OILEX

UCO Exchange Marketplace

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Contents

Part One

1. Text Chapter

1.1 Abstract

The World is faced with a formidable challenge. The hope of the Kyoto Protocol was that industrialised nations would cut their collective emissions of greenhouse gases by 5.2% in 2012 compared to the year 1990. However, that World governments was not capable of achieving even this token first-step. And this at a time when all manner of climate-induced disasters are gathering force, and polar ice caps melting at a rate that even the worst-case scenario computer models did not anticipate. Action is needed and action is needed now. Road transport contributes about 20% of the EU27 carbon dioxide emissions, and must play a fundamental role in greenhouse gas emissions reductions if we are to stave off catastrophic impacts on our living planet. Despite the desperate urgency of the situation, alternative fuel producers and environmental technologies are constantly facing resistance, criticism and hostility, which, if the same strict criteria were applied to the present generation of energy technologies, it would make a mockery of them. Biodiesel has not escaped such harsh and ill-informed attacks, particularly in the last year. It is the aim of this project to give in-depth information to prospective biodiesel producers, or project managers, to enable correct decision-making and to ensure success for their proposed projects. It seeks to analyse the real potential in the EU27 for biodiesel production from Used Cooking Oil (UCO), and its place in the market.

1.2 Introduction

Biodiesel is an alternative road fuel made from transesterfied fatty acids. The most common form is made from straight vegetable oil, whether that be rapeseed oil, soya oil or others. It can however, also be produced from used cooking oil (UCO) or animal fat such as tallow, and if processed correctly will produce high quality fuel. Although certain diesel engines can run on straight vegetable oil, if transformed into biodiesel it can be used in almost all diesel engines, most importantly in modern high-performance direct injection engines. Despite the knowledge of the possibilities for running diesel engines on vegetable oil having been overlooked for a large part of the last century, Dr Rudolf Diesel first developed the Diesel engine in 1895 with the full intention

of running it on a variety of fuels, including vegetable oil. The concept is neither revolutionary nor fanciful. Recent developments at European Union level are transforming both the disposal method of Used Cooking Oil (UCO) and the way in which the EU fuels its road transport vehicles. These combined developments have made the use and production of biodiesel from UCO an increasingly favourable prospect. In May 2003, the European Parliament and the Council adopted the 'Directive on the promotion of the use of biofuels or other renewable fuels for transport'. This Directive requires that Member States in 2005 to replace 2% of their diesel and petrol with biofuels, and replacing 5,75 % by 2010. The EU Animal by-product Regulation 1774/2002 sets restrictions on the use of Used Cooking Oil originating in restaurants, catering facilities and kitchens. The effect is that, except for in special cases, UCO from catering premises can no longer be used as an ingredient in animal feed, which historically was its main disposal route. In parallel, the Landfill Directive 99/31EC requires each Member State to set out a pollution control regime which prohibits the acceptance of certain types of wastes at landfills, including liquid wastes 4 such as UCO. Furthermore, recent statistics show a huge increase in volume of production of UCO in the last few decades and the number of catering establishments in European countries is on the increase. With a growing amount of UCO in the EU, the disposal problems UCO generators now face, and the concern to remove the UCO from the food chain, the production of biodiesel offers an ideal solution. The waste management exigency and sustainable transport strategy can both be addressed by the production of biodiesel. This is a real opportunity.

1.3 Key Terminology

UCO : Used Cooking Oil. Also referred to throughout the literature as WVO (waste vegetable oil) and UVO (used vegetable oil), RVO (recycled vegetable oil) and RCO (Recycled Cooking Oil). UCO has been chosen as the standard for this document.

FAME : Fatty Acid Methyl Ester. The technical acronym for biodiesel.

UCOME : Used Cooking Oil Methyl Ester. FAME coming from UCO.

B30 : The use of B followed by a number such as B30 and B100 is used in this document where appropriate, to identify the various percentages of biodiesel blends. Although historically mainly used in America, the terminology is well understood and it is starting to be used across Europe now too, hence was deemed appropriate.

Billion : The Anglo-Saxon use of billion has been chosen. That is to say for the purposes of this document, it represents one thousand million, and not a million million, which is referred to as a trillion.

"," or "." : The Anglo-Saxon use of decimal points and commas to represent numbers has been chosen for the purposes of this document (except in the accompanying excel spreadsheets, and the occasional figure or table derived from excel, where continental numeration has been used). That is to say that a "." represents a decimal point, and a "," distinguishes between multiples of thousands, millions and billions. [References]: Where sources have not been given, the information has come directly from OilEx consortium partners.

1.3.1 Background

OilEx project is a project to facilitate the uptake of used cooking oil to produce biodiesel. The objective of OilEx is the promotion of localised biodiesel production for transportation purposes, by means of the active involvement of key local actors the European and Extra-European countries that want to participate.

The promotion will be enforced by the creation of a UCO exchange marketplace powered by Blockchain Technology and by the creation of a OCF (OilEx Community Fund) to promote such initiatives.

There are essentially four phases to the OilEx project:

Information gathering and synthesis (WP2) This phase recognises the existence of multiple sources of information and experience from across Europe concerning the supply chain of biodiesel UCOME. It aims to make the first comprehensive analysis of this state of the art to form the basis of the later project phases.

The development of tools and resources (WP3) The second phase takes the results of the first and develops from them a set of tools and resources which provide concise and comprehensible guidance to market actors in any Member State. With this guidance new biodiesel production facilities can be initiated and vehicle fleets converted to biodiesel.

The set up of demonstration activities (WP 4-6) Using the tools and resources developed in WP3, Work packages 4-6 focus on bringing collected knowledge and tools into practice. The three work packages reflect three major focal points (and target groups) within the supply chain for establishing successful biodiesel demonstrations on local scale: production of local biodiesel plants (WP4), distribution facilities for biodiesel (WP5), and demand development for fleets (WP6). The demonstration phase forms the heart of the OilEx action; WP 2 and 3 are focused on providing deliverables (e.g. tools) that enable successful and efficient demonstration activities.

Dissemination (WP 7/8) and Project Coordination (WP1) During the full duration of the project, dissemination activities (WP 7/8) are carried out in which results from the individual work packages are disseminated to relevant target groups including project partners, OilEx supporters, EC delegates as well as relevant target groups. This phase covers a wide range of dissemination techniques, from printed and electronic handbooks to workshops and training sessions, ongoing networks, all having the ultimate goal of increasing the uptake of biodiesel among public and private transport fleets across the EU. An overarching work package is concerned with the management of the project from start to finish, ensuring proper coordination, quality assurance and budgetary control (WP1).

1.3.2 Bullet Points

- The first item
- The second item
- The third item

1.3.3 Descriptions and Definitions

Name Description
Word Definition
Comment Elaboration

2. In-text Elements

2.1 Theorems

This is an example of theorems.

2.1.1 Several equations

This is a theorem consisting of several equations.

Theorem 2.1.1 — Name of the theorem. In $E = \mathbb{R}^n$ all norms are equivalent. It has the properties:

$$\big|\,||\mathbf{x}|| - ||\mathbf{y}||\,\big| \leq ||\mathbf{x}-\mathbf{y}|| \tag{2.1}$$

$$||\sum_{i=1}^{n} \mathbf{x}_i|| \leq \sum_{i=1}^{n} ||\mathbf{x}_i|| \quad \text{where } n \text{ is a finite integer} \tag{2.2}$$

2.1.2 Single Line

This is a theorem consisting of just one line.

Theorem 2.1.2 A set $\mathscr{D}(G)$ in dense in $L^2(G)$, $|\cdot|_0$.

2.2 Definitions

This is an example of a definition. A definition could be mathematical or it could define a concept.

Definition 2.2.1 — Definition name. Given a vector space E, a norm on E is an application, denoted $||\cdot||$, E in $\mathbb{R}^+ = [0, +\infty[$ such that:

$$||\mathbf{x}|| = 0 \;\Rightarrow\; \mathbf{x} = \mathbf{0} \tag{2.3}$$

$$||\lambda \mathbf{x}|| = |\lambda| \cdot ||\mathbf{x}|| \tag{2.4}$$

$$||\mathbf{x}+\mathbf{y}|| \leq ||\mathbf{x}|| + ||\mathbf{y}|| \tag{2.5}$$

2.3 Notations

Notation 2.1. *Given an open subset G of $\mathbb{R}^n$, the set of functions φ are:*

1. *Bounded support G;*
2. *Infinitely differentiable;*

a vector space is denoted by $\mathscr{D}(G)$.

2.4 Remarks

This is an example of a remark.

R The concepts presented here are now in conventional employment in mathematics. Vector spaces are taken over the field $\mathbb{K} = \mathbb{R}$, however, established properties are easily extended to $\mathbb{K} = \mathbb{C}$.

2.5 Corollaries

This is an example of a corollary.

Corollary 2.5.1 — Corollary name. The concepts presented here are now in conventional employment in mathematics. Vector spaces are taken over the field $\mathbb{K} = \mathbb{R}$, however, established properties are easily extended to $\mathbb{K} = \mathbb{C}$.

2.6 Propositions

This is an example of propositions.

2.6.1 Several equations

Proposition 2.6.1 — Proposition name. It has the properties:

$$\big|\,||\mathbf{x}|| - ||\mathbf{y}||\,\big| \leq ||\mathbf{x}-\mathbf{y}|| \tag{2.6}$$

$$||\sum_{i=1}^{n}\mathbf{x}_i|| \leq \sum_{i=1}^{n}||\mathbf{x}_i|| \quad \text{where } n \text{ is a finite integer} \tag{2.7}$$

2.6.2 Single Line

Proposition 2.6.2 Let $f, g \in L^2(G)$; if $\forall \varphi \in \mathscr{D}(G)$, $(f,\varphi)_0 = (g,\varphi)_0$ then $f = g$.

2.7 Examples

This is an example of examples.

2.7.1 Equation and Text

■ **Example 2.1** Let $G = \{x \in \mathbb{R}^2 : |x| < 3\}$ and denoted by: $x^0 = (1,1)$; consider the function:

$$f(x) = \begin{cases} e^{|x|} & \text{si } |x-x^0| \leq 1/2 \\ 0 & \text{si } |x-x^0| > 1/2 \end{cases} \tag{2.8}$$

The function f has bounded support, we can take $A = \{x \in \mathbb{R}^2 : |x-x^0| \leq 1/2+\varepsilon\}$ for all $\varepsilon \in]0;5/2-\sqrt{2}[$. ■

2.7.2 Paragraph of Text

■ **Example 2.2 — Example name.** Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris. ■

2.8 Exercises

This is an example of an exercise.

Exercise 2.1 This is a good place to ask a question to test learning progress or further cement ideas into students' minds. ■

2.9 Problems

Problem 2.1 What is the average airspeed velocity of an unladen swallow?

2.10 Vocabulary

Define a word to improve a students' vocabulary.
Vocabulary 2.1 — Word. Definition of word.

Part Two

3. Presenting Information

3.1 Table

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table 3.1: Table caption

3.2 Figure

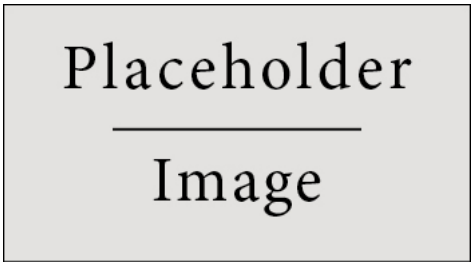

Figure 3.1: Figure caption

Bibliography

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