



Assessment of best practices in UCO processing and biodiesel distribution

D4.1 - Biodiesel Stakeholders' input on existing practices in processing UCO to biodiesel and in biodiesel distribution

TECHNICAL UNIVERSITY OF CRETE
A p r i l . 2 0 1 3

PROMOTION OF USED COOKING OIL RECYCLING FOR SUSTAINABLE BIODIESEL PRODUCTION (RecOil)

RecOil aims to increase sustainable biodiesel production and its local market intake by enhancing household used cooking oil collection and transformation. It assesses the “UCO to biodiesel” chain best practices, through a household survey, the industry expertise, the local authorities’ cooperation, and a review of the legal and market barriers and opportunities. The information gathered will integrate an online decision-making guide: a tool to assist stakeholders in developing an UCO-to-biodiesel supply chain adjusted to local specifications. Pilot projects in promotion, collection, transformation and commercialization of UCO/biodiesel will be carried out according to the best practices identified. These projects will be living labs helping to validate the feasibility of these good practices but also showcasing and spreading the project’s results in a way that the achievements can be used to promote similar initiatives in other regions and by other entities. Promotional campaigns and communication tasks will be developed to guarantee stakeholders’ involvement and to increase public interest about UCO recycling, motivating a behavioural change among citizens.

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1. INTRODUCTION – AIM OF THE TASK

The Used Cooking Oil (UCO) processing and biodiesel distribution systems are depending on a number of parameters and the different normative framework in the EU Member States.

In order to evaluate and classify the existing technologies and practices in UCO processing and biodiesel distribution, the RecOil consortium has searched the input of a number of stakeholders in each national biodiesel market. The industry actors' knowledge and actual experience about existing practices and applied technologies as well as their considerations and barriers they face were identified and recorded through:

- > Interviews to biodiesel producers and distributors, according to a structured discussion guide/questionnaire
- > Direct contacts with producers and relevant associations, companies that transport and distribute biodiesel as well as responsible authorities (focus groups, workshops, teleconferences)
- > Workshops with experts and relevant stakeholders in each RecOil country
- > Industry reports and researches results — derived from EU and National organizations EU projects and case studies carried out by local, national or European entities.

In order to compile and assess the existing practices in UCO processing and biodiesel distribution, the information and data gathered were assessed and compared. For this scope, structured questionnaires / discussion guides have been developed by TUC to be used by the consortium members during the interviews of selected biodiesel producers and distributors in each country, in order to:

- > record their experiences, opinion and perception on the adopted practices in terms of technology, efficiency and return on investment, appropriate financing mechanisms, suggestions for improvements, etc.;
- > identify the real market needs and existing limitations

The analysis of the biodiesel producers/distributors knowledge, experience and proposals provides useful input, in order to determine how different solutions are facing the various factors and to draw attention to the most mature, economically and technically sound scenarios.

This report summarises the feedback of the industry's stakeholders obtained through the interviews and workshops in national level.

2. EXISTING TECHNOLOGIES AND PRACTICES

2.1. Biodiesel Producing Procedures and most common technologies

Biodiesel obtained from renewable lipids, such as the ones UCO contains, consists of long-chain fatty acid methyl esters (FAME). Biodiesel is highly biodegradable and has minimal toxicity; it can replace petrodiesel fuel in many different applications including internal combustion engines without major modifications. A small decrease in their performances is reported with almost zero emissions of sulphates, aromatic compounds and other chemical substances that are destructive to the environment. Technical problems facing biodiesel include low-temperature properties, storage stability and slightly increased NO_x exhaust emissions. Marketing issues with biodiesel include economics and the fact that there is only enough vegetable oil or fat available to replace a few per cent of the petro diesel market.

Transesterification is the most common method to produce biodiesel. Methanol is the most normally used alcohol in the process due to its low cost and physical and chemical advantages. Homogeneous base catalysts are the most widely used in industry to produce biodiesel as they accelerate the process and achieve more mild reaction conditions. The reaction can be carried out either discontinuously (batch) or continuously. After the reaction, the glycerol is separated by settling or centrifuging. The biodiesel phase is then purified before being used as diesel fuel in compliance with the EN14214 Standard and other national quality standards and technical norms. In Table 1 the advantages and disadvantages of the transesterification method, as reported in relevant studies and research reports, are summarised.

Table 1. Advantages and disadvantages of the transesterification method

PROCESSING METHOD	ADVANTAGE	DISADVANTAGE
Transesterification	Fuel properties are closer to diesel	Low free fatty acid and water content are required (for base catalyst)
	High conversion efficiency	Pollutants are produced because products must be neutralized and washed
	Low cost	Accompanied by side reactions
	Suitable for industrialized production	

In cases that UCOs are used as feedstock, more severe transesterification conditions are required compared to those of the normal process utilizing new oils. This is attributed to the fact that properties of the used oils are different from those of refined and crude oils. As the result of the high temperature during cooking and the water from the food, triglycerides in the oils are hydrolyzed and this gives rise to an increase in free fatty acid (FFA) content. The FFA content is one of the important factors for alkali-catalysed transesterification. This is due to the FFAs reacting with the alkaline catalyst to produce soap, which inhibits the reaction and the results in the reduction of biodiesel yield.

The following flowchart indicates the main procedure stages, usually considered in the biodiesel production process.

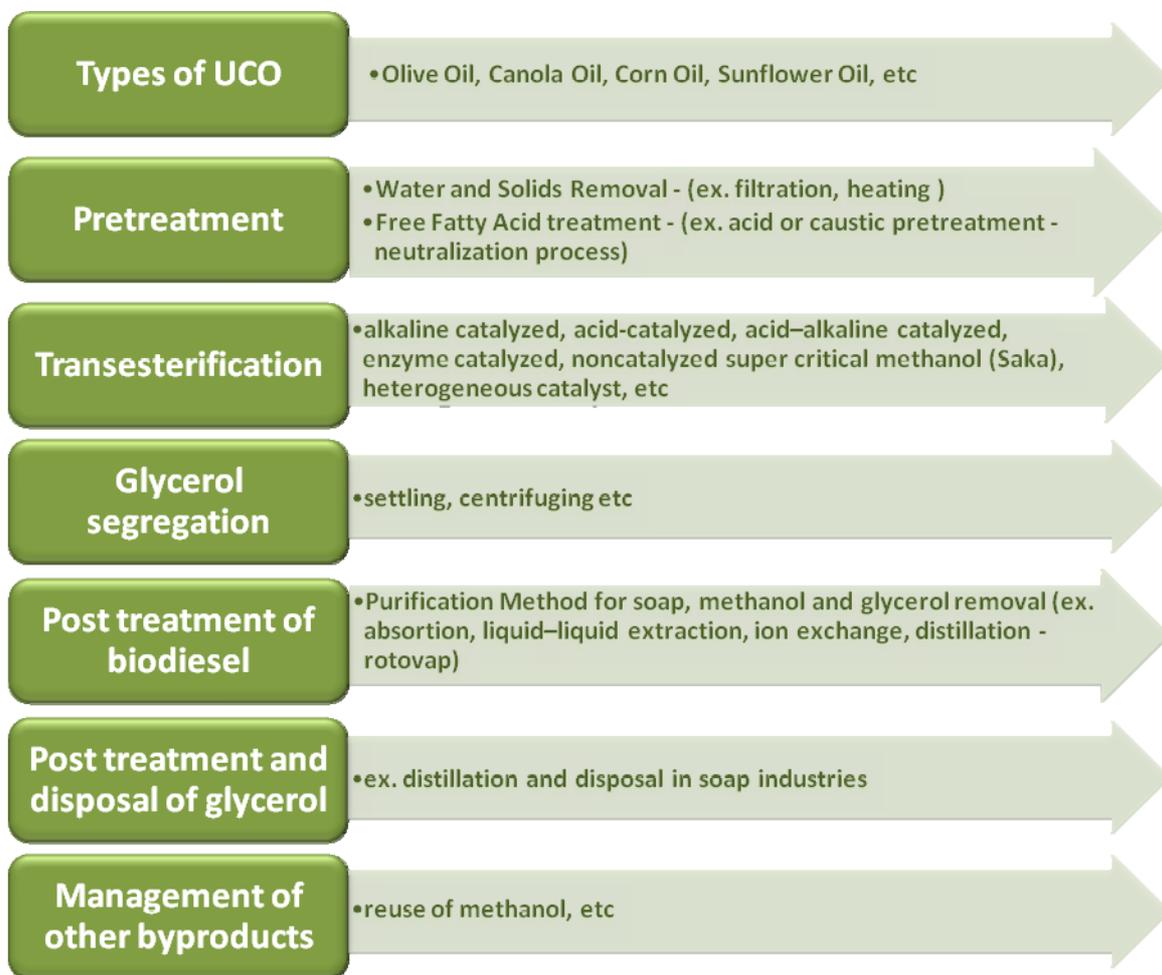


Figure 1. Indicative flowchart of the biodiesel producing process



2.2 Biodiesel Distribution Process

Biodiesel distribution involves the steps and provisions required to transfer the biodiesel from the producer into the marketplace or into the refinery for blending. This includes the storage infrastructure, the blending techniques, the quality assurance and transportation methods and means.

The following flowchart indicates the stages which should be considered in the biodiesel distribution process.

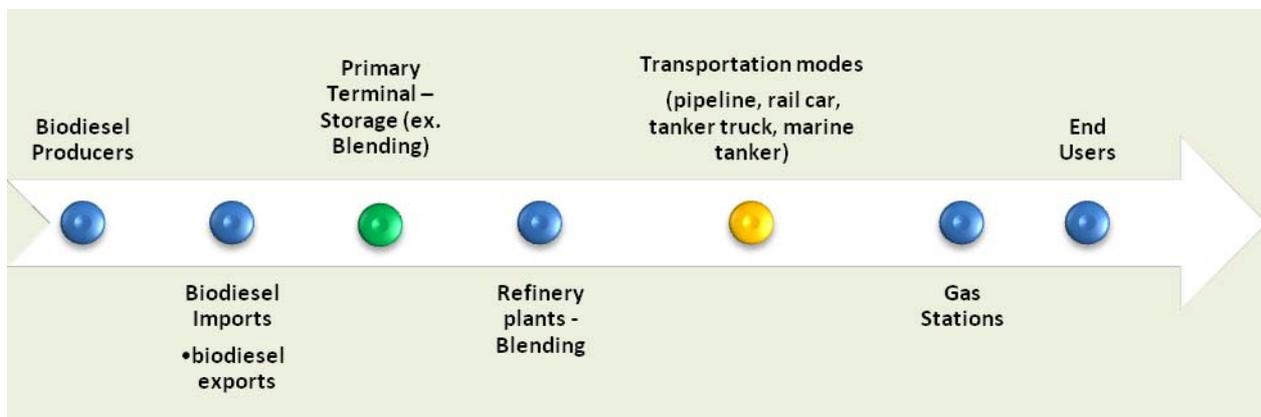


Figure 2. Indicative flowchart of the biodiesel distribution steps

3. INTERVIEWING THE BIODIESEL INDUSTRY ACTORS

3.1. Methodological approach

The experience, opinions and perceptions of the industry’s actors on the existing practices in terms of technology, efficiency and return on investment, financing mechanisms were recorded and analysed. Suggestions for improvements, existing limitations and real needs of the biodiesel producers were also noted. The collected information is useful for the classification of existing practices and the assessment of best examples.

The main actors in biodiesel processing and distribution have been identified and contacted in national level.

A structured questionnaire (Annex 3), accompanied with a discussion guide, was developed by TUC and distributed in national level by the responsible partners. Two (2) types of questionnaire were developed; one targeted to biodiesel producers and a second to the biodiesel distributors. Each one of the questionnaires consists of 2 parts:

- the Commercial part (to be answered by the company’s Commercial Manager) and
- the Technical part (to be answered by the company’s Production/Technical Manager)

Biodiesel producers and distributors in each RecOil country were contacted, informed about the scope of the project and the survey objectives. The questionnaires were filled during organized face-to-face meetings, telephone interviews or teleconferences, or even by exploiting workshops or industry events where those actors were present.

Table 2 presents the number of the interviewed biodiesel companies in each participating country. The contacted industry actors are listed in Annex 1.

Table 2. Filled questionnaires by biodiesel producer/distributors in each RecOil country

Country	Filled Questionnaires		
	Total	Producers	Distributors
Denmark	3	2	1
Greece	6	6	
Italy	4	4	
Spain	3	3	
Portugal	5	4	1
TOTAL	21	19	2

3.2. Interviewing the biodiesel actors in RecOil countries

3.2.1. Greece

In Greece, 23 companies are involved in the biodiesel trade; 13 are producers and 10 importers. Two of the biodiesel importers are also the two Greek biodiesel and petroleum distributors, namely the refineries MOTOR-OIL SA and ELPE SA. Thirteen companies produce biodiesel B100, while the remaining ten companies import biodiesel B100 mainly from Italy, Belgium and Austria; all sell to the two above refineries for blending and distribution.

To implement the interviews, the biodiesel producers were selected to be interviewed, for a representative overview of the production and distribution process. All thirteen biodiesel producers were contacted and interviewed; 6 of them have completed the questionnaire. Questionnaires were answered by the Technical or/and Commercial Departments of the interviewed companies. The interviewed companies are listed in Annex 1.

In Figure 3, the annual biodiesel production in Greece is indicated, according to the annual (Joint Ministerial Decisions - JMDs -). In Greece, the reduction in the annual biodiesel production is a result of the reduction of the Gross Domestic Product (GPD). A reduction of 10% of GDP leads approximately to a reduction in demand for diesel by 9.1% and for petrol by 8.7%.

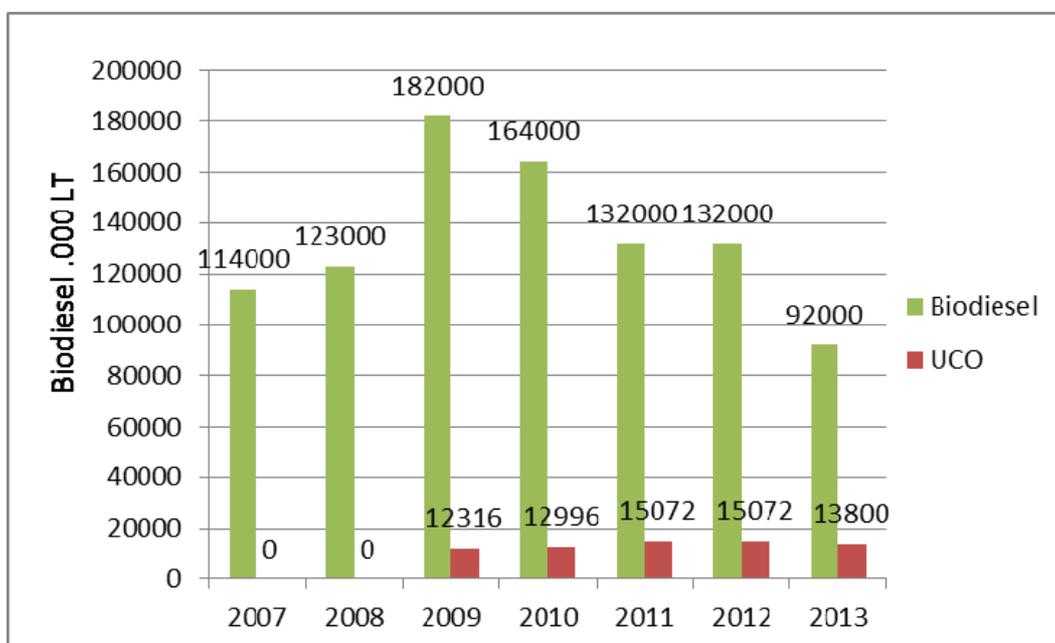


Figure 3. Annual biodiesel production in Greece (source: JMDs 2007-2013)

Figure 4 presents the share in UCO used in biodiesel production chain as feedstock (data related to the annual JMDs in Greece).

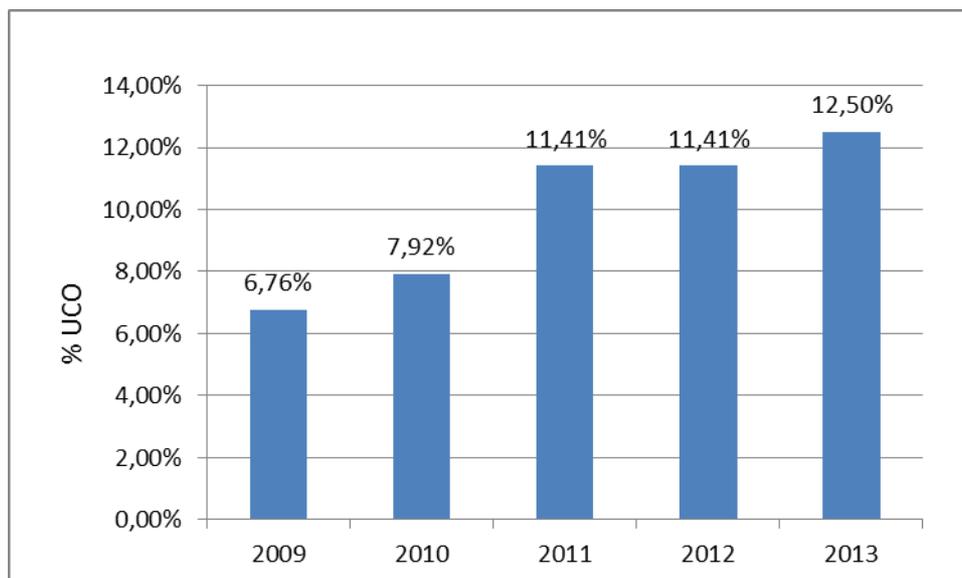


Figure 4. Share of UCOs in the biodiesel production in Greece (source: JMDs 2009-2013)

3.2.2. Denmark

Denmark has two main biodiesel factories. Besides that, biodiesel is being produced in a few other companies, as well as some uncontrolled small-scale production of rape seed oil, made with small screw presses. Daka Biodiesel is organizing the processing of animal fats for biodiesel in Denmark, while others export it for processing abroad.

Three questionnaires were collected in Denmark, a 4th one was filled by a biogas production company. One is referred to biodiesel distribution and one to biodiesel production while the third provides initial information regarding a new biodiesel production company with enzyme catalysis.

3.2.3. Italy

In Italy exist 16 biodiesel production companies, most of them currently not in operation. Four filled questionnaires were collected from biodiesel production companies. Regulatory delays with regard to sustainability criteria for biofuels to be sold on the internal market have blocked the biodiesel fuel production and sales in 2011. Without the sustainability criteria in place, oil refiners and product distributors, which are obliged to add a quota of biofuels to the car fuels they sell to consumers under EU and national laws, refused to sign supply contracts with biofuel producers and importers.

Also Italy's biodiesel industry depends heavily on imported raw materials including palm oil and rapeseed due to the scarce supply of local feedstock. The industry has been hit hard in the past few years by cheap biodiesel imports, which sometimes cost less than the raw materials.



3.2.4. Spain

In Spain 47 biodiesel plants have been reported but most of them are not producing. As a result of that, three filled questionnaires were collected. It is remarkable that one company is using UCO in a percentage of 100%. Also, biodiesel blends in higher mixtures B20 and B30 are set in the market, rendering Spain to one of the main advisers both in UCO utilization and maximizing the biodiesel-fossil diesel blends.

3.2.5. Portugal

In Portugal, 7 major producers of biodiesel and about 18 small producers of biofuels are active. Six questionnaires were filled, one referring to a biodiesel distributor, one referring to UCO collection and four from biodiesel production companies. Similar to Spain, two biodiesel production companies use 100% UCO in their biodiesel production chain and further determinative information can be provided for the UCO processing.

3.3. Questionnaires Analysis

19 biodiesel production companies and 2 distributors were interviewed in the RecOil countries. The collected data are presented in this chapter.

→ Questionnaire PART 1. Commercial and Economical Aspects

A. Company Profile

The majority of the interviewed biodiesel producers were established the last five years (Figure 5). The older biodiesel producers were reported in Italy (18 years) and Spain (11 years).

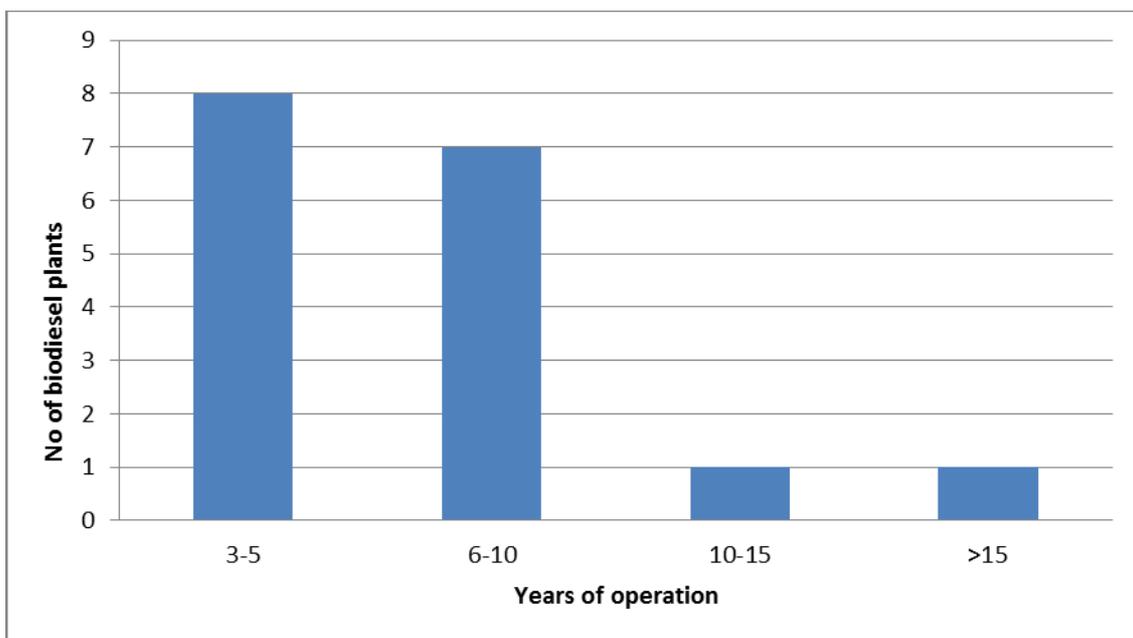


Figure 5. Years of company's operation for biodiesel production (2012)

The maximum annual biodiesel production capacity exceeds the 50.000m³ (Figure 6) in six biodiesel companies, although the actual biodiesel production is significant lower (Figure 8). The largest biodiesel company was interviewed in Spain with a capacity of 285.000m³ while smaller companies are established in Portugal with all capacities under 5.000m³ (Figure 7).

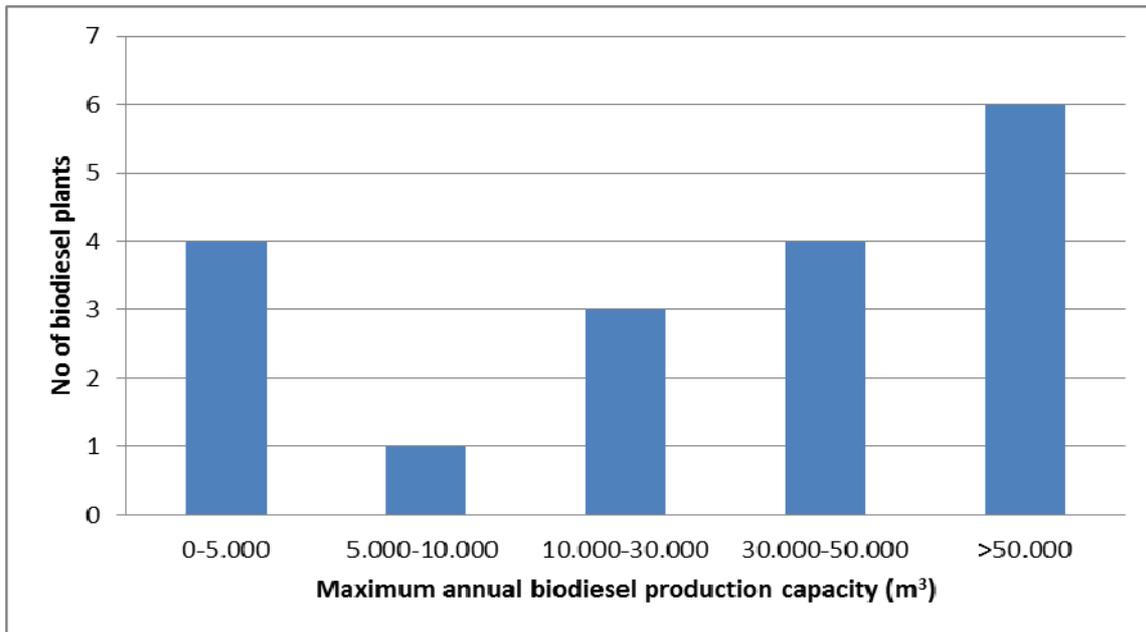


Figure 6. Maximum annual biodiesel production capacity (2012)

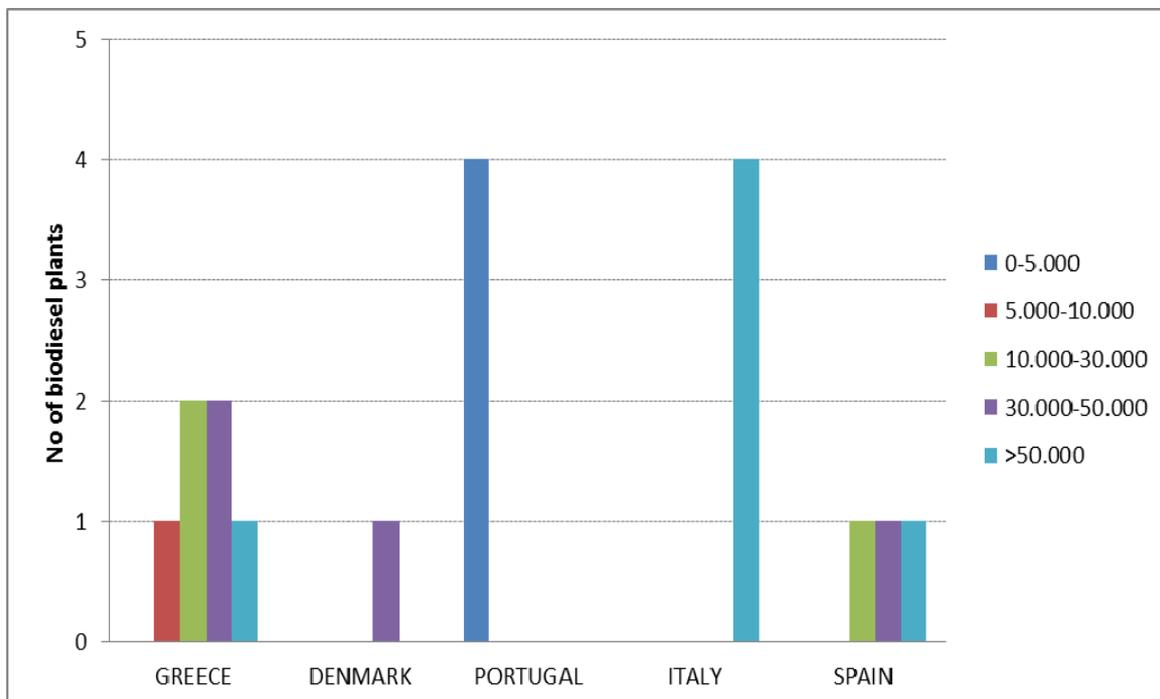


Figure 7. Maximum annual biodiesel production capacity per country (2012)

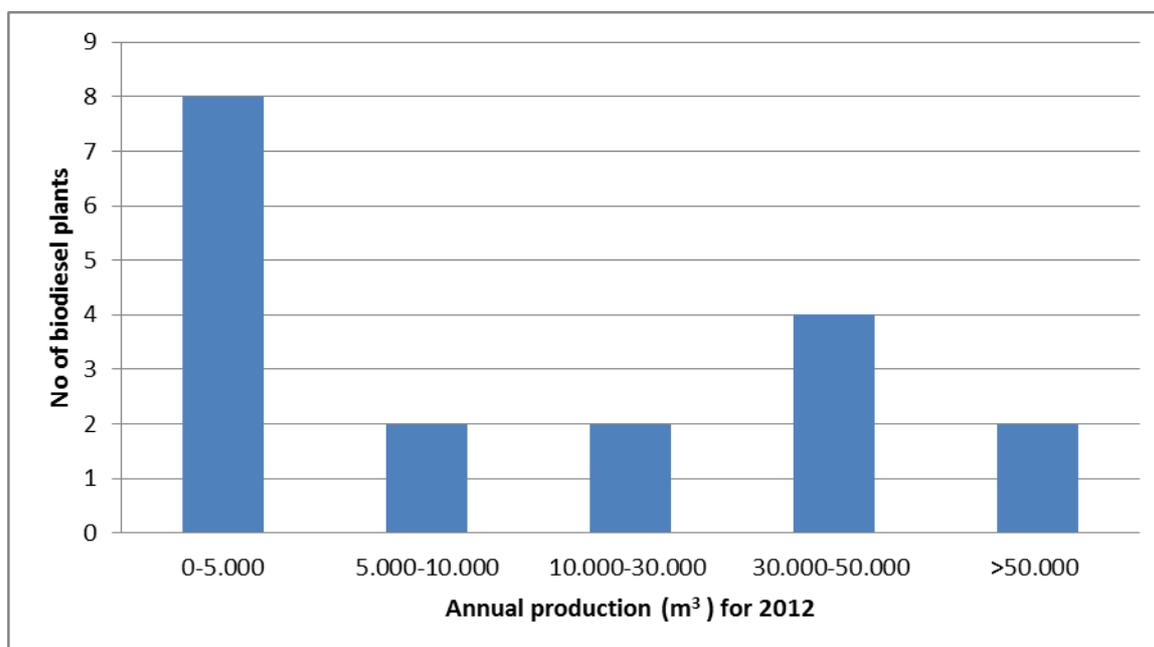


Figure 8. Annual biodiesel production (2012)

Apart from biodiesel production, most companies have additional activities regarding the byproducts handling (such as glycerin selling). Six companies also reported UCO collection. All answers referring to the biodiesel company's side activities are listed in Table 3.

Table 3. Other company's activities (apart from the biodiesel production)

	Fuel distribution	UCO collection	Recycling	Other
Greece		2		Crude glycerine production, FFA selling, rapemeal selling, soyameal selling, energy cultivations
Denmark	1			
Portugal	1	2	1	Crude glycerine production, RES consulting
Italy	2	1		Crude glycerine production
Spain	1	2		Glycerin and industrial fats production
Total	5	6	1	

B. Customers and Suppliers

The majority of biodiesel producers use UCO in their biodiesel production chain. Only in Spain a production plant was reported to utilise only animal fats (Table 4).

Table 4. Use of UCO as raw material in biodiesel production

Country	No of answers	Yes	No
Greece	6	6	
Denmark	1	1	
Portugal	3	3	
Italy	3	3	
Spain	3	1	2
TOTAL	16	14	2

Some of the producers also import UCOs, however the share of the imported UCO in the total UCO they use is low (5-10%). There is an exception of one Italian plant which imports 50% of the UCOs they use (Table 5).

Table 5. UCO imports in the biodiesel production chain (number of relevant answers/number of total responses)

Country	No of answers	Yes (UCO imports)	Share of imported UCO at the total UCO used
Greece	6	1	10%
Denmark	1	1	N/A
Portugal	3	0	N/A
Italy	4	2	5% and 10%
Spain	2	1	10%
TOTAL	16	5	

Although the UCO imports are not in high percentages, one of the main difficulties regarding the imports mostly in Spain are that national biodiesel sales in Spanish market are hindered by the importation of non EU countries fuel (Argentinean and Indonesian fuel). Last year many

production plants in Spain have stopped their production because it's not considered as a profitable business.

The UCO suppliers are mainly the HORECA sector followed by households and food processing factories. Because of the indirectly collection method, the stakeholders were not fully informed about the origin of the UCOs (Table 6).

Table 6. UCO origin (number of relevant answers/number of total responses)

Country	No of answers	HORECA	HOUSEHOLDS	FOOD FACTORIES	OTHER
Greece	6	6	6	6	
Denmark	1	1			
Portugal	3	2	2		schools, hospitals
Italy	1	1			
Spain	2	1	1		
TOTAL	13	11	9	6	

UCOs are collected mainly via an affiliate company or indirectly with main suppliers like Hotels, Restaurants and Cafes (HORECA). Portugal, Italy and Spain have also recorded UCO collection from schools, hospitals and other institutions (Table 7).

Table 7. UCOs collection method by the biodiesel producers

Country	No of answers	Directly	Indirectly	via an affiliate
Greece	6		6	5
Denmark	1	1		
Portugal	3	2	2*	
Italy	1		1	
Spain	1			1
TOTAL	12	3	9	6

*One company reported both directly and indirectly collection

The majority of the biodiesel plants produces B100 and transports it mainly to the refineries and very few to an authorised private distributor. Only in Spain, there were noted biodiesel blends higher than B7 set in the market with the proper labelling (according to the RED requirements). In Spain also, one biodiesel producer reported a 10% sales to transport companies (Table 8).

There were also some exports reported (8 from the 21 interviewed), mainly in EU countries (only one company referred to exports in Turkey).

Table 8. Customers of the biodiesel production plants

Country	Destination	QUESTIONNAIRE NUMBER					
		1	2	3	4	5	6
Greece	Refineries	100%	90%	100%	100%	100%	100%
	Distributor		10%				
Denmark	Refineries	√					
	Distributor	√					
Portugal	Refineries						
	Distributor						
Italy	Refineries	95%	85%	100%	95%		
	Distributor	5%	5%				
Spain	Refineries		100%				
	Distributor	80%					
	Final Users (Transport Companies)	10%					
	Gas Stations	10%					

C. Economical aspects

Limited information was reported about economical aspects related with the production costs, payback period and funding. Referred economical bottlenecks are listed in chapter 5. The production cost depends on the raw material used in each production period, an indicative range according to the producers answers is listed in Table 9.

Table 9. Indicative range of the biodiesel production cost in the RecOil countries

Country	Production Cost (€/m ³)
Greece	850 - 1.200
Denmark	-
Portugal	450-800
Italy	850-950
Spain	850-1.100

D. Policy / Legislation

Economical and legal limitations were recorded in relevance with the biodiesel production and distribution as listed in Table 10. The majority of the biodiesel producers reported limitations in the areas of the production, the sales and the taxation. Only two biodiesel producers reported that the national or local authorities are efficient in supporting their business (Portugal and Italy). The economical, legal and technical bottlenecks faced by the biodiesel producers are summarized in chapter 5.

Table 10. Areas of barriers which biodiesel producers face at the RecOil countries

Areas of referred barriers	No of producers who encounter this type of barrier
Licensing	6
Auditing procedures	4
Production limitations	9
Sales	10
Taxation	10
Financing	4

→ Questionnaire PART 2. Production and Technical Aspects

The feedstock in the biodiesel production chain is mainly sunflower oil, rapeseed oil and soya seed oil. UCOs follow with different share from plant to plant. Two plants in Portugal and one plant in Spain use 100% UCOs for the biodiesel production (Table 11).

In all plants, B100 is produced and blended according to each country's blending limits, except of Spain where higher blends are set in the market (B100, B7, B30, B20).

Table 11. Feedstock used in the biodiesel production chain of the producers interviewed at RecOil countries

Feedstock (%)	GREECE			DENMARK	ITALY				PORTUGAL		SPAIN		
	1	2	3	1	1	2	3	4	1	2	1	2	3
sunflower seed oil	25		65										100
rapeseed oil	30		10		50	20	40						
soya seed oil	25				50								
Other (PLS define)						70% palm oil				50 % by products			
Vegetable oils		55											
Used Cooking Oils	20	40	15	2		10	30	50	100	100	100		
Animal fats		5		98			30						100
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100

Transesterification method in a batch common process was recorded, with an acid or caustic pre-treatment of the collected UCOs and subsequently an alkaline catalysis on methanol. Enzymatic catalysis was recorded in a newly developed biodiesel plant in Denmark, which is going to start production during 2013 (Table 12).

Table 12. Pre-treatment of UCOs and biodiesel production method

Transesterification in continuous mode batch common process	GREECE	DENMARK	ITALY	PORTUGAL	SPAIN
No of answers	6	1	3	2	3
Pre-treatment-Refining					
Filtration	5*			2	
Heating	1			1	
Centrifugal Separation	2				
Free Fatty Acid Treatment					
Acid pre-treatment		1	2		
caustic pre-treatment			1		
neutralization process			1		
deacidification			1		1

* one company reported that it takes place before selling to another factory

After the transesterification, glycerol is separated by settling and centrifuging (Table 13).

Table 13. Glycerol separation method

Method	GREECE	DENMARK	ITALY	PORTUGAL	SPAIN
No of answers	5	1	1	2	1
Settling	4	1		2	
Centrifuging	1	1	1		1

The purification of biodiesel as recorded is mostly made through removal of methanol, gravity separator, hot washing, centrifugal separator, and removal of water and methanol (Table 14).

Table 14. Biodiesel purification method

Method	GREECE	DENMARK	ITALY	PORTUGAL	SPAIN
No of answers	3	1	0	1	2
Washing	3				
Absorption				1	
Distillation		1			1
Centrifugal separator	3				1

Regarding the treatment and disposal of the by products, most companies who answered this question sell glycerine to chemical or soap industries and produce fertilizers or rape/sunflower meals (Table 15).

Table 15. Glycerine and other by products post treatment and disposal

Glycerine post treatment and disposal	GREECE			DENMARK	ITALY		PORTUGAL	SPAIN		
	1	2	3	1	1	2	1	1	2	3
Distillation										
Disposal in chemical industries		√								√
Other	Water evaporation (max 5% water)	*	Selling of FFA to chemical industries.				Glycerol sell to national and European companies			
Other by-products and their treatment, disposal or reuse			Rape-sunflower meal	fertilizer					√	√
Methanol reuse	√		√		√	√				

*acidification, soap splitting, flashing for removal of water and methanol. Final concentration of glycerine min. 80% wt.

4. WORKSHOPS/EXCHANGES WITH MARKET ACTORS AND EXPERTS

Workshops were foreseen in each RecOil country in order to further exchange with the biodiesel market actors and experts about the good practices and critical factors, in the biodiesel production and distribution and to identify advantages and disadvantages of different methods. The workshops were organised in parallel with the workshops foreseen in WP3 that aimed to discuss about the factors that enable efficient UCO collecting and transport systems and to identify the best practices.

In Italy, the workshop was held at the Municipality of Castrolibero (March 4, 2013) focusing to the state of the art in biodiesel production and the future developments in order to increase the recycling rate of UCO. The workshop was attended by representatives of several local institutions including the University of Calabria.

Participants stressed that the active involvement of citizens, which can be elicited by an effective information campaign and mechanisms for door-to-door collecting is critical for the whole UCO to biodiesel chain. They referred to three methods for the production of biodiesel from waste vegetable oils:

- Processing by acid reagents;
- Processing by alkaline reagents: it's considered as the most widely used methodology to produce waste material (alkaline reagents) that must be disposed.
- Processing by enzymatic process: it's more expensive, but has a lower environmental impact

It is emphasized that currently in Italy the diesel fuels of organic origin (oil) is normally already admixed with about 10 to 12% of diesel fuel of vegetable origin.

In Italy, a major problem is in the mechanism of commercialization of biodiesel, due to the increase in the cost of sales given by the addition of excise duties. Currently, the production cost of biodiesel is about € 0.46, the cost of sales is rather close to that of conventional diesel.

In Spain two Workshops were held, the one referring to UCO Management targeted to the collection companies in the Province of Cadiz (March 6) and the second targeted to the municipalities and local authorities (March 21). In both events the UCO collection practices were discussed in order to identify which factors are used for decision-making for a used cooking oil collection system and which kind of system is the most appropriate and to identify advantages and disadvantages of different UCO collection methods. The biodiesel production and distribution was not extensively discussed at these workshops.



In Portugal, two workshops were held, one in Lisbon (February 27th, 2013) and one in Portalegre (May 23rd, 2013), in two parts. Part one referred to the critical factors, best practices and problems in the UCO collection methods. The door to door collection was here considered suitable for restaurants (HORECA) where large UCO quantities are produced. Also collectors at strategic locations are presented as a more secure collection practice and with the best control. Part two referred to the different biodiesel production methods and their advantages and disadvantages.

Workshop in Portalegre key findings:

- There are low quantities of UCO as raw material for the major producers biodiesel production chain.
- Non compliance with the standard EN 14214 for parameter "oxidative stability" using UCO. Antioxidants can be used but it increases the cost of biodiesel production.
- The transesterification process can be optimized for UCO utilization and compliance with EN 14214.
- Small biodiesel producers can assure the valorisation of UCOs.
- Taxes have to be reduced from 23% to 6%.

Workshop in Lisbon key findings:

- The batch common transesterification process is the most used biodiesel production procedure.
- The transesterification method includes the danger for personal safety resulting from the production of methanol because of its flammability/explosiveness.
- Other methods are very recent technologies (not fully ripe such as ultrasonics) require higher initial costs and lower incomes and face problems with residues.

In Greece, due to the high competition, it was considered that the organization of a workshop for "public" exchanges of information and data amongst the market players would not be efficient due to:

- the high existing competition in the Greek market making them hesitant to exchange essential information and share with their competitors
- their wide distribution in the country (key market players are located in Peloponnese, Athens, Macedonia, Thessaly)

For the above reason, it was decided that -at this stage- it would be more effective to develop bilateral cooperation with the major Greek stakeholders (in addition to the questionnaire interviews) with an emphasis to players not wishing to answer directly in the questionnaire.



Main output of the discussions and bilateral exchanges with them are summarised below:

(i) as concerns the UCO collection:

- the inadequate existing double counting system (need to monitor the raw material)
- the high competition which increases the price of UCO
- the existing low quantities of the selection done by households in supermarkets

(ii) as concerns the UCO process to biodiesel:

- the low exploitation of the existing manufacturing capacity
- the need to cooperate with research institutions to minimize the production cost and test new processing method

(iii) as concerns the biodiesel distribution and use

- the not flexible mechanism for small autoproducers due to the tax restrictions
- the unclear, yet, legal frame for the use by Local Authorities.

Additionally, in order to formulate a more effective approach of the current real market, TUC - representing the RecOil partnership- has undertaken an initial contact with the newly created association EWABA (European Waste-to-Advanced Biofuels Association), in order to identify any synergies.



5. MARKET BARRIERS/BOTTLENECKS REPORTED FROM INDUSTRY ACTORS

During the interviews, the workshops and the bilateral exchanges, the involved biodiesel producers and distributors referred to a number of bottlenecks they face in terms of economical, legal and technical barriers. The most important are summarised below.

Economical Bottlenecks

- > **High taxation rates:** The lack of taxation incentives affects the biodiesel selling prices. It is reported that the VAT should be decreased to 6% from 23% (Greece, Spain, Italy). Furthermore in Greece, VAT is included in the raw material cost but it is not included in the selling price of biodiesel to the refineries. The current selling price to the refineries is ~1.30 €. If biodiesel could be sold to other authorised distributors then its price would exceed the fossil diesel price. On the other hand in Portugal it was reported that biodiesel can only be sold to private distributors.
- > **Lack of financial support:** There were reported not enough incentives to enhance the production of biodiesel in most of the RecOil countries (Greece, Spain, Italy). The bank financing is very difficult. Furthermore, payback period for the private investors is too long.
- > **High operation cost:** The production processes have to be adapted on the raw materials used and the EN14214 regulations so, as reported, the operation cost increases. In Italy, a major problem is in the mechanism of commercialization of biodiesel, due to the increase in the cost of sales given by the addition of excise duties. Currently, the production cost of biodiesel is about € 0.46, the cost of sales is rather close to that of conventional diesel. In Portugal it is reported that other methods than the common batch transesterification have larger operation cost.

Legal Bottlenecks

- > **Very long licensing procedures:** Almost all stakeholders reported difficulties in obtaining the required licenses to start a biodiesel production plant in combination with a slow and expensive licensing procedure.
- > **Unstable legal conditions:** Authorities do not provide clear guidelines and the legislation is continuously changing. There is not adequate promotion of biodiesel. Apart from a huge lack of knowledge about biodiesel by local entities, cases that support "quick wins" were reported ignoring the sustainability criteria of the Fuel Quality Directive.

- > **Imports of biodiesel (unfair competition):** National biodiesel sales in Spanish market are hindered by the importation of Argentinean and Indonesian fuel (cheaper than Spanish). Last year many production plants in Spain have stopped their production because it's not a profitable business. In Italy, it is reported that it is impossible to compete with subsidized products from S. America & Asia. EU Biodiesel producers cannot compete with non-European biodiesel producers. According to a Portugal distributor, Europe should have a policy that protects the biodiesel distribution in Europe against unfair competition.
- > **Transpose of the European Policy:** Mostly in Spain, it is reported that authorities are not implementing the EU regulations (such as sustainability norm), so biodiesel rejected in the rest of EU member states is accepted in Spain in very low prices. According to the Italian stakeholders an EU level regulation needs to be taken regarding the imports of products that are subsidized through differential export tariffs in non EU producing countries. In Denmark, UCOs are not allowed in the double counting system.

Technical Bottlenecks

- > **EN 14214 standard:** Regarding the UCO utilization in the biodiesel feedstock materials, problems are reported to decrease the mono- and diglycerides and reach the desired ester contents according to EN 14214. According to Greek producers due to the EN 14214 quality standards, a maximum share of 10% of UCOs can be used during the winter period, with lower rates of cottonseed oil and soya oil, because of the higher clouding point of FAME from UCOs. According to Portugal producers, additives can be used in order to decrease the oxidation stability of FAME from UCOs but it increases the production cost.
- > **Biodiesel distribution:** The main problems in the biodiesel distribution as reported by Danish producers are the limited storage systems and the long distances. In order to face difficulties considering the low temperatures in Denmark and Portugal, heated tanks are used with materials such as steel or fiberglass. There is no gum contamination problem reported, for that reason no additives are used. According to a Portugal distributor, Europe should have a policy that protects the biodiesel distribution in Europe against unfair competition.

6. CONCLUSIONS

As recorded by the biodiesel producers interviewed in the RecOil participating countries, the production procedure mainly involves a batch common process, with an acid or caustic pre-treatment of the collected UCOs and subsequently an alkaline catalysis on methanol. Enzymatic catalysis was recorded in a newly developed biodiesel plant in Denmark, which is going to produce the current period in 2013.

The selection of a particular biodiesel production process depends on the amount of free fatty acid and water content of the used cooking oil.

Regarding the alkaline transesterification process, it is most effective in converting triglycerides into esters when free fatty acid level is less than 1% and when it has high conversion efficiency up to 98%. It is less effective when the free fatty acid level exceeds 1% because the FFA reacts with the most common alkaline catalysts (NaOH, KOH, and CH₃ONa) and forms soap which inhibit the separation of ester from glycerine and which in turn reduces the conversion rate.

Regarding the acid-catalysed transesterification process, it produces the maximum ester yield as compared to the alkali catalysed reaction, except for methyl esters. This process does not yield soap due to the absence of alkali material. Nevertheless the transesterification of the triglycerides is very slow, taking several days to complete and causes formation of water which stays in the reaction mixture and finally stops the reaction well before reaching the completion. For that reason it is assumed that it is less preferable in the biodiesel production plants.

The bottlenecks are mainly legal and economical, high VAT is applied and the taxation and unpredictable. Because of EN 14214 quality standards further increase of the UCO share in the biodiesel chain are limited.



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ANNEXES

ANNEX 1 – LIST OF CONTACTED BIODIESEL PRODUCERS AND DISTRIBUTORS

Contacted biodiesel producers and distributors in GREECE

Nr	Company	Location	Webpage	Contact Person	Phone Nr	Email	Contact date	Filled questionnaires
1	Paulos N. Pettas ABEE	Municipality of Patras	-	Konstantinopoulos Panagiotis	0030 2610 242100	biodiesel@pnpettas.gr	18.2.2013	
2	GF energy ABEE	Municipality of Korinthos	http://www.gfenergy.gr	Nikolentzos Vasilios	0030 2106109201	v.nikolentzos@gfenergy.gr	17.1.2013	
3	Agroinvest AEBE	Municipality of Fthiotida	http://www.agroinvest.gr/	Argirios Fabatas	0030 2104812280	agrovst@agroinvest.gr	15.1.2013	
4	EL.BI. ABEE	Municipality of Kilkis	http://www.elvi-hellenic-biopetroleum.gr	Giorgos Karakoulas	0030 2341072250	g.papaioannou@elvi.gr	14.1.2013	✓
5	Elin Biokausima SA	Municipality of Athens	http://www.elin.gr	Harris Adrianos	0030 2106241515	thand@elinbio.gr	14.1.2013	✓
6	New Energy SA	Municipality of Serres	http://www.newenergy.gr	Nikos Lempesis	0030 2321073303	info@newenergy.gr	14.01.2013	
7	EL.PE S.A	Municipality of Athens		Stauros Sasloglou	0030 2106302840	ssasloglou@helpe.gr	21/1/2013	
8	BiontizeL EPE	Municipality of Thessaloniki	-	Stelios Gouniotis	0030 2394061961	biodieselassiros@yahoo.gr	17.1.2013	✓
9	Manos SA	Municipality of Athens	-	Manos Sekertzis	0030 2425024222	sekertzis@manossa.gr	21/1/2013	✓
10	Mil Oil Hellas SA	Municipality of Thessaloniki	http://www.miloil.gr	Nikos Tsagkalidis	0030 2310330501	info@miloil.gr	4/2/2013	✓
11	Bioenergia SA	Municipality of Chalkidiki	http://www.bioenergia.gr/	Paplomatas Sarantis	0030 2399020120	info@bioenergeia.gr	4/2/2013	
12	MOTOR OIL (HELLAS) S.A	Municipality of Athens		Dimitris Loutrianakis	0030 2108094272		21.1.2013	
13	Staff Colour Energy ABEE	Municipality of Larissa	http://www.agroil-energy.gr	Kokalis G.	0030 2410541500	info@staffcolour-energy.gr	14.1.2013	✓

Contacted biodiesel producers and distributors in Portugal

Nr	Company	Location	Webpage	Contact Person	Phone Nr	Email
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						



ANNEX 2 – DISCUSSION GUIDES /QUESTIONNAIRES

ANNEX 2.1 FOR PRODUCERS

DISCUSSION GUIDE / QUESTIONNAIRE FOR BIODIESEL PRODUCERS

Company Name:	
Company Location:	
Facility/Plant Location:	
Contact person(s)/position:	
Company website:	
Interview Location:	Interview Date:
Name of the interviewer:	

PART 1. COMMERCIAL AND ECONOMICAL ASPECTS

A. COMPANY PROFILE

1. Years of company's operation for biodiesel production: _____
2. Company's activities, apart from the biodiesel production (e.g. fuel distribution, recycling, UCO collection, etc): fuel distribution*: _____ UCO collection: _____ Recycling: _____ Other (PLS define) _____ <i>(*if yes please address to the same company the Questionnaire for biodiesel distributors)</i>
3. Maximum annual biodiesel production capacity (in m ³): _____
4. Annual biodiesel production during the previous years (in m ³): 2012: _____ 2011: _____ 2010: _____ 2009: _____ 2008: _____
5. Expected / Planned Biodiesel Production for 2013: _____
6. Foreseen production capacity in five years from now (2017): _____
7. Does your company: <input type="checkbox"/> distribute the biodiesel produced itself <input type="checkbox"/> sell it to fuel distribution companies



B. CUSTOMERS AND SUPPLIERS

8. Do you use UCO in your biodiesel production chain*? Yes _____ No _____ <i>(*If no, PLS skip the following questions and go to question 12)</i>
9. Do you import UCO? Yes _____ No _____ If yes, which is the share of the imported UCO in the total UCO you use? _____%
10. What are your main UCO suppliers? <input type="checkbox"/> food processing factories <input type="checkbox"/> HORECA (Hotels, Restaurants, Cafes) <input type="checkbox"/> households <input type="checkbox"/> Other (PLS define) _____
11. If your company also collects UCO, do you collect: <input type="checkbox"/> Directly <input type="checkbox"/> via an affiliate <input type="checkbox"/> indirectly (via third party). <i>In that case, PLS define if one main supplier or several suppliers</i> _____
12. Who is your customer? Refineries: _____ (% of production) Gas stations: _____ (%) Distributor: _____ (%) Other (PLS define) _____ (%)
13. Is your customer(s) situated in your region?
14. Do you export part of your production? If yes, which is the share of your production that you export? a) at EU countries _____% b) at non EU countries _____% Please note the countries where you export? _____

C. ECONOMICAL ASPECTS

15. Do you consider your current production cost satisfactory? Yes _____ No _____
16. Which is an indicative range of your current production cost (€/m ³)? _____ <i>Include the procurement cost of raw materials</i>
17. Have you received any EU or national funding? Yes _____ No _____
18. What is the estimated payback period of your investment? _____
19. Which is your investment cost so far (in €)? _____



20. Could you share with us any suggestions to improve the financing of biodiesel production in your country?

21. Do you consider biodiesel production in your country a fruitful investment? PLS justify your answer

D. POLICY / LEGISLATION

22. Are there any legislative limitations that your company faces considering the:

	YES	NO
Licensing		
Auditing		
Production		
Other		

	YES	NO
Sales		
Taxation		
Financing		

PLS explain the most critical ones:

23. Is your national/ local authorities system efficient in regulating/supporting your business? PLS comment

24. Are there any improvements which you could suggest as concerns your local and national authorities system?

25. Is your company registered in a National Data Management and Information System of the relevant Administration of Petroleum Policy? Yes _____ No _____

26. In what way should EU policy support the biodiesel chain with regard to the production and/or distribution? PLS provide your opinion:

27. What is your perception for the future of biodiesel in EU? Please explain

Positive/very positive _____ Negative/very negative _____ Neutral _____



PART 2. PRODUCTION /TECHNICAL ASPECTS

28. Which types of raw material do you use in the production chain?

Energy crops	sunflower seed oil _____ % rapeseed oil _____ % soya seed oil _____ % cottonseed oil _____ % Other (PLS define) _____ %
Vegetable oils	_____ %
Used Cooking Oils (%)	_____ %
Animal fats	_____ %
SUM	100%

1. Which is the total amount of raw materials you use for your biodiesel production?

_____ m³ or tonnes/year

2. Which types of biodiesel do you set in the market?

B100 _____ % B7 _____ % Other blends (PLS define) _____ %

(please mention if you sell biodiesel blends for transport with higher volumes than 7% v/v of biodiesel)

3. Production method you are currently using (transesterification, continuous/ batch common process, supercritical processes, ultrasonic methods, hydrogenation, etc.)

> Pre-treatment-Refining

Water and Solids Removal (ex. Filtration, Heating, Centrifugal Separation)

Free Fatty Acid Treatment (ex, Acid pretreatment, caustic pretreatment neutralization process, deacidification)



> **Transesterification**

(i) Catalysis

i.e. alkaline, acids, heterogeneous, enzymatic

(ii) non catalytic process

i.e. BIOX co-solvent, Supercritical

> **Glycerol Separation**

i.e. settling, centrifuging

> **Biodiesel post treatment – Purification Method for soap, methanol and glycerol removal**

i.e. absorption, liquid–liquid extraction, ion exchange, distillation, rotary evaporator - rotovap – water washing

> **Glycerin post treatment and disposal**

(ex. Distillation and disposal in chemical industries)

> **Other by-products and their treatment, disposal or reuse**

(i.e.. Methanol reuse)

4. Which are the reasons for choosing the particular method?

Economical _____ proven technology _____ High performance _____

In accordance with an European or national standard _____

Other reason (PLS define) _____

5. Which are the technological limitations and problems that your company face related to this production method?



6. Have you modified your production process from the one followed at the first years of production and if yes in what way?
7. Do you consider your current production cost satisfactory? Yes _____ No _____
8. Do you consider any alternatives in order to decrease your production cost?
9. Are there any systematic research activities to improve your production method? What are the areas that your research is focusing?
10. Have you estimations of the emissions of your process (air, water, soil)?
11. How do you handle them?
12. Is your biodiesel production method in accordance with a European or national standard? EN 14214:2008 + A1 2009 _____ Older EN 14214 standard: _____ Other (<i>PLS define</i>): _____
13. If you produce according the EN 14214, do you record any limitations regarding the UCO use in the biodiesel production?

IMPORTANT NOTE:

All answers will be used only for statistical analysis and will be kept confidential.

Thank you for your contribution!

ANNEX 2.2 FOR DISTRIBUTORS

DISCUSSION GUIDE / QUESTIONNAIRE FOR BIODIESEL DISTRIBUTORS

Company Name:	
Company Location:	
Facility/Plant Location:	
Contact person(s)/position:	
Company website:	
Interview Location:	Interview Date:
Name of the interviewer:	

PART 1. COMMERCIAL AND ECONOMICAL ASPECTS

A. COMPANY PROFILE

1. Years of company's operation for biodiesel distribution: _____
2. Company's activities, apart from the biodiesel distribution: Biodiesel blending: _____ liquid fuel distribution: _____ biomass distribution : _____ UCO collection: _____ Other (PLS define) _____
3. Are you distributing mineral fuels apart from biodiesel? Yes _____ No _____
4. Maximum annual biodiesel distribution capacity (in m ³): _____
5. Annual biodiesel distribution during the previous years (in m ³)? 2012: _____ 2011: _____ 2010: _____ 2009: _____ 2008: _____
6. What is your foreseen distribution capacity in five years? _____ m ³
7. Does your company produce the biodiesel which is being distributed* Yes _____ No _____
(*if yes please address to the same company the Questionnaire for biodiesel producers)



B. END CUSTOMERS

8. Who is your end customer?

Fuel companies: _____ (% of distribution) Refineries: _____ (%) (for biodiesel blending)
Petrol stations: _____ (%) Other (PLS define) _____ (%)

9. Do you distribute biodiesel to other countries?

If yes, which is the share of your distribution that is exported ?

a) at EU countries _____% b) at non EU countries _____%

Please note the countries where you export? _____

C. ECONOMICAL ASPECTS

10. Do you consider your current distribution cost satisfactory? Yes _____ No _____

11. Do you consider any alternatives in order to decrease your costs for the distribution? Could you shortly describe them?

12. Which is an indicative range of your current distribution cost (€ /m³) _____

13. Which is your investment cost so far (in €)? _____

14. Have you received any EU or national funding? If so, at what rate of your investment?

Yes _____ No _____ _____ % rate

15. What is the estimated payback period of your investment? _____

16. Could you share with us any suggestions to improve the financing of biodiesel distribution?

17. Do you consider biodiesel distribution in your country a fruitful investment? PLS justify your answer.



D. POLICY / LEGISLATION

18. Are there any legislative limitations that your company faces considering the:

	YES	NO
Licensing		
Auditing		
Transportation		

	YES	NO
Taxation		
Financing		
Other		

PLS explain the most critical ones:

19. Which are your suggestions for legislative adjustments with regard to the above?

20. Is your national and local authorities system efficient in regulating and supporting your business?

Yes _____ No _____

21. Are there any improvements which you could suggest as concerns your local and national authorities system?

22. In what way should EU policy support the biodiesel chain with regard to the production and/or distribution? PLS provide your opinion:

23. What is your perception for the future of biodiesel in EU? Please explain

Positive/very positive _____ Negative/very negative _____ Neutral _____



PART 2. DISTRIBUTION METHOD AND TECHNICAL ASPECTS

A. DISTRIBUTION METHOD

1. What is the structure of your distribution chain? Please explain in a few words. (e.g. B100 producer – Primary Terminal-distributer- petrol stations –public)

2. How far is the location of your biodiesel supplier/s? _____ *volume*km/month (average)*

3. By what means is biodiesel supplied to you?

Tanker trucks _____ Trucks _____ Railcars _____ Ships _____ Other (*PLS name*) _____

4. By what means do you distribute biodiesel? (trucks, railroad, ships, other)

Tanker trucks _____ Trucks _____ Railcars _____ Ships _____ Other (*PLS name*) _____

5. What is the capacity of your storage facilities (in m³) _____

6. What are the bottlenecks of your distribution chain?

irregular supply of biodiesel _____ irregular orders from customers _____

limited storage systems _____ long distances _____

limited transport options _____ inefficient transport means _____

Other (*PLS name*) _____

PLS explain the most critical ones:

7. Which are your thoughts/suggestions to overcome the above restrains?



B. TECHNICAL ASPECTS

8. Which types of biodiesel do you distribute?

B100 B7 Other (PLS name) _____

9. Do you collect directly the pure biodiesel or biodiesel blends you distribute? Yes ____ No ____

10. Are you processing (eg filtering) or mixing the supplied biodiesel before distributing it?

Yes ____ No ____

If yes, is your technique in accordance with a European or national standard?

EN 509/2009 other (PLS define) _____

11. During the winter months, do you come across with difficulties in storage and transport of:

	YES	NO
B100		
B7		
other blends		

12. If yes, how do you face the difficulties considering the low temperatures?

Insulated tanks underground tanks
 Heated tanks other methods (PLS define) _____

13. Do you come across difficulties with certain materials?

	YES	NO
B100		
B7		
other blends		

14. Which storage tank materials do you use?

	YES	NO
Aluminium		
Steel		
Teflon		
Fibreglass materials		
Other (PLS name)		



15. Do you come across “gum” contamination problems during the storage of biodiesel?

Yes _____ No _____

16. If yes, how do you face the difficulties concerning the “gum” contamination?

Small storage periods _____ Storage facilities cleaning _____ Additives usage* _____

*(if yes, PLS name the additives if possible)

17. Is your storage and transport system takes into account the Seveso II or Seveso III?

Seveso II _____ Seveso III _____

18. If your storage and transport system is adapted to Seveso II, have you any plan to adjust your system to Seveso III? Yes _____ No _____

PLS mention any identified barriers to meet the Seveso III requirements till 2015?

IMPORTANT NOTE:

All answers will be used only for statistical analysis and will be kept confidential.

Thank you for your contribution!

ANNEX 2.3 GUIDELINES FOR THE INTERVIEWERS

The above discussion guides / questionnaires are used to record the existing practices and experiences in the field of biodiesel production and distribution. Based on the data gathered and analysed, a guide on used cooking oil processing and biodiesel distribution practices will be developed taking into account the technologies applied, the different technical aspects and considerations, identified advantages/disadvantages, economical aspects, potential benefits and/or risks of each method.

There are two (2) types of questionnaires available; one **for biodiesel producers** and one **for biodiesel distributors**. In case that a company is activating both in production and distribution of biodiesel, pls fill both questionnaires avoiding asking the parts that are common to both questionnaires.

The questionnaires could be filled during organized face-to-face meetings or teleconferences, or even by exploiting industry events where those actors are present.

The interviewer should use the questionnaire to guide the conversation during the interview and to record – in a structured way- the information provided.

At first, the appropriate companies in regional level should be identified. A face to face meeting or a phone discussion could be planned in advance with the appropriate company's staff. Before starting the interview with a chosen company, a **web review** could help to pre-fill some of the questions in order to save time for the interviewed person. Any additional documentation about the methods/practices followed by the company could be useful, so if the company provides you with any brochures, publications or additional material pls. attached them to the questionnaire.

IMPORTANT NOTE: Before starting the interview it is important to reassure the interviewed persons that the information provided will be kept confidential and will be only used for generic identification of existing methods and for statistical analysis without identifying individual opinions.

WHO TO INTERVIEW

The questionnaires are addressed to biodiesel producers and distributors. In order to have a more representative picture of your local/regional/national biodiesel market practices, potential and barriers it is preferable to select the major companies, activating to the field for at least three years.

PLS, focus to gather the input of biodiesel producers (4 filled questionnaires from biodiesel producers, 1 filled questionnaire from biodiesel distributors). Avoid to interview companies that only import biodiesel.

Each one of the questionnaires consists of 2 parts:

- the Commercial part (to be answered by the Commercial Manager) and
- the Technical part (to be answered by the Production/Technical Manager)

HOW MANY INTERVIEWS

4-5 biodiesel producers/distributors should be interviewed in each of the 8 regions (in 5 countries).

ANNEX 3 – NATIONAL WORKSHOPS DISCUSSION POINTS

WORKSHOPS/BILLATERAL MEETINGS DISCUSSION POINTS (joint activity with WP3)

PART A: COLLECTION OF UCOs (refer to WP3)

1. Identify which factors are used for decision-making regarding a) decide if we are going to execute a system for oil collection or not, and b) if we are going to execute it, what kind of system are we going for:

- Critical Factors for not doing it
- Critical factor for selecting/eliminating a specific collection method
- Factors that threaten success
- Factors that facilitate success

2. Identify advantages and disadvantages of different UCO collection methods

First identify different UCO collection methods, and then describe for each of them:

a) How do the system operates (include maintenance and cleaning of collection points and transport – how they do it and how often)

- Where
- How
- When (how many times)

b) Good practices that enhance oil collection system success; important advices for:

- improving collection
- maintenance
- transport

c) Problems that need to be solved

- Problems that exist and possible solutions

When discussing this section there are some questions that can lead you to answering it:

- *consider previous decisions regarding non-executing oil collection (Why decision was **not** to perform it; the decision was made based on which criteria/factors?)*
- *opinions about places where stakeholders would never consider to implement an oil collection system (Why would they never do it there, which are the factors that inhibit them?)*
- *think about unsuccessful cases (Why do you consider them unsuccessful? In your opinion why did they fail?);*
- *threatens or challenges (what can make your life difficult during implementation and operation phases of an oil collection system and biodiesel production);*

PART B: UCO PROCESSING TO BIODIESEL (refer to WP4)

3. Identify advantages and disadvantages of different UCO to biodiesel processing methods

a) Critical factors for selecting transformation/process methods

- Factors to decide the most efficient biodiesel production method
- Factors that inhibit the choice of a particular method
- Facilitators for specific methods

b) Good practices to enhance the processing of UCO to biodiesel

- Important advices for improving the production process
- Suggestions to improve the financing of biodiesel production
- Important advice for maintenance of produced biodiesel

c) Barriers and recommendations to overcome them

- Barriers due to legislation issues (licencing, taxation, other)
- Barriers due to technical issues
- Barriers due to financing issues
- Other barriers

d) Other Discussion topics

- Biodiesel Blending (increasing biodiesel blends with diesel for transport, over the 590/2009 standard (7%))
- Double Counting System (Would it help to include UCOs in the double counting feedstock materials, 2 TdB?, how the system support or not the business)
- Perspectives of the biodiesel producing business for the next years (growing, paused, blocked), explain why
- Proposed interventions in local/regional/national level to support the UCO processing to biodiesel
- Expectation from under development EU policies

PART C: BIODIESEL DISTRIBUTION

4. Identify advantages and disadvantages of biodiesel distribution methods

a) Good practices with regard to the biodiesel distribution

- Facilitators for specific methods
- Factors that affect the choice of a particular method
- Advices for improving existing methods

b) Barriers and recommendations

- Barriers due to legislation issues
- Barriers due to technical / quality issues
- Barriers due to financing issues
- Other barriers

c) Suggestions for legislative adjustments and supporting mechanisms



You may use the attached indicative form:

Identify advantages (+) and disadvantages (-) of different UCO collection methods

	Critical factors for decision making: - Critical Factors for not collecting UCO - Critical factor for selecting (S)/eliminating (E) a specific collection method - Factors that threaten success(-) - Factors that facilitate success (+)	How do the system operates (include maintenance and cleaning of collection points and transport) - Where - How - When (how often)	Good practices that enhance oil collection system success: - Important Advices for improving collection - Important advice for maintenance - Important advices for transport	Problems that need to be solved - Problems that exist (P) - Possible solutions for them (S)
No collection system				
Door-to-door				
Containers on the streets				
Containers at strategic stores (e.g. markets, supermarkets...)				

Identify advantages (+) and disadvantages (-) of different UCO processing/transformation and distribution methods

	Critical factors for decision making: - Factors to decide the most efficient biodiesel production/distribution method - Factors that inhibit the choice of a particular method - Factors that facilitate/enhance success (+)	Good practices that enhance processing of UCO to biodiesel or distribution systems success: - advices for improving the processes or methods - Suggestions to improve the financing of biodiesel production - Important advice for maintenance of produced biodiesel - Important advices for biodiesel transport to end users	Barriers and recommendations - Barriers due to legislation issues - Barriers due to technical / quality issues - Barriers due to financing issues - Other barriers
Method 1:			
Method 2:			
Method 3:			
Method 4:			

Notes:

RecOil Partnership

- Energy and Environment Agency of Arrábida (coordinator)
- Factor Social
- Technical University of Crete
- Local Energy Agency Province of Cosenza
- Energy Management Agency Province of Cádiz
- Regional Energy Agency for Barreiro, Moita, Montijo and Alcochete
- Elin Biofuels S.A.
- Energy, Transport, Agriculture SRL
- Municipality of Castrolibero
- European Biomass Industry Association
- Agro Business Park.



www.recoilproject.eu

