<p>Website: <a href="http://biodiesel.infopop.net/2/OpenTopic?a=frm&amp;s=465094322&amp;f=819090994">http://biodiesel.infopop.net/2/OpenTopic?a=frm&amp;s=465094322&amp;f=819090994</a></p>

- **Feedstock Supply**

Currently recycled frying oil is the preferred feedstock due to its low purchase price. With the excellent climatic and growing conditions however rapeseed will become the preferential non-food crop as it is the case in Germany and France.

With many harbour sites available potential investors may choose also those locations for establishing large Biodiesel production plants so other oils such as soy oil and palm oil can be imported at low cost.

- **Quality Management**

The EU fuel standard for Biodiesel prEN 14214 is not yet formally ratified and may become the Biodiesel fuel standard for rebate eligibility in the 3<sup>rd</sup> quarter of 2003. <http://www.petroplus.co.uk/English/>

- **Production Development**

Name	Details
 Rix BioDiesel Ltd.	Capacity: projected enlargement to 30 000 t/a. Feedstock: recycling oils Website: <a href="http://www.rixbiodiesel.co.uk/">http://www.rixbiodiesel.co.uk/</a>
 Global Commodities UK Ltd.	Start: 2002 / Distribution via Broadland Fuels  Brand name: Website: <a href="http://www.globeco.co.uk/">http://www.globeco.co.uk/</a>
Ebony solutions	Brand name:  Feedstock: recycled oils Website: <a href="http://www.ebony-solutions.co.uk/">http://www.ebony-solutions.co.uk/</a>
 Greenergy	Brand: "GlobalDiesel", a blend of ULSD (ultra low sulphur Diesel) with up to 5% FAME. Distribution via the Sainsbury supermarket fuel pump network. Website: <a href="http://www.greenergy.com/">http://www.greenergy.com/</a>
 Petroplus Marketing Ltd.	Brand: "Bio-Plus", a blend of fossil Diesel with up to 5% FAME. Handing out greenhouse gas reduction certificates to customers at the fuel pump. Website: <a href="http://www.petroplus.co.uk/">http://www.petroplus.co.uk/</a>
Envirodiesel	Feedstock: recycled frying oil. Small scale Biodiesel supply in 1 000 litre IBCs and 25 litre drums "for easy storage and use at home" Website: <a href="http://www.envirodiesel.co.uk">http://www.envirodiesel.co.uk</a>
Allied Biofuels Industries Ltd. UK Biodiesel Suppliers	Small scale Biodiesel supply network. Website: <a href="http://www.biofuels.fsnet.co.uk">http://www.biofuels.fsnet.co.uk</a> and <a href="http://www.ukbiodiesel.biz">www.ukbiodiesel.biz</a>

Estimates for current Biodiesel production are at about 5 000 t/a, but it is expected that this figure is soon to be outdated, as the new tax regulation will increase the number of professionally built industrial sized Biodiesel sites.

Two further processing plants are under construction:

Name	Details
 Argent Energy Ltd. (Argent Group Europe)	Capacity: 50 000 t/a Start: 1/2004 Feedstock: animal fats, beef tallow  Address: 258 Belsize Road, London, NW6 4BT
 Biofuels Corporation Ltd.	Advanced project to construct a modern Biodiesel production plant with a production capacity of 250 000 t/a at a harbour site close to a mineral oil refinery at the Teesside in the North-East of England. Website: <a href="http://biofuelscorp.com/project.htm">http://biofuelscorp.com/project.htm</a>

#### • Marketing Strategy

The main marketing activities are focused on the promotion of a 5% blend of Biodiesel with fossil diesel; part of the Biodiesel sold is imported from France, Germany and Denmark or overseas.

Largest quantities are sold either directly to large fleets or to more than 70 road-side filling stations. Close to the so far few small scale methyl-ester production sites fuel is sold in containers of 25 to 1 000 litres; it can be assumed that there the quality management is maintained at a low level.

#### 4. Summary / Forecast

The new duty rate for Biodiesel represents a strong trigger for getting a British Biodiesel industry started. In order to reach the volume targets as set by the European Directive further incentives for large-scale production will be required. Such incentives exist already for fossil sourced LPG & CNG.

With a present consumption of fossil diesel fuel of approx. 17 Mio. the United Kingdom has to produce 340 000 t of Biodiesel by the year 2005 in order to reach the 2 % market share goal. Given set-aside acreage of more than 500 000 ha, on which rapeseed can be grown, the British Biodiesel industry should have plenty of feedstock available. Furthermore it is estimated that additional 40 000 t of recycling oil as cheap and suitable source for Biodiesel production can be collected. As already observed imports of soy oil and palm oil are considered as an economic option.

Best-case calculations estimate a maximum fossil diesel substitution rate of 10 %, and that would mean a saving of about 1.7 million t/a fossil diesel.

## 4.2 The Americas

### Argentina



Argentina is the world's largest exporter of oilseed meals and the 3<sup>rd</sup> largest exporter of oilseeds as well as edible oils, mainly soybean and sunflower; it is furthermore ranked as the 4<sup>th</sup> largest oilseed producer. Consequently, there is an enormous potential for Biodiesel production. Unfortunately, the country's current socio-economic crisis is hindering investment decisions, which is the main barrier for any significant Biodiesel investment.

There are seven existing Biodiesel production units with capacity ranging from 10 – 50 t/d, and at least 11 projects, ranging from small scale farmers cooperatives to big scale production with 30 million US\$ investment, are pending. Only one small-scale home-brewer unit is effectively producing now.

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**Brazil**

In May 2002 the PROBIODIESEL (Programa Brasileiro de Desenvolvimento Tecnológico de Biodiesel) programme was announced, which will set up the regulatory framework for Biodiesel development and production. The programme is coordinated by the Ministry of Sciences and Technology, Secretariat of Technology and Enterprise Policy ([www.mct.gov.br/legis/portarias/702\\_2002.htm](http://www.mct.gov.br/legis/portarias/702_2002.htm)).

Besides the production of soy-methyl-ester (SME) the development of a soy-ethyl-ester (SEE) is under consideration as Brazil traditionally has a very large national production of Bioethanol from sugarcane. (Bioethanol has been used as a liquid biofuel for transport purposes for many years.) Both the SME and SEE are going to be used as B-5 blends in fossil Diesel.

The vegetable industry (ABIOVE – Associação Brasileira de das Indústrias de Óleos Vegetais) will provide 80 000 litres free of charge for performing these tests.

Currently there are four companies able to start a Biodiesel production, but as commercialization has not yet been authorized, there is no dedicated Biodiesel production plant operating yet.

There is one company producing Biodiesel as a fuel additive for its product called “AEP 102”, which is fossil diesel blended with Bioethanol and 2 % of SME (soy methyl ester). <http://biodieselbrasil.com.br>

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**Canada****1. Introduction / History**

Canadian scientists at the University of Saskatoon (the home of “Canola”, the basic 00-rapeseed variety for the last 30 years) were the organisers of the first Biodiesel conference in March 1994.

Biodiesel is not yet a commercial fuel product in Canada but the recent foundation of “Biodiesel Canada Association” indicates that commercial activities are in the planning phase and will be accelerated.

**2. Legislative Framework**

- Supportive Taxation Measures

Presently Biodiesel is fully taxed at the same level as fossil diesel fuel in Canada, with the exception of Ontario that removed the provincial road tax from Biodiesel.

Due to low taxation on fossil diesel the exemption of the Canadian federal tax rate on Biodiesel at 4 cents per litre, would - even combined with a provincial incentive - not

represent a sufficient incentive.

- **Other Regulative Measures**

Biodiesel is registered as a fuel and fuel additive with the Canadian Environmental Protection Agency and meets the clean diesel standards as established by Environment Canada.

Neat (100% or B-100) Biodiesel has been designated as an alternative fuel by required federal and provincial bodies.

### 3. Implementation

- **Supportive Institutions**

Name	Details
Biodiesel Association of Canada	Founded by June 2003 by COPA (Canadian Oilseed Processors Association; members: ADM, Bunge, Canbra foods, Cargill); chaired by Robert Broeska
 Canadian Renewable Fuels Association	NPO founded in 1994, to promote renewable bio-fuels (ethanol, Biodiesel) for automotive transportation Website: <a href="http://www.greenfuels.org">http://www.greenfuels.org</a>
 <b>Natural Resources Canada</b> Office of Energy Efficiency- Transportation Energy Use Division	The weekly "Canadian Biodiesel Network News" is published by Ms. Christine Paquette, Project Manager: Website: <a href="http://www.oeo.nrcan.gc.ca">http://www.oeo.nrcan.gc.ca</a>

## R&D institutions

 Ontario soybean growers	Involved in various Biodiesel R&D projects (e.g Biox)  Website: <a href="http://www.soybean.on.ca/">http://www.soybean.on.ca/</a>
 Agricultural Adaptation Council	Conducting six research projects and developing a market development and promotion plan together with the Ontario Soybean Growers  Website: <a href="http://www.adaptcouncil.org">http://www.adaptcouncil.org</a>

- **Feedstock Supply**

Canada is known for its large rapeseed production (“canola”), but sunflower seed is also grown there. Today Canada is the world’s 4<sup>th</sup> largest oilseed exporter. Currently vegetable oils, but also recycled frying oils and animal fats are used as feedstock sources.

- **Quality Management**

For the past several years there have been efforts undertaken in Canada to develop a Canadian General Standards Board specification for Biodiesel fuels. These efforts have not yet resulted in a published specification; the German standard DIN 51606 FAME and the US ASTM D 6751-02 FAME remain the orientation standards for quality management.

The introduction of quality insurance system seems to be indispensable for the market introduction of Biodiesel in Canada too.

- **Production Development**

Name	Description
 BioX Corporation	Start: 4/2001 First large-scale demonstration plant  Website: <a href="http://www.bioxcorp.com">http://www.bioxcorp.com</a>
 topia energy inc.	Offering Biodiesel in rail-cars and tanker-trucks volumes  Website: <a href="http://www.aboutbiodiesel.com">http://www.aboutbiodiesel.com</a>
 BIO-DIESEL CANADA INC.	Biodiesel marketer  Website: <a href="http://www.biodieselcanadainc.com/">http://www.biodieselcanadainc.com/</a>

Currently one demonstration plant started production in April 2001. The technology was provided from the University of Toronto. In a quite challenging approach it is planned to raise capacity in the following steps: 80 t/a in 2001 to 880 t/a in 2002 increasing to 158 000 t/a in 2003 and finally to 480 000 t/a in 2004.

- **Marketing strategy / Distribution system**



For one year, 155 STM buses will run on Biodiesel in downtown Montreal to gain practical experience in the use of Biodiesel under real-life conditions, particularly in cold weather, and to demonstrate the feasibility of supplying Biodiesel to a mass transit company like the STM. The project will also assess the economic and environmental impact of using this fuel, which is made from recycled sub-food-grade vegetable oil and animal fats. (Website: <http://www.stcum.qc.ca>).

Further on-road tests are in progress in Saskatoon with two buses of the Saskatoon Transit Services running on B-5.

(Website: <http://www.city.saskatoon.sk.ca/org/transit/biobus.asp>).

The fleet services of Toronto Hydro-electric systems began in September 2001 a large-scale pilot project using Biodiesel in about 80 fleet vehicles. By July 2002 the project was extended to the entire fleet of 400 vehicles.

(Website:

[http://www.torontohydro.com/corporate/initiatives/green\\_fleet/index.cfm#biod](http://www.torontohydro.com/corporate/initiatives/green_fleet/index.cfm#biod))

#### **4. Summary / Forecast**

With its large production of rapeseed but also sunflower Canada has plenty of virgin vegetable oil available. The one potential key weakness that may impede its development in Canada is Biodiesel's winter operability (CFPP = Cold Filter Plugging Point). Additives or special diesel blending fuels may be one solution but they will add cost to the product.

Nevertheless, with the tax incentive introduced by the Ontario government, it is likely that one or two Biodiesel plants could be commercially viable.

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**Nicaragua**

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In the early 90ies a Biodiesel plant with a production capacity of 3 000 t/a was established with the support of an Austrian development programme. It is unique as the feedstock is produced from the locally grown bush *Jatropha curcas* or physic nut, which produces a highly suitable oil for Biodiesel production according to the Austrian fuel standard ON C 1191 for FAME.

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**USA**

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**1. Introduction / History**

Until the early 1970's, the USA were self sufficient in fossil oil production. Because of a decreasing domestic production and increasing energy needs mineral oil imports have increased at an accelerating rate.

In the early 1990's United States interest in Biodiesel was stimulated by the Clean Air Act combined with regulations requiring reduced sulphur content in fossil diesel fuel and reduced diesel exhaust emissions.

In 1992, soybean farmers formed the National SoyDiesel Development Board (NSDB), which was funded by the United Soybean Board and financed by the national soybean check-off dollar system. It was the initially leading organisation in the United States conducting research and market development activities with Biodiesel.

At the same time first quantities of Biodiesel were produced in non-dedicated plants e.g. by Procter & Gamble and used in initial fleet tests.

It was also in 1992 that Congress passed The Energy Policy Act of 1992 (EPAAct), through which requires that certain fleets purchase alternative fuel vehicles (AFVs) capable of operating on non-petroleum fuels, such as CNG, LPG, but also Bioethanol and Biodiesel.

The NSDB changed its name to the National Biodiesel Board (NBB) in September 1994.

In 1996 there were only 2 registered Biodiesel suppliers; four years later there were more than 14 companies engaged in the development of Biodiesel manufacturing plants and industry development activities, with 200 000 t/a (= 60 million gallons) of dedicated Biodiesel capacity available.

On 20<sup>th</sup> June 2001 the nation's first retail biofueling station started serving the general public in Aiken, South Carolina, offering customers a complete selection of bio-fuels including E-85 (85% Bioethanol and 15% gasoline), B-20 (20% Biodiesel and 80% fossil diesel), and B-100.

In February 2002, the American Society of Testing and Materials (ASTM) issued the first fuel standard D 6751 for Biodiesel fuel bought and sold in the U.S., marking a major milestone for the Biodiesel quality management.

In April, California became the first US state in which a bill restricting carbon dioxide emissions from automobiles was introduced. Legislative Framework

- **Supportive Taxation Measures**

At the federal level, Biodiesel was taxed so far at the same rate as standard number 2 fossil diesel fuels with 24.40 cents per gallon.

There is pending federal legislation to reduce this by one cent per percent Biodiesel blend up to B-20 (20% Biodiesel / 80% fossil diesel).

In addition to federal excise taxes, most states also charge their own taxes on fuel. At present the states Idaho, Illinois, Iowa, Hawaii, Massachusetts, Montana, North Dakota (a plant is built in this state) and Texas offer incentives for Biodiesel.

A state mandate requiring a minimum Biodiesel share of 2% of total diesel consumption has been introduced in Minnesota. Some states (and even local communities) may also offer incentives for specific blends or for special groups of users.

On 25<sup>th</sup> April 2002, the U.S. Senate voted in favour of Bill S-517, the Energy Policy Act of 2002, with multiple provisions to help level the playing field for Biodiesel: excise tax incentive, tax credit, renewable fuels standard, federal fleet use, and removal of the 50% Biodiesel limit in EPACT.

### • Other Regulative Measures

Another supportive measure for Biodiesel is the U.S. Department of Agriculture's (CCC- Commodity Credit Corporation) program that provides a subsidy up to 7,5 million US\$/a thereby stimulating industrial consumption of agricultural commodities such as soybean oil.

With the subsidies, Biodiesel is currently selling for \$1.30 to \$1.50 per gallon (without road taxes). The CCC program is paying producers 40% of the value of soybeans purchased to produce fuel.

## 2. Implementation

### • Supportive Institutions

Name	Details
 National Biodiesel Board	Formerly the National Soydiesel Board. National association representing the Biodiesel industry as the co-ordinating body for R&D, promotion and lobbying in the USA.  Website: <a href="http://www.biodiesel.org">http://www.biodiesel.org</a>
 United Soybean Board	Founder of NBB, marketing, research and commercialisation programs for soybean products.  Website: <a href="http://www.unitedsoybean.org/">http://www.unitedsoybean.org/</a>
<b>R&amp;D institutions</b>	
 National Renewable Energy Laboratory	The U.S. Department of Energy's premier laboratory for research & development on renewable energy.  Website: <a href="http://www.nrel.gov/">http://www.nrel.gov/</a>
	Office of Transportation Technologies Website: <a href="http://www.ott.doe.gov/">http://www.ott.doe.gov/</a> i.e. on EPACT: <a href="http://www.ott.doe.gov/epact/">http://www.ott.doe.gov/epact/</a>
 EREN	Energy Efficiency and Renewable Energy Network  Website: <a href="http://www.eren.doe.gov">http://www.eren.doe.gov</a>

 University of Idaho	Biodiesel research, Bioenergy conferences Website: <a href="http://www.uidaho.edu/">http://www.uidaho.edu/</a>
 IOWA STATE UNIVERSITY	R&D, Biodiesel workshop Website: <a href="http://www.me.iastate.edu/biodiesel/">http://www.me.iastate.edu/biodiesel/</a>

## Other sites of interest:

Site name	Details
AFDC- Alternative Fuels Data Centre	One-stop shop for all alternative fuel and vehicle information needs Website: <a href="http://www.afdc.doe.gov/">http://www.afdc.doe.gov/</a>
 Clean Cities Network	Sponsored by the Department of Energy (DOE), supports public and private partnerships that deploy alternative fuel vehicles (AFVs) and build supporting infrastructure Website: <a href="http://www.cities.doe.gov/">http://www.cities.doe.gov/</a>
The Soy Daily	Biodiesel / biobased news Website: <a href="http://www.thesoydailyclub.com/BiodieselBiobased/news.asp">http://www.thesoydailyclub.com/BiodieselBiobased/news.asp</a>
Union of Concerned Scientists	Develops and promotes strategies to reduce the adverse impacts of the US transportation system Website: <a href="http://www.ucsusa.org/clean_vehicles/index.cfm">http://www.ucsusa.org/clean_vehicles/index.cfm</a>
 Archer Daniel Midlands	One of the largest international food providers in the world and largest Bioethanol producer in the USA. Engaged in Germany with 2 Biodiesel production plants of 220.000 t capacity in total. Website: <a href="http://www.admworld.com">http://www.admworld.com</a>
 BUNGE	A leading global player in the food oil industry with Biodiesel production activities in Europe. Including plants in Verdun (France), Livorno (Italy), Bruck (Austria) and Marl (Germany) as a result of the recent acquisition of Cereol/Novaol. Website: <a href="http://www.bunge.com">http://www.bunge.com</a>
 Cargill	International marketer, processor and distributor of agricultural, food, financial and industrial products; engaged in Biodiesel production in Germany. Website: <a href="http://www.cargill.com">http://www.cargill.com</a>
Biodiesel Discussion forum	<a href="http://biodiesel.infopop.net/2/OpenTopic">http://biodiesel.infopop.net/2/OpenTopic</a>

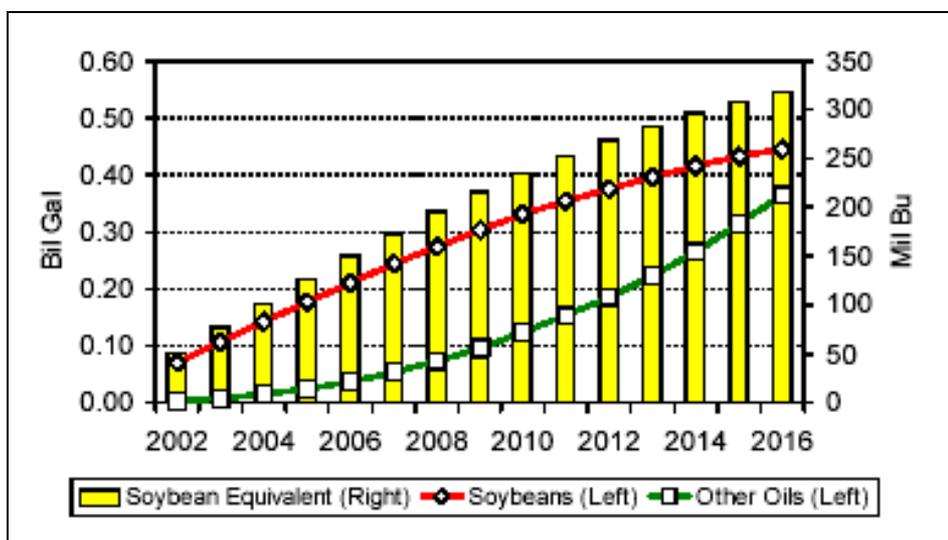
• **Feedstock Supply**

Soybean oil dominates the vegetable oil market comprising over 75% of the total vegetable oil volume. The combined vegetable oil and animal fat production amounts to 35.3 billion pounds (158.9 million tons) per year; at about 7.6 pounds per gallon of oil.

<b>Vegetable Oil Production</b>	<b>Billion pounds</b>	<b>Million tons</b>
Soybean	18,340	82,53
Peanuts	0,220	0,99
Sunflower	1,000	4,50
Cottonseed	1,010	4,55
Corn	2,420	10,89
Others	0,669	3,01
<b>Total Veg. Oil</b>	<b>23,659</b>	<b>106,47</b>
<b>Animal Fats</b>		
Edible Tallow	1,625	7,31
Inedible Tallow	3,859	17,37
Lard & Grease	1,306	5,88
Yellow Grease	2,633	11,85
Poultry Fat	2,215	9,97
<b>Total Animal Fat</b>	<b>11,638</b>	<b>52,37</b>

Total Annual Production of US Fats and Oils

Currently more than 90 percent of US produced Biodiesel is made from soybean oil, which will remain the predominant feedstock, although an increasing share of Biodiesel production will come from other oils, including yellow grease, rapeseed oil, cottonseed oil, animal fats and recycled frying oil.



Feedstock sources 2002-2016

- **Quality Management**

The American Society of Testing and Materials (ASTM) developed and issued the Biodiesel fuel standard D 6751-02.

It was approved by the ASTM Committee D2 in December 2001 after more than 7 years of work by the ASTM Biodiesel Task Force.

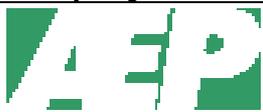
D 6751-02 is replacing the provisional specification PS 121-99, issued in 1999. The new standard covers the incorporation of pure Biodiesel (B-100) into fossil diesel fuel up to 20 percent by volume (B-20) with higher blend levels being acceptable, depending on the experience of the engine company.

In order to reduce the risk to public health from exposure to emissions, any Biodiesel marketer is required to register with the US Environmental Protection Agency, as it is the authority to regulate fuels and fuel additives.

- **Production Development**

As no clear differentiation between dedicated (e.g. Griffin Industries) and non-dedicated (e.g. Procter & Gamble) Biodiesel production plants can be made, it is difficult to distinguish between Biodiesel producers and marketers.

The following indicative list tries to enumerate the most important of them:

Company	Details
 Ag Environmental Products	Feedstock: soy oil NBB corporate member Biodiesel brand name:  Application forms include Marine Biodiesel, additives and winterised Biodiesel Website: <a href="http://www.soygold.com/">http://www.soygold.com/</a> <a href="http://www.agp.com">http://www.agp.com</a>
 Biodiesel Industries <small>PRODUCTION • TECHNOLOGY • DEVELOPMENT</small>	Biodiesel Industries NBB corporate member; technology provider for the first large-scale production unit in New South Wales, Australia Website: <a href="http://pipeline.to/biodiesel">http://pipeline.to/biodiesel</a>
 Columbus Foods	Columbus Foods NBB corporate member Website: <a href="http://columbusfoods.net/">http://columbusfoods.net/</a>
 Griffin Industries	Feedstock: Recycled frying oil, grease and animal fats NBB corporate member Biodiesel brand name:  Website: <a href="http://www.griffinind.com/html/biodiesel/html">http://www.griffinind.com/html/biodiesel/html</a>
	Capacity: 600 000 gallons (2 000 t/a) Start: 10/1986

Pacific Biodiesel	<p>Feedstock: Recycled oils &amp; grease One of the first companies producing Biodiesel</p> <p>Website: <a href="http://www.biodiesel.com">http://www.biodiesel.com</a></p>
 Procter & Gamble	<p>One of the largest producers of methyl esters in the US selling to Biodiesel marketers on contractual basis.</p> <p>Website: <a href="http://www.procterandgamble.com">http://www.procterandgamble.com</a></p>
 Stepan Company	<p>NBB corporate member</p> <p>Website: <a href="http://www.stepan.com">http://www.stepan.com</a></p>
 Superior Process Technologies	<p>Start: 1982 Demonstration plant</p> <p>Website: <a href="http://www.superiorprocesstech.com">http://www.superiorprocesstech.com</a></p>
 Corsicana Technologies	<p>Oleo-chemical plants, producing methyl ester for NBB members on contractual basis</p> <p>Website: <a href="http://www.corsicanatech.com">http://www.corsicanatech.com</a></p>
 West Central Soy	<p>Capacity: 12 million gallons (40 000 t/a) Start: 12/2002; NBB corporate member, Biodiesel brand name: </p> <p>Website: <a href="http://www.westcentralsoy.com">http://www.westcentralsoy.com</a></p>
Ocean Air Environmental	<p>Feedstock: Recycled oil &amp; grease Former NOPEC; NBB corporate member;</p> <p>Website: <a href="http://www.oceanairenvironmental.com/">http://www.oceanairenvironmental.com/</a></p>
American Biofuels	<p>Capacity: plans to expand its plant to 15 million gallons per year (50 000 t/a) NBB corporate member;</p> <p>Website: <a href="http://www.americanbiofuels.com">http://www.americanbiofuels.com</a></p>
 Southern States Power Company	<p>Signed a letter of intent to invest in a Biodiesel production plant with a capacity of 3 million gallons per year (10 000 t/a)</p> <p>Website: <a href="http://www.sspowerco.net">http://www.sspowerco.net</a></p>
 Imperial Western Products	<p>NBB corporate member, Biodiesel brand name: </p> <p>Website: <a href="http://www.imperialwesternproducts.com">http://www.imperialwesternproducts.com</a></p>

Most of them are dedicated plants; however, Procter & Gamble, Columbus Foods and Stepan Chemical are not dedicated.

Current dedicated production capacity is estimated to be between 60 - 80 million gallons (200 000 – 265 000 t/a) per year. This capacity is mostly modular, and could be doubled or tripled in a short time frame.

In addition, several oleo-chemical plants with significant volumes of excess methyl ester production produce Biodiesel on a contract basis for NBB members. Examples of such companies are Procter & Gamble, Corsicana Chemical and Soy Solutions.

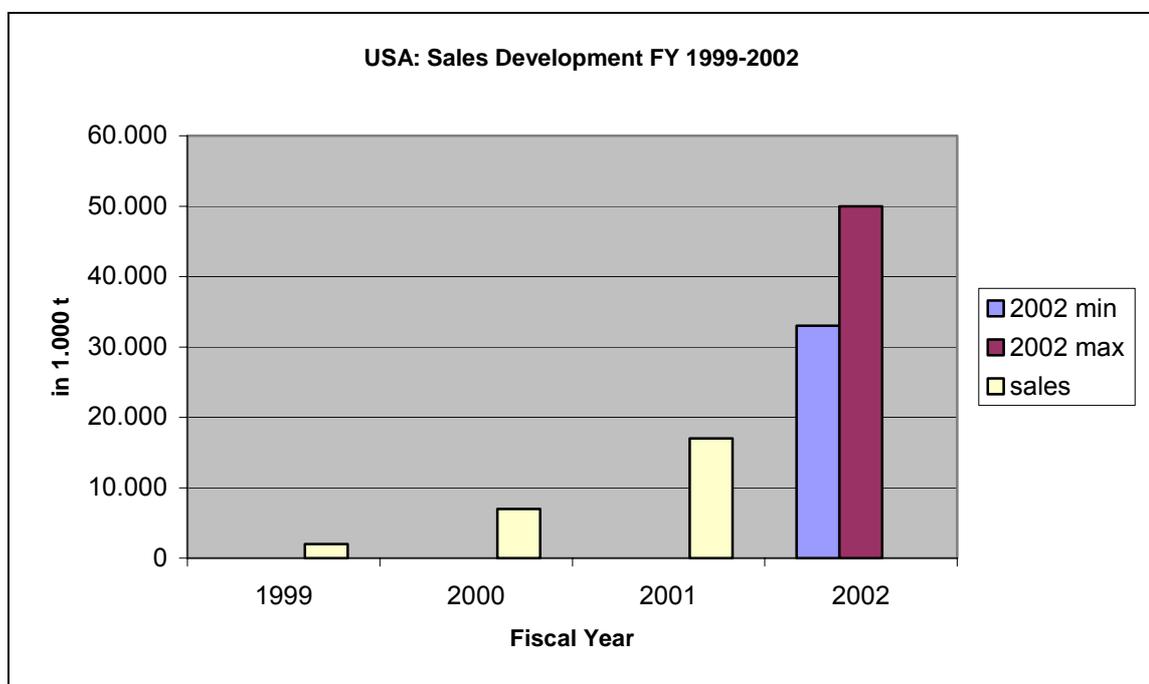
Although few estimates are available to document this surplus capacity within the oleo-chemical industry, Biodiesel suppliers have reported that up 660 000 t/a (200 million gallons) of production capacity is available through long-term production agreements with existing Biodiesel marketing firms. More Biodiesel plants are being planned in at least 15 states.

- **Marketing Strategy**

In recent years Biodiesel industry efforts were mostly concentrated in four markets: urban transit, government/regulated fleets, marine, and underground mining, as the attributes of Biodiesel appeared to justify the additional cost per gallon in these markets.

Biodiesel is used in three primary applications to address three different market segments: B-100 (neat Biodiesel); B-20 (20% Biodiesel/80% fossil diesel); and B-2 (2% Biodiesel). The largest market is probably within EPACT-affected fleets, which requires large fleets to use alternative fuels.

Total sales for fiscal year 2002 are estimated to range between 33 000 and 50 000 t (10 - 15 million gallons).



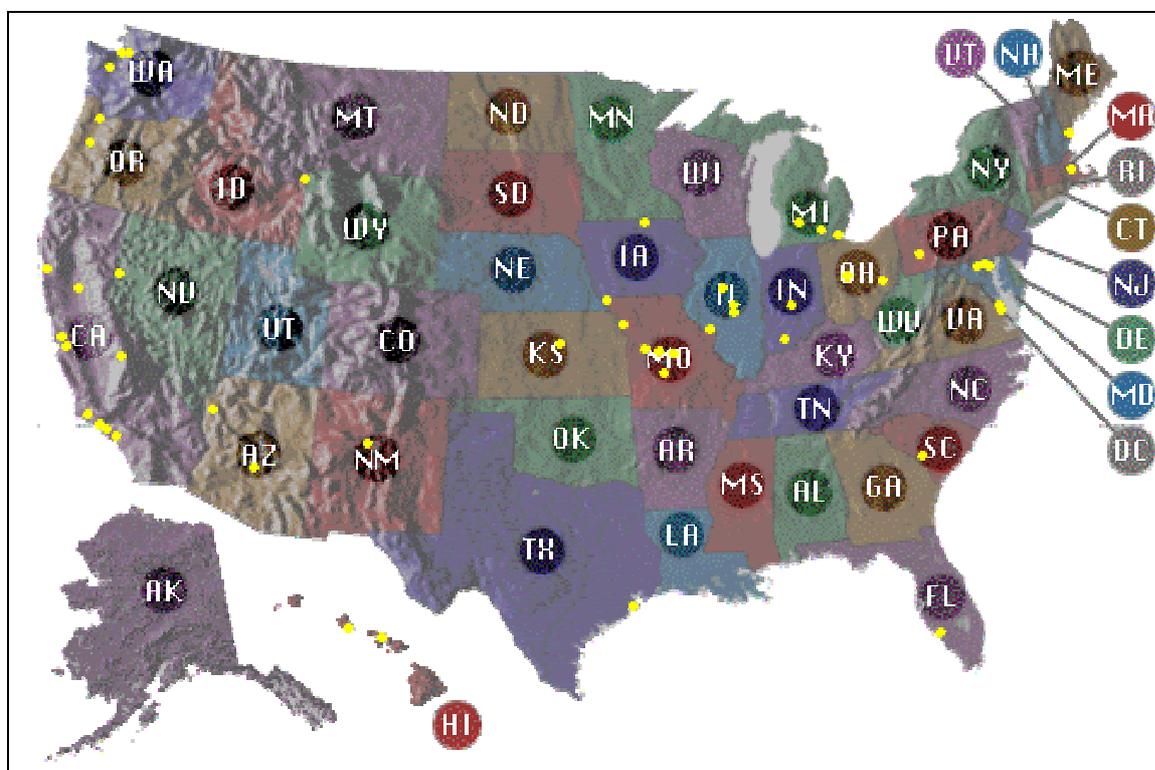
**Sales development Fiscal Years 1999-2002**

More than 200 fleets use Biodiesel commercially. These include federal fleets like the US Department of Agriculture and Yellowstone National Park; state fleets like the Missouri Department of transportation; municipal fleets like Peterson Air Force Base in Colorado Springs; school district fleets such as Medford Schools in New Jersey and St. John's in Michigan; and public utility companies like Florida Power & Light and Alabama Power.

As per announcement of June 29<sup>th</sup>, 2003 the city of Berkeley, California, switched more than 180 of the City's diesel vehicles to B-100, representing 90 percent of its fleet.

There are several ways to purchase the fuel: directly from a Biodiesel supplier, from a petroleum distributor or a public pump.

There are hundreds of petroleum distributors carrying Biodiesel and Biodiesel blends nationwide, and over 35 pumps now make Biodiesel or Biodiesel blends available to the public at stations and fuel docks.



Allocation of public fuelling stations offering Biodiesel

### 3. Summary / Forecast

A number of other important areas for alternative fuels were touched by the new Energy Policy Act, e.g. including a green school bus pilot program and temporary Biodiesel credit expansion. All these measures may contribute to a further growth of the renewable fuels.

## 4.3 Australasia

### Australia



#### 1. Introduction / History

Today Biodiesel production is still in its infancy, but the production of liquid biofuels is receiving increased attention.

Two main facts can be held responsible for this trend:

- Fossil oil imports account for more than half of total usage, and make up the single largest component of the trade deficit.
- Motorised transport turned out to be the most significant contributor to urban air pollution in Australia, therefore the reduction of exhaust emissions from road transport is a key element of air quality management strategies established by Commonwealth, State and Territory governments.

The federal government has recently commissioned a "barriers to entry study" for Biodiesel and Bioethanol. The interim results are due at the end of November 2002 with the study and its recommendations expected to be released by the end of 2003.

#### 2. Legislative Framework

- **Supportive Taxation Measures**

As announced on 30 May 2003 the new Biodiesel taxation arrangements include:

- the Government applying excise on Biodiesel - whether pure or blended - at the same rate as diesel fuel from 18 September 2003;
- providing domestic Biodiesel producers and importers with a subsidy of 38.143 cents/ litre until June 30, 2008, with a net effective excise rate for Biodiesel of zero over this period;
- adjusting the net effective excise rate for Biodiesel in a series of five even annual steps, commencing on July 1, 2008 and ending on July 1, 2012;
- setting a fuel standard for Biodiesel, after which Biodiesel will be listed as an eligible alternative fuel for on-road grants under the Energy Grants Credit Scheme;
- and setting a new excise rate that will apply to Biodiesel from July 1, 2012.

Under the existing excise and subsidy arrangements the effective zero excise rate for already domestically produced Bioethanol is extended until June 30, 2008.

### • Other Regulative Measures

Federal Environment Minister David Kemp and Agriculture Minister Warren Truss announced two-year study with an AUS\$ 5 million budget to address market barriers to the increased use of biofuels (mainly Bioethanol and Biodiesel) in transport.

The study will develop a broad strategy to increase biofuels production to 350 million litres per annum by 2010.

The study will examine options for addressing market access difficulties including an assessment of the respective merits of nationally mandated minimum biofuel standards for transport fuels and voluntary arrangements.

Existing biofuel manufacturers report that, even with an excise exemption, they are having difficulty accessing markets.

Additionally there have been other regulatory disputes: Trade Measurement Regulation bodies at the State and Federal level have been refusing to approve the use of "diesel" dispenser pumps (bowsers) for Biodiesel.

### 3. Implementation

#### • Supportive Institutions

Name	Details
 Bioenergy Australia	Alliance of some 49 organisations fostering biomass for energy and products, established in 1997  Website: <a href="http://www.users.bigpond.net.au/bioenergyaustralia/">http://www.users.bigpond.net.au/bioenergyaustralia/</a>
 Biodiesel Association of Australia	Founded in late 2000 to build Biodiesel from a backyard industry to a standardised, viable addition to Australia's energy resources. Publishing the BAA-Newsletter.  Website: <a href="http://www.biodiesel.org.au/">http://www.biodiesel.org.au/</a>
 EA-Environment Australia	Plans to develop a fuel standard for Biodiesel under the Fuel Quality Standards Act 2000; has issued a discussion paper in March 2003.  Website: <a href="http://www.ea.gov.au/">http://www.ea.gov.au/</a>
 Australian Biofuels Association	Promoting mainly Bioethanol  Website: <a href="http://www.australianbiofuelsassociation.org.au/">http://www.australianbiofuelsassociation.org.au/</a>

## R & D institutions

	<p>Australian Institute of Energy Contact: Mr. Mail Forster</p> <p><a href="http://www.aie.org.au">www.aie.org.au</a></p>
	<p>CSIRO Australia Scientific and Industrial Research: Biodiesel life cycle analysis Contact: Mr. Tom Beer</p> <p><a href="http://www.dar.csiro.au/sourcesink/analysis.html">http://www.dar.csiro.au/sourcesink/analysis.html</a></p>

Other sites of interest:

Name	Details
 EnergyCentral	<p>Provides an overview of the diversity of skills, technologies and capabilities available from Australia's sustainable energy industries.</p> <p>Website: <a href="http://energycentral.com.au/">http://energycentral.com.au/</a></p>

- **Feedstock Supply**

Current production originates from recycled frying oil (that may otherwise be exported to Asia for soap production), and animal fats (e.g. beef tallow).

Various oilseed are grown in Australia and probably a multi-feedstock blend of oils from rapeseed, sunflower and soybean are going to be used for Biodiesel production.

- **Quality Management**

Up till early 2003 there was no Biodiesel standard in place in Australia. Each new batch was tested at the small scale production plants against variables, and monitored for storage stability (as part of a State Government-funded and operated Biodiesel Verification Trial).

The next step was to develop a national fuel standard for Biodiesel and following Ministerial approval the "National Standard for Biodiesel - Discussion Paper 6", which integrated latest information and data material from the European EN 14214 and the US ASTM 6751-02, was released for public comment. The link to the discussion paper is listed below:

<http://www.ea.gov.au/atmosphere/transport/biodiesel/index.html>

The comment period closed on Friday, May 23, 2003, received inputs were integrated and in September 2003 the final Australian Biodiesel standard was published, which is in some parameter slightly less challenging than the European one.

Earlier on the Australian Greenhouse Organisation had commissioned CSIRO with a study of life-cycle emissions and environmental benefits of bio fuels (published in March 2000) in order to obtain information to assess their eligibility under the Diesel and Alternative Fuels Grants Scheme.

Both studies provided the foundation for the development of quality standards.

### • Production Development

Reportedly there are a few small scale “backyard producers” and three larger production plants with two of them being commercial ones.

Total capacity amounts to 48 000 t/a.

Name	Details
 <p>PRODUCTION • TECHNOLOGY • DEVELOPMENT</p>	<p>Capacity: 35 000 t/a            Start: 13. March 2003            Location: Rutherford, NSW.            Joint venture with Biodiesel Industries, Las Vegas, USA  <a href="http://www.pipeline.to/biodiesel">http://www.pipeline.to/biodiesel</a></p>
 <p>Australian Renewable Fuels Pty Ltd</p>	<p>Planning for a commercial 35 000 t/y Biodiesel production plant in progress.             Website: <a href="http://www.ausrf.com.au">http://www.ausrf.com.au</a></p>
 <p>Australian Biodiesel Consultancy</p>	<p>Restart of an up-scaled and improved Biodiesel production site was scheduled for April 2003. Intentions to build several plants of a standard size of 40 000 t/y.             Website: <a href="http://www.biodiesel.net.au/">http://www.biodiesel.net.au/</a></p>

Six major potential producers have been identified, who plan to establish production capacities of larger than 40 000 t/a.

Additionally there are another 10 potential smaller/niche market producers; these include:

- Clearwater Industrial Services / Western Sydney: Conversion of liquid waste (oils, fats, tallow) to produce Biodiesel fuel; applying for SEDA (Sustainable Energy Development Authority) grant of 650 000 AU\$ (= 361 000 €).
- Australian Biodiesel Consultancy / Berkeley Vale: Project to more than double production of Biodiesel from recycled vegetable oils and tallow; applying for SEDA (Sustainable Energy Development Authority) grant of 205 000 AU\$ (= 114 000 €).
- Australian Renewable Fuels / Western Australia: planning to produce Biodiesel from tallow or animal fats using Austrian technology. It will initially produce 40 million litres of Biodiesel a year processing animal fats and recycled oils and fats.

#### • Marketing Strategy

Biodiesel is not yet available for general supply through out Australia. Very limited trials are being executed, and there are 3 service stations that have been selling Biodiesel.

Currently, Biodiesel has a pump price approximately the same as fossil diesel AU\$ 0.90/litre (= 0.50 € ).

SAFF is retailing Biodiesel B100 at its Head Office site in Pooraka, South Australia and they shall retail B20 blend after the necessary excise lift has been implemented, too.

Distributors	
Name	Details
 Australian Farmers Fuel (SAFF)	First retailer offering Biodiesel to the farming community. Biodiesel B-20 blend is being used in operational trials in a MAN bus operated in Adelaide by Transport SA.  Website: <a href="http://www.farmersfuel.com.au">http://www.farmersfuel.com.au</a>

#### 4. Summary / Forecast

Estimations for 2003 Biodiesel production capacity are estimated with approx. 40 000 t. The further development of Australia's Biodiesel industry is highly dependent on the outcomes of the federal "barriers to entry" study.

The federal government has set a target of 350 million litres of biofuels (Bioethanol and Biodiesel) by 2012, and if the current 6 major potential producers implement their plans, the total production will reach 350 million litres already by 2006.

With an Australian Biodiesel fuel standard in place the engine manufacturers have recently provided statements of support and are starting to look at involvement in trials.

**China****1. Introduction / History**

The transportation sector was left out of China's economic plans for many years, and the resulting lack of infrastructure is a major obstacle for the country's energy sector and overall economy. Nevertheless China is one of the biggest fossil diesel oil consumer's worldwide. About 60 - 70 million tons of fossil diesel oil is used every year, with approximately one third of it being imported to balance the market.

The Chinese government emphasized its support for biofuels some time ago, but it seems that with the construction of the world's largest Bioethanol-production plant with approx. 600 000 t/a in Changchun, Jilin Province, the development of this biofuel has for the time being a higher priority than Biodiesel.

In 1998 the Austrian Biofuels Institute completed a study together with the Centre for Renewable Energy Development (CRED) in Beijing and the Scottish Agricultural College (SAC) within the INCO-programme of the European Union. This study evaluated the feedstock availability for Biodiesel production from a variety of potential sources.

**2. Legislative Framework**

- **Supportive Taxation Measures**

There are no special regulations or tax exemptions for Biodiesel in mainland China and Hong Kong, but following the example set for Bioethanol this may change in the near future.

**3. Implementation**

- **Supportive Institutions**

Name	Details
 State development planning commission	Website: <a href="http://www.sdpc.gov.cn/">http://www.sdpc.gov.cn/</a>

**R&D institutions**

 The University of Hong Kong	Main research, feasibility study concerning the introduction of Biodiesel in Hong Kong  Website: <a href="http://hkumea.hku.hk/">http://hkumea.hku.hk/</a>
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- **Feedstock Supply**

Currently rapeseed oil, cottonseed oil and recycled frying oils are investigated and used for trial Biodiesel production.

- **Quality Management**

All existing Biodiesel producers are producing according to the German DIN E 51 606 FAME standard according to obtained reports.

- **Production Development**

Name	Details
 Gushan vegetable fat chemistry Mianynag	Capacity: 10 000 t/a, with plans to extend capacity to 100.000t by then end of 2003 Start: 6/2001 First commercial Biodiesel producer Website: <a href="http://www.gsfc.com/">http://www.gsfc.com/</a>
Dunwell Engineering Co., Ltd. Hong Kong	Capacity: 3 700 t Start: 8/2001 Website: <a href="http://www.dunwellgroup.com/">http://www.dunwellgroup.com/</a>
CNPC ZHZH Petroleum Co., Ltd. Beijing	Start: 10/2002 Capacity: planned extension to 50 000 t/a by the end of 2003, using the process technology of Gushan

Our field research indicates that at least one more company is producing Biodiesel.

- **Marketing Strategy**

China's vehicle stock is dominated by heavy commercial vehicles, but passenger cars are expected to be the fastest growing component.

Currently Biodiesel is predominantly exported to Hong Kong; the users are fleet operators and a limited amount of private light vehicles.

#### 4. Summary / Forecast

The Hong Kong Government has commissioned the University of Hong Kong to conduct a feasibility study of Biodiesel as an automobile fuel in Hong Kong. The report has recently been submitted to the government for consideration, and it is expected that price competitiveness will be the most decisive factor concerning the decision for promoting this fuel in Hong Kong and China.

The potential markets are expected to grow rapidly: vehicle ownership rate in China is around 8.5 vehicles per 1 000 persons (the level the US in 1912), and the number is projected to have grown six fold by 2020 (52 vehicles per 1 000 persons).

Corresponding to these figures, transportation energy demand in China is projected to grow by 6.4 % per year from 1999 to 2020, increasing its share of world energy use for transportation from 4.1 % in 1999 to 9.1 % in 2020. This implies that China is expected to overtake Japan by 2005 and become the world's second largest consumer of transportation fuels.

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**India**

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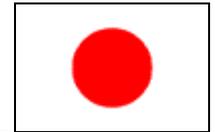


At present Biodiesel initiatives are focused mainly on research, development and demonstration projects. On September 12, 2002 the first Biodiesel / Bioethanol conference was held in New Delhi, and was sponsored by the Ministry of Rural Development and the Petroleum Conservation Research Association

Being a tropical country India has a wide variety of domestic plants that produce oil-bearing materials of sufficient volume potential, e.g. Sal (*Shorea r.*), Neem (*Azadirachta i.*) and the physic nut (*Jatropha c.*) and which are considered as feedstock for Biodiesel production.

It is reported that in the near future a 100 ton/day unit is expected to begin operation near Hyderabad.

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**Japan**

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The City of Kyoto introduced Biodiesel made from recycled frying oil into 220 garbage collection trucks in 1997, and has used the B-20 mixture for 81 city buses since 2000.

If all the edible-oil wastes are recycled and reused as Biodiesel Fuel (BDF), a market of about 30 billion yens will probably be created.

To realize such a market, however, it is necessary to establish an integrated recycling system involving citizens, companies and local administrations.

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**Malaysia**

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As reported at the International Biofuel Conference in 1998, which was organised by PORIM (Palm-Oil Research Institute of Malaysia), initial trials in production at PORIM's pilot plant and in utilisation as a fuel in Diesel engines were completed in a promising way. This included very detailed tests in bus fleets, which were started by Daimler-Benz already in 1987.

Malaysia's mineral oil company PETRONAS is carefully watching and studying further developments in Europe, but has not yet acted in public.

With feedstock limitations in Europe the export of palm oil may become an interesting business for Malaysia's palm oil industry.

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**Philippines**

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In 2001, the Philippine Coconut Authority announced the launch of a nation-wide program to develop the use of coconut oil Biodiesel as an alternative fuel. Coconut oil contains 45 – 53 % lauric acid, which is a saturated short-chain fatty acid (12:0) with a rather high level of oxygen of 14.9 %. Higher oxygen levels cause lower energy contents and therefore lower engine performance on the one hand but better combustion and therefore lower emission levels on the other hand.

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**South Korea**

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Biodiesel is approved as an alternative fuel. It is expected that tax exemption will be given in 2-3 years.

Investigations have shown that there are two small-scale Biodiesel production plants with a total capacity of 8 000 t/a; the company NEOENERGY has one large-scale plant (100 000 t/a) is in construction and intends to market a soy-oil based non-branded Biodiesel as B-20 blend. Biodiesel is provided to vehicle fleets operated by several municipal governments for the test operation. The tests will be completed by July 2004.

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**Thailand**

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Various mixes of unesterified vegetable (coconut and palm) oil blended with diesel oil or kerosene have been introduced in the past year under the name of “Biodiesel”; most of them did not meet official standards for commercial use.

Other tests are in progress with “real” Biodiesel from recycled cooking oils (called “super-Biodiesel”); but achieved quality levels cannot be reported for the time being.

## 5 ACKNOWLEDGEMENTS:

The above report is a result of an intensive research process using many information channels and sources and obtaining wide and detailed support provided by e.g. national ministries for energy or the environment, university and other R&D institutes, national energy agencies, commercial institutions like chambers of commerce or trade delegations, process technology and engineering companies, and professional organisations like the EBB (European Biodiesel Board). The acting team of the Austrian Biodiesel Institute wants to express its appreciation for all the support obtained from all over the world.

## 6 REFERENCES:

- ABI (Austrian Biofuels Institute): Review on Commercial Biodiesel Production World-wide, Study for the IEA-Bioenergy, Vienna, Austria, 1997
- ABI (Austrian Biofuels Institute): „World-wide Trends in Production and Marketing of Biodiesel”, ALTENER – Seminar “New Markets for Biodiesel in Modern Common Rail Diesel Engines”, University for Technology in Graz, Austria, 22 May 2000
- ABI (Austrian Biofuels Institute): Biodiesel- a Success Story, the Development of Biodiesel in Germany, Vienna, Austria, June 2001
- ADEME (French Agency for Environment and Energy Management): Non Technical Barriers to the Development of Biofuels Phase IV, Paris, France, March 2000
- ADM (Archer Daniels Midland): Blending Agriculture into Energy-Economic Opportunity, presented at Saskatoon Inn, Saskatoon, Canada, January 2002
- BIRKY A., GREENE D., GROSS T. et al: Future U.S Highway Energy Use: A Fifty Year Perspective, Office of Transportation Technologies, U.S. DoE, USA, 2001
- BOCKEY D.: Biodiesel production and marketing in Germany The situation and perspective, edited by UFOP, Berlin, Germany, 2002
- CONNEMANN J., FISCHER J.; Biodiesel in Europe 1998; International liquid biofuels congress, Curitiba, Brazil
- CVENGROS M.: Review on Development and Legislation of Biodiesel production and utilization in Slovakia; article presented at Techagro Fair, Brno, Czech Republic, April 2002
- ENERGY INFORMATION ADMINISTRATION: International Energy Outlook 2002, 2002; Internet: <http://www.eia.doe.gov/oiaf/ieo/>
- EUROPEAN COMMISSION, COM (2000) 769: “Green Paper on Security of supply”, Brussels, Belgium 2000
- EUROPEAN COMMISSION, COM (2001) 547: Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions on Alternative Fuels for Road Transport and on a Set of Measures to Promote the Use of Biofuels”, Brussels, Belgium, November 2001
- FRANKE B.; REINHARDT G.; Environmental impacts of Biodiesel use; IFEU; Heidelberg, Germany, 1998
- HOPKINSON L., SKINNER S.(Civic exchange, the Asia Foundation): Cleaner Vehicles and Fuels, The Way Forward; Hong Kong, August 2001
- HOWELL S., WEBER, A.: U.S. Biodiesel Overview, edited by the National Biodiesel Board, USA, 2000
- KÖRBITZ W.: New Trends in Developing Biodiesel, presentation at the Asia Bio-Fuels Conference, Singapore, April 2002
- LEVELTON ENGINEERING, (S&T)<sup>2</sup> Engineering- Assessment of Biodiesel and Ethanol diesel blends, greenhouse gas emissions, exhaust emissions and policy issues, n.p, Ottawa, Canada, 2002
- MORTIMER N.D.: Evaluation of the comparative energy, environmental and socio-economic costs and benefits of Biodiesel, Draft Report for the Department for Environment, Food and Rural Affairs, n.p., U.K., June 2002

- NBB (National Biodiesel Board): Biodiesel Production Technology Overview. Gen 004. Internet: <http://www.biodiesel.org>
- PROSSNIG B.: Experiences with Biodiesel in the Bus fleet of the Public Transportation System of the City of Graz (GVB); Seminar: "From the Frying Pan into the Tank - Recycled Frying Oil Collection and its Use as Biodiesel in Styria", Graz, Austria, 29 June 2000
- SCHÖPE M.: Economic aspects of Biodiesel production in Germany; 2nd European Motor Biofuels Forum; Graz, Austria, 1996
- TYSON K.S.: Biodiesel handling and use guidelines-National Renewable Energy Laboratory- edited by the National Renewable Energy Laboratory, USA, September 2001
- VERMEERSCH, Georges: LIPIDS, FATS AND OILS: Opportunities and Responsibilities in the New Century; Congress DGF/AFECG - Würzburg, Germany; October 8-10, 2000
- WÖRGETTER M., PRANKL H., RATHBAUER J.: Biodiesel in Austria - an Overview, 3rd Biomass Conference of the Americas, Conference Proceedings, August 1997
- WÖRGETTER M., PRANKL H.: The Introduction of Biodiesel as a Blending Component to Diesel Fuel in Austria, Final Report of NTB-net Phase IV, Wieselburg, Austria, 2000
- WÖRGETTER M., RATHBAUER J., LASSELSBERGER L., DISSEMOND H., KOPETZ H., PLANK J., RAKOS C.: Bioenergy in Austria: Potential, Strategies, Success Stories, Wieselburg; Internet: <http://www.blt.bmlf.gv.at/vero/artikel/artik009/austria.pdf>

## 7 APPENDIX:

### World-wide Review of Biodiesel Production / Questionnaire

Already in 1997 the Austrian Biofuels Institute completed a study on “Review on Commercial Production of Biodiesel World-wide”, as commissioned by the “International Energy Agency – Bioenergy”, as a snapshot of a quite young but emerging industry.

As we can observe a strong and further accelerating growth of Biodiesel development since then the time was right to update this review, again commissioned by the “IEA-Bioenergy /Task 39 Liquid Biofuels”. This new survey on Biodiesel production activities world-wide is intended to provide in-depth information to interested stakeholders in the fuel and vehicle industry, to policy makers, investors and academia.

The following questionnaire will provide us an online primary source for this new survey and we need of course your constructive support in order to accomplish this task in a satisfactory way. Our objective is to provide you with a professionally researched report.

The questionnaire consists of 7 pages; it is designed to minimise your time and effort and should not take more than approx. 9 minutes of your valuable time.

Please answer all questions to the best of your ability. If there are any questions that you do not want to answer you may leave them blank.

We appreciate an online evaluation; anyhow, in case you prefer to fill out a text version and send it to us ([world.report@biodiesel.at](mailto:world.report@biodiesel.at)), there is a .pdf-version available [here](#).

Please let us know in the last section of the questionnaire, if you are interested in one of our publications listed, - we would be glad to send it to you free of charge as a “thank You” for Your active participation:

- Review on Commercial Production of Biodiesel world-wide (Nr.2/ to be published in January 2003)
- Biodiesel-a success story; Development of Biodiesel in Germany (February 2002)
- Biodiesel Courier: weekly e-mail newsletter
- Review on Commercial Production of Biodiesel world-wide (Nr.1/1998)

Thank you for your active participation and support for making an interesting study available to the world-wide Biodiesel community!

Attachment: the questionnaire

# World-wide Review of Biodiesel Production

## Questionnaire

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Already in 1997 the Austrian Biofuels Institute completed a study on “Review on Commercial Production of Biodiesel World-wide”, as commissioned by the “International Energy Agency – Bioenergy”, as a snapshot of a quite young but emerging industry.

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- Review on Commercial Production of Biodiesel world-wide (Nr.1/1998)

Thank you for Your active participation and support for making an interesting study available to the world-wide Biodiesel community!

**To the survey**

### **Protection of data privacy:**

In order to protect you from data misuse, we are neither publishing nor passing on any contact information (address, e-mail, telephone, fax), unless explicitly desired otherwise by you and confirmed in writing to us.

By filling out this questionnaire, you accept that the information provided by You is used for the report “Review on Commercial Production of Biodiesel World-wide” only.

## BASIC DATA

**Name of company**

**Your name**

**First name**

**Function**

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**Biodiesel plant address**

**Area code**

**City**

**Country**

**E-mail**

**Website**

**Fax**

	http://	
--	---------	--

**Number of employees in Biodiesel production**  
**Your Currency)**

**Total Biodiesel turnover (in**

--	--

## PRODUCTION DATA

**Type of plant**

research/demonstration /commercial

**Process technology provider**

**Type of process technology**

Pressure

ambient

other.....bar

Process

batch

semi-continuous

continuous

Catalyst

KOH

NaOH

other.....

**Biodiesel production start-up date**

month

year

--	--

**Total annual Biodiesel (in 000 tons/gallons per year)**

	1998	1999	2000	2001	2002 est.	2003 est.	2004 est.	2005 est.
capacity								
production								

## RAW MATERIALS

**Type of feedstock used**

	Vegetable oil	Animal fats	Waste oil and fats
% share of total			
which:	.....% rapeseed	.....% beef (tallow)	.....% households
	.....% sunflower	.....% swine (lard)	.....% restaurants
	.....% soybean	.....% chicken	.....% trap fat
	.....% palm oil	.....% .....	.....% .....
other:	.....%.....	.....%.....	.....%.....

**Yield**

upper limit of FFA to be processed:.....%

1000 kg oil/fat processed to: .... kg Biodiesel

utilisation of FFA:	<input type="checkbox"/> heating fuel	
	<input type="checkbox"/> distillation	
	<input type="checkbox"/> Biodiesel	
	<input type="checkbox"/> waste	



**Quality level of Biodiesel produced**

Quality standard required?	re-	no <input type="checkbox"/>	yes <input type="checkbox"/> : applied standard:
		<input type="checkbox"/> Austrian ON C 1191 FAME <input type="checkbox"/> German DIN 551606 FAME <input type="checkbox"/> USA ASTM D 6751-02 FAME <input type="checkbox"/> EN 14214 FAME	
		<input type="checkbox"/> Any other standard applied:	

**Quality level of glycerine produced**

Applied standard
British Standard BS 2623 (99%) <input type="checkbox"/> BS 2622 (88%) <input type="checkbox"/> BS 2621 (80%) <input type="checkbox"/> lower <input type="checkbox"/>

**Quality management**

in your own analytical laboratory <input type="checkbox"/>
by external independent analytical laboratory <input type="checkbox"/> name:

**Market size**

Total Diesel fuel market size:	<input type="checkbox"/> Diesel:..... tons/gallons per year
	<input type="checkbox"/> Heating oil:..... tons/gallons per year
Your estimate of maximum possible market share of Biodiesel:.....%	

**Your markets & your targets therein**

	sales share in %
Private cars	<input type="checkbox"/>
City bus & taxi fleets	<input type="checkbox"/>
Trucks (HDV)	<input type="checkbox"/>
Agricultural/ forestry machinery	<input type="checkbox"/>
Boats/ marine sector	<input type="checkbox"/>
Federal & public fleets	<input type="checkbox"/>
Others:.....	<input type="checkbox"/>

**Physical distribution channels**

<input type="checkbox"/> direct:	to customer	sales share in %
<input type="checkbox"/> indirect distribution:	<input type="checkbox"/> wholesaler <input type="checkbox"/> (local) retailer <input type="checkbox"/> refinery, further processing <input type="checkbox"/> other:	



### Brand strategy

Do you use brands?	<input type="checkbox"/> no	brand name:
	<input type="checkbox"/> yes	

### Final product usage

	sales share in %
100 % Biodiesel	<input type="checkbox"/>
... % blend	<input type="checkbox"/>
... % blend	<input type="checkbox"/>
....% for heating oil light	<input type="checkbox"/>
export (regardless of final use)	<input type="checkbox"/>
others:	<input type="checkbox"/>

### Pricing strategy

Base price of fossil diesel at the pump:...	(Aug 2002)
Base price of Biodiesel (100 %) at the pump:	(Aug2002)
Base price of Biodiesel .....% blend at the pump:	(Aug2002)

## LEGAL FRAMEWORK

### Taxation policy

National level fossil diesel tax/excise duty: .....
---

National level of Biodiesel detaxation: .....
<input type="checkbox"/> fixed amount of .....per ton/kilo/gallon
<input type="checkbox"/> fixed percentage of ....% of fossil diesel tax
<input type="checkbox"/> volume limitations for tax exemption:.....tons/gallons per year
<input type="checkbox"/> other tax regulation (please describe):

### Other existing supportive measures (please describe)

<input type="checkbox"/> taxation (e.g.: greenhouse tax exemption):
<input type="checkbox"/> regulation (e.g.: obligatory market share):
<input type="checkbox"/> subsidies (e.g.: feedstock purchasing):
<input type="checkbox"/> other (e.g.: free parking):



**Most important barriers/problems important)**

(1=most important

5=not so

	1	2	3	4	5
high raw material cost	<input type="checkbox"/>				
irregular raw material supply	<input type="checkbox"/>				
missing engine approvals	<input type="checkbox"/>				
poor distribution infrastructure	<input type="checkbox"/>				
inadequate quality management	<input type="checkbox"/>				
missing legal framework	<input type="checkbox"/>				
others.....	<input type="checkbox"/>				

**Most efficient measures to remove them efficient)**

(1=most efficient

5=not so ef-

	1	2	3	4	5
reasonable raw material prices	<input type="checkbox"/>				
obtaining more engine approvals	<input type="checkbox"/>				
efficient distribution infrastructure	<input type="checkbox"/>				
active quality management	<input type="checkbox"/>				
removal of tax hurdles	<input type="checkbox"/>				
supportive legislative measures	<input type="checkbox"/>				
others.....	<input type="checkbox"/>				

We thank you for having taken the time to complete this questionnaire.

Please let us know if you are interested in one of these publications. As a thank you, we would be glad to send them to you free of charge.

- Review on Commercial Production of Biodiesel World-wide (Nr.2/2003)**  
Austrian Biofuels Institute (ABI), to be published in January 2003
- Biodiesel-a Success Story; Development of Biodiesel in Germany**  
Austrian Biofuels Institute (ABI), 2001
-  Biodiesel Courier : weekly newsletter by e-mail
- Review on Commercial Production of Biodiesel World-wide (Nr.1/1998)**  
Austrian Biofuels Institute (ABI), 1998

For additional comments and information or questions about this survey, please contact:

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