EcoMatters Trust

BioDiesel Discussion 20th May, 2009

by Andre' Hamman

Convener – BANZ – Liquid Biofuels group

Director – Biodiesel Australasia Ltd

Director – NZ Ester Fuels Ltd

Discussion Points

- BANZ-LBIG Overview
- NZ Biodiesel Scene
- BioDiesel Technology
- NZ Ester Fuels facility

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BIOENERGY
Association of New Zealand

woodpellets in New Zealand
A BANZ Interest Group

liquidbiofuels in New Zealand
A BANZ Interest Group

woodfuel in New Zealand
A BANZ Interest Group

biogas in New Zealand
A BANZ Interest Group

Vision: to assist the establishment of a sustainable liquid biofuels market in NZ based on indigenous resources.

Objectives:

The objectives of the Liquid Biofuels Interest Group should be:

- Assist manufacturers to set up production and develop market share
- Assist liquid biofuel manufacturers to ensure that quality product is on the market.
- Lobby for a liquid biofuels research and development fund
- Provide meaningful press and PR support to the technology, publishing case studies etc, and leveraging the BKC and **Liquid Biofuels in NZ** websites to disseminate this information
- Run workshops for potential suppliers, to raise awareness of the possibilities

Why establish of a sustainable liquid biofuels market in NZ based on indigenous resources ?

Extract from BANZ Position Paper : Liquid biofuels – the New Zealand advantage

... the existing resources available in New Zealand such as tallow, used cooking oil, rotational oil seed crops and whey are indeed sustainable and moreover, are amongst the best performers in terms of net green house gas emission reductions...

Specific Benefits are –

- Enhanced security of fuel supply − indigenous supply of fuel for New Zealand essential services in times of need
- Value added New Zealand raw materials that are currently exported
- Job creation - more employment opportunities via "green collar" jobs
- Value maximisation of land - improved utilization of land and value creation within rural communities
- Reduction of 'wastes' to landfill
- Mitigating our Kyoto agreement liability due to reduced net GHG emissions from transport
- Positive health impact - grass roots improvements in workplace health, biofuels produce far less emissions and don't contain carcinogens and harmful polyaromatic cyclic hydrocarbons
- Investment in R&D and biofuel manufacturing - developing an industry platform
- Tourism growth by reinforcing the NZ "Clean & Green" image

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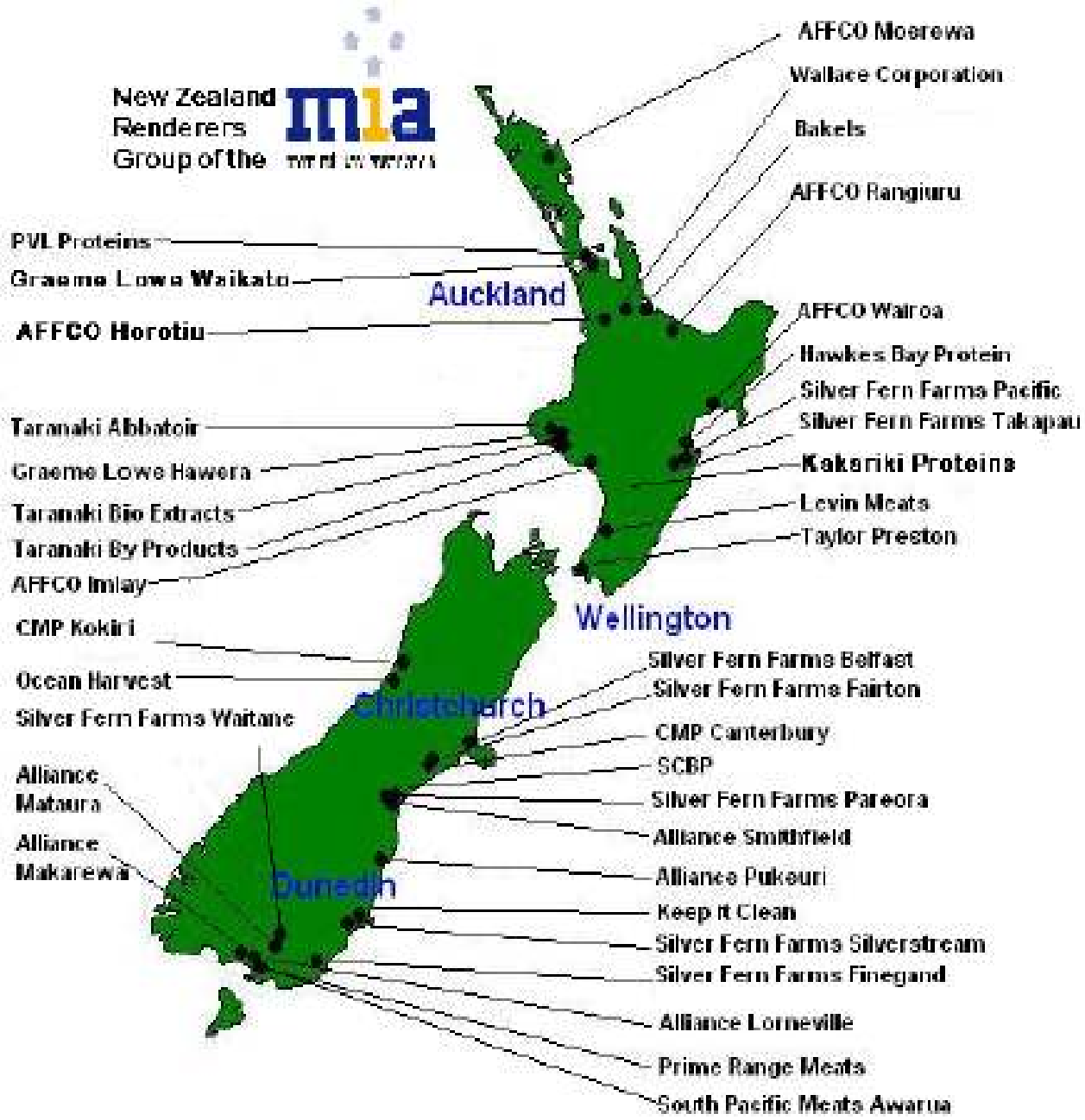


NZ Biodiesel feedstocks

❑ Tallow

140 Ml pa (approx 50% directly available for Biofuel)

❑ Used cooking oil

5 Ml pa

❑ Rotational oil seed crops

+70 Ml pa

❑ other lipids stream

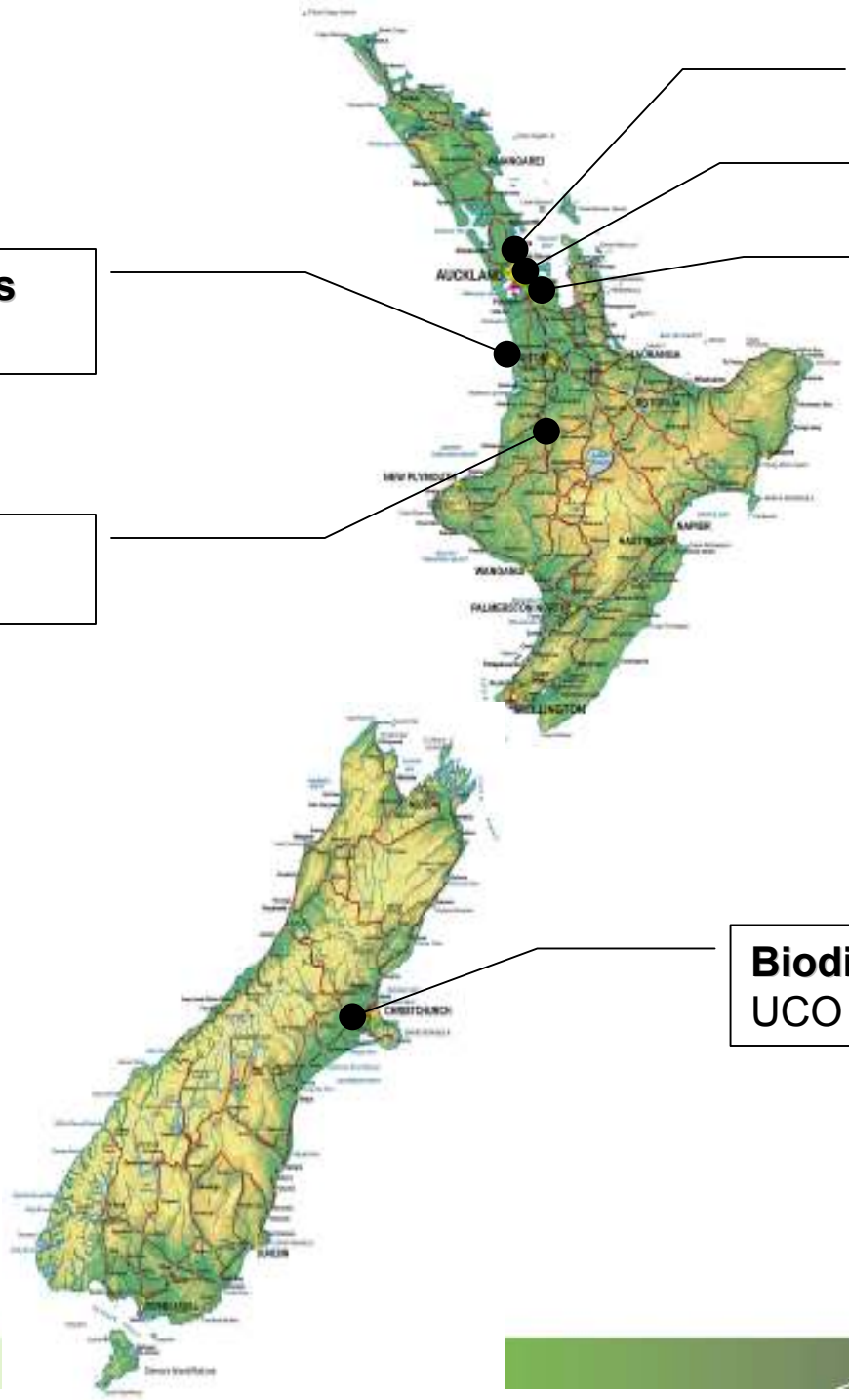
algae oils, grease trap wastes

(technology barriers)

Comparative perspective :

NZ Fossil Diesel Use

2500 Ml pa



Flo-Dry Eng

EcoDiesel

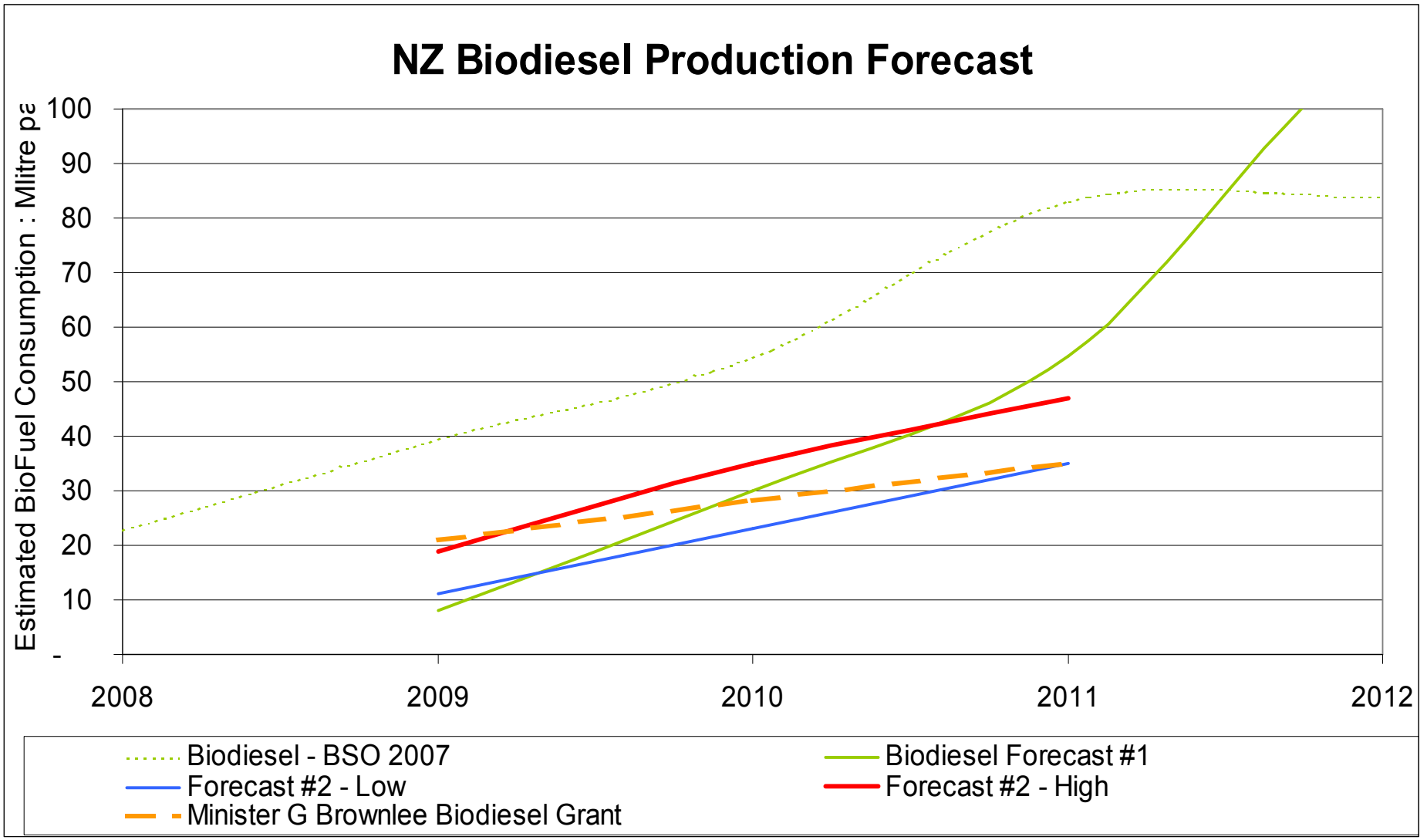
Biodiesel Oils NZ

Tallow

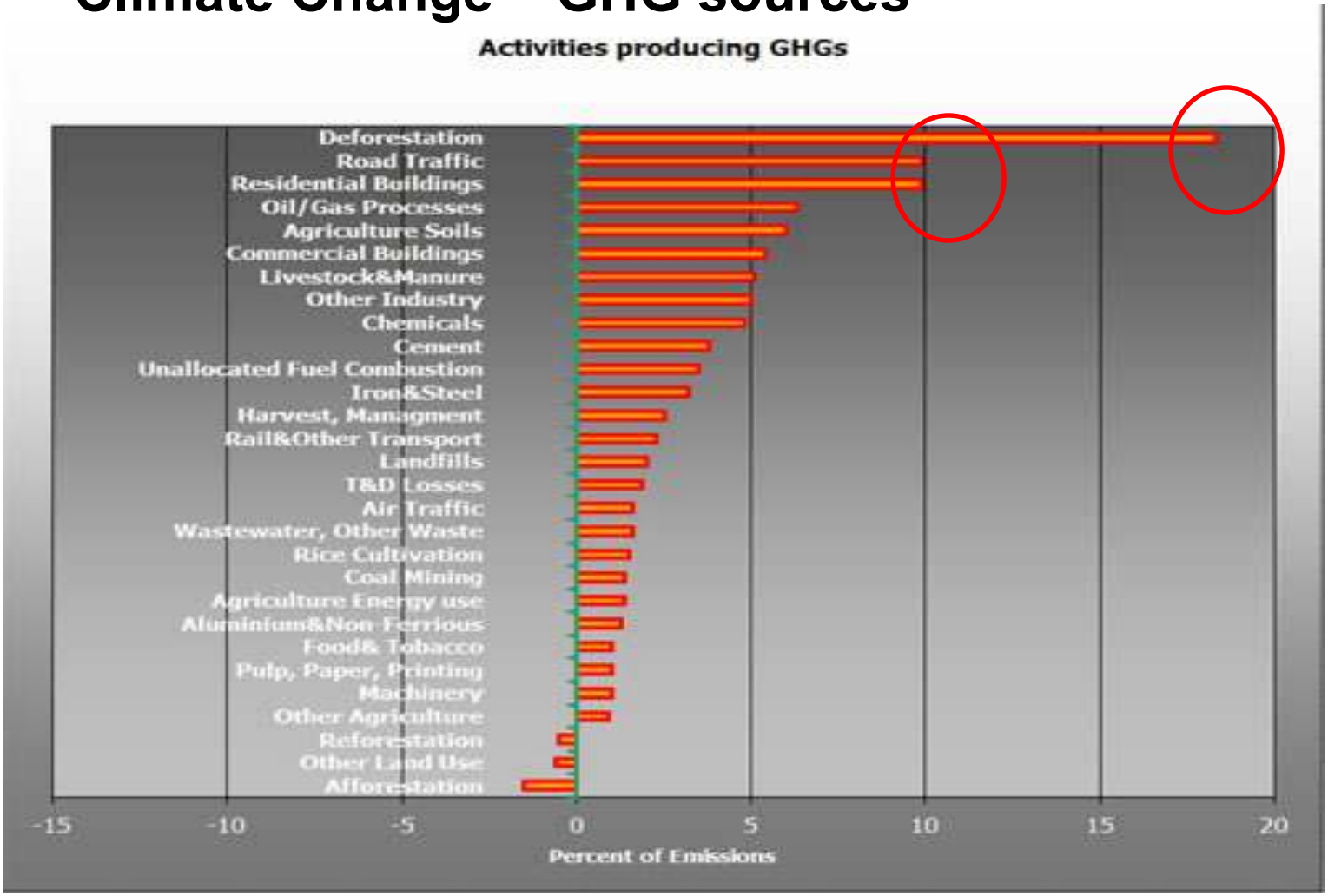
NZ Ester Fuels
UCO & other

EnvironFuels
UCO

Biodiesel NZ
UCO & Rotational Oilseed



Climate Change – GHG sources



- The dominant sources of GHG emissions are deforestation and the burning of fossil fuels.
- It is absurd that deforestation is occurring in some parts of the world to plant Biofuel crops !! Hence the need for a focus on sustainability of biodiesel manufacture

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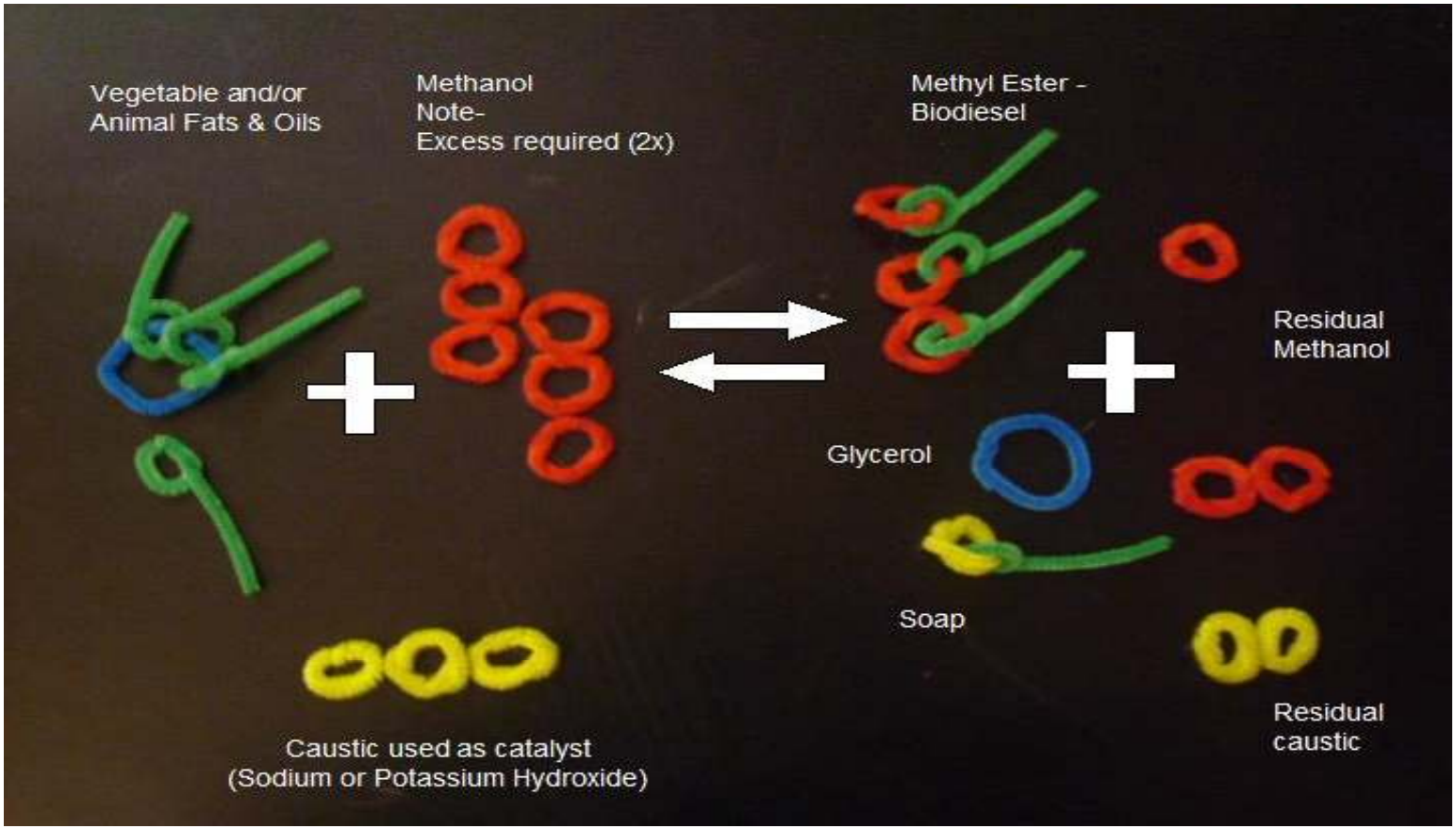
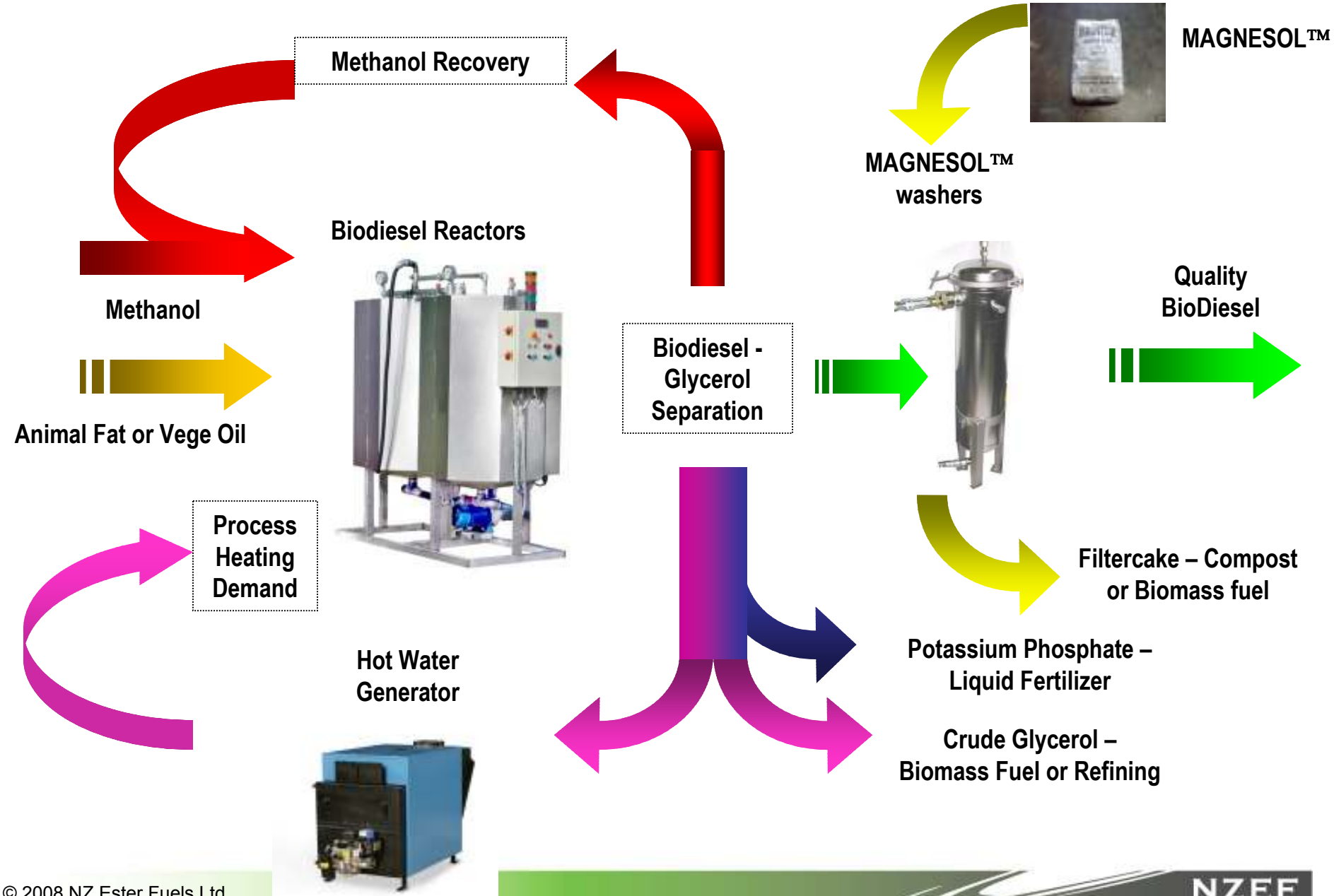
What is Biodiesel?

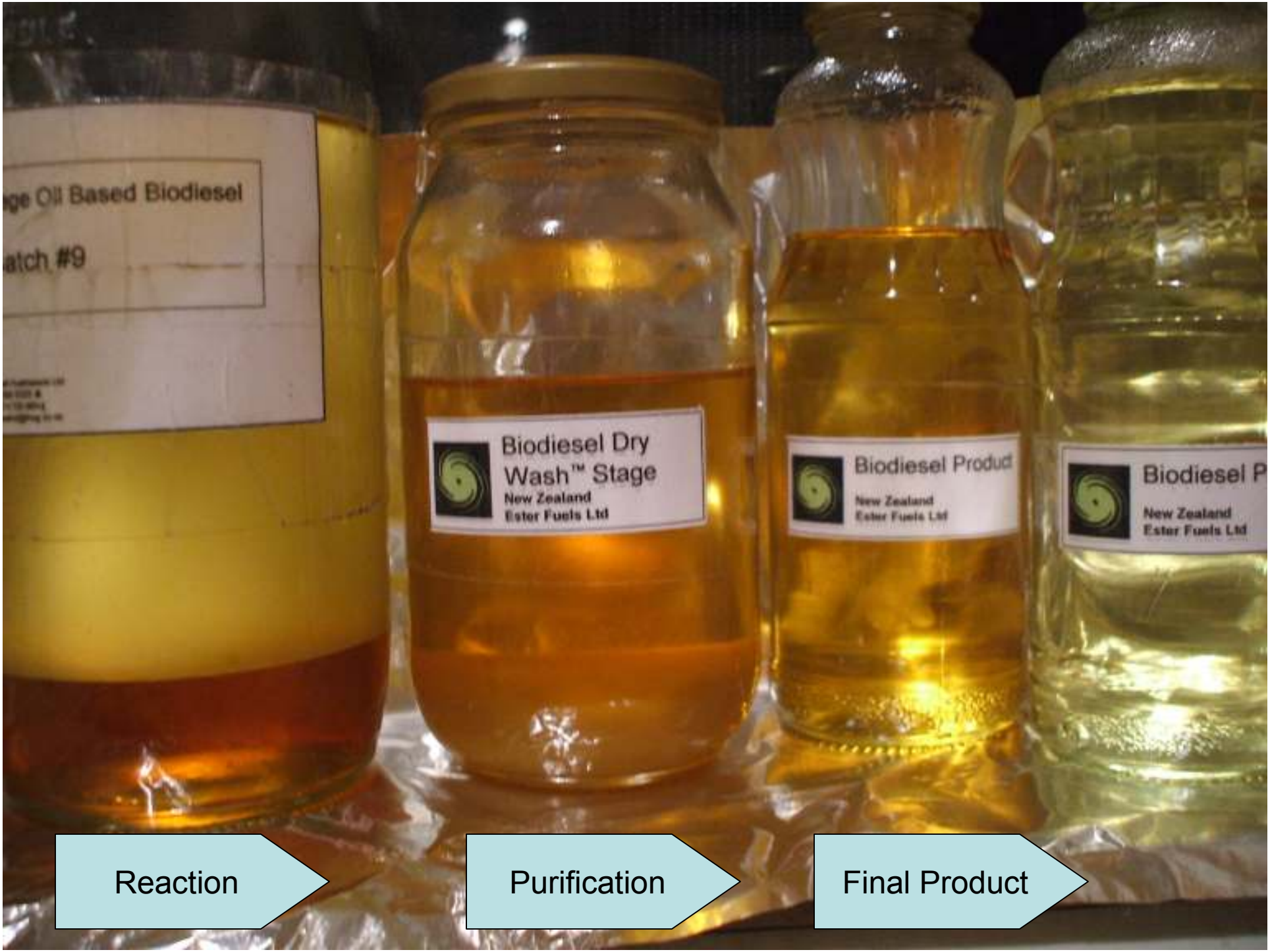
Biodiesel is a non-toxic, biodegradable replacement for petroleum diesel and can be made from any vegetable oil eg. Canola or animal fat eg. Tallow

Through a process called transesterification, oils and fats are reacted with methanol and a catalyst to produce methyl esters (Biodiesel) along with the co-products: glycerine and soaps.

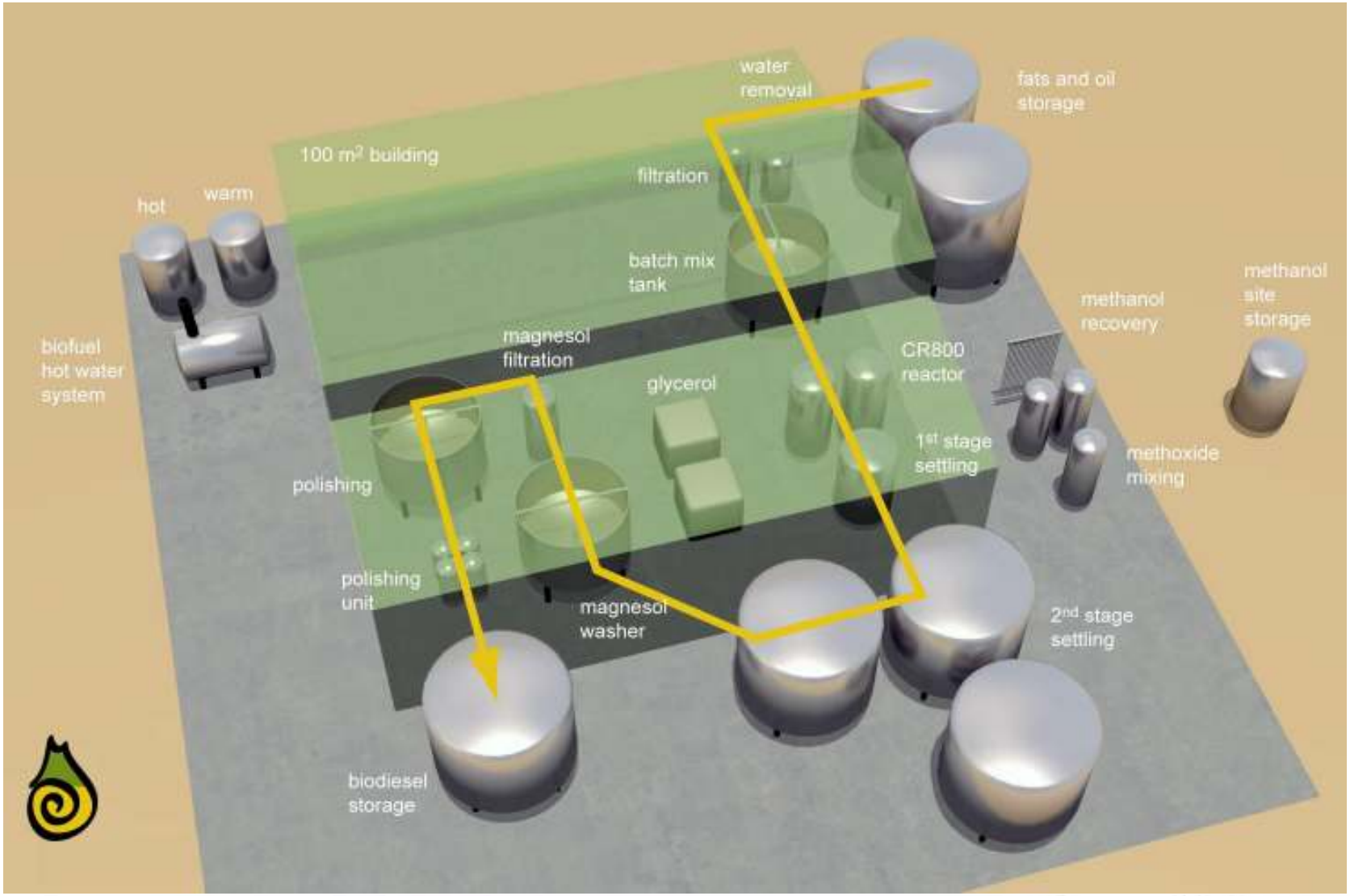


Integrated Biodiesel Manufacturing Concept

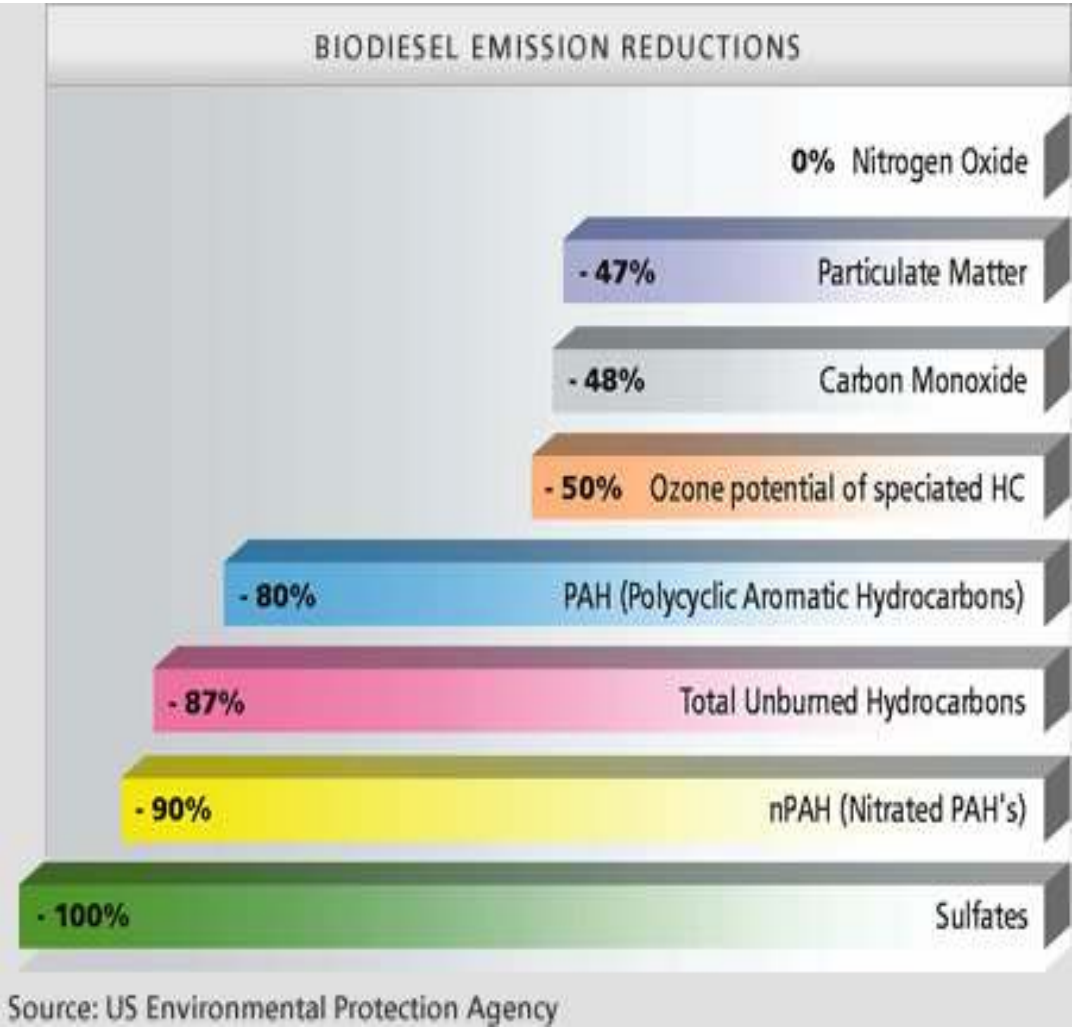



Biodiesel Dry Wash™ Stage
New Zealand Ester Fuels Ltd
Biodiesel Product
New Zealand Ester Fuels Ltd
New Zealand Ester Fuels Ltd
Reaction
Purification
Final Product

Conceptual Plant Layout



Biodiesel - why USE it?



The benefits of Biodiesel are

- ❑Utilizes a renewable resources
- ❑Replaces fossil diesel on a 1:1 basis
- ❑Readily biodegradable, classified as a non-hazardous material
- ❑Significant lower vehicle exhaust emissions (smoke particulate and carbon monoxide)
- ❑No sulphur
- ❑Improved engine lubrication and hence less wear

Provided it is manufactured on a sustainable basis

Biodiesel is a superior fuel that significantly lowers engine exhaust emissions

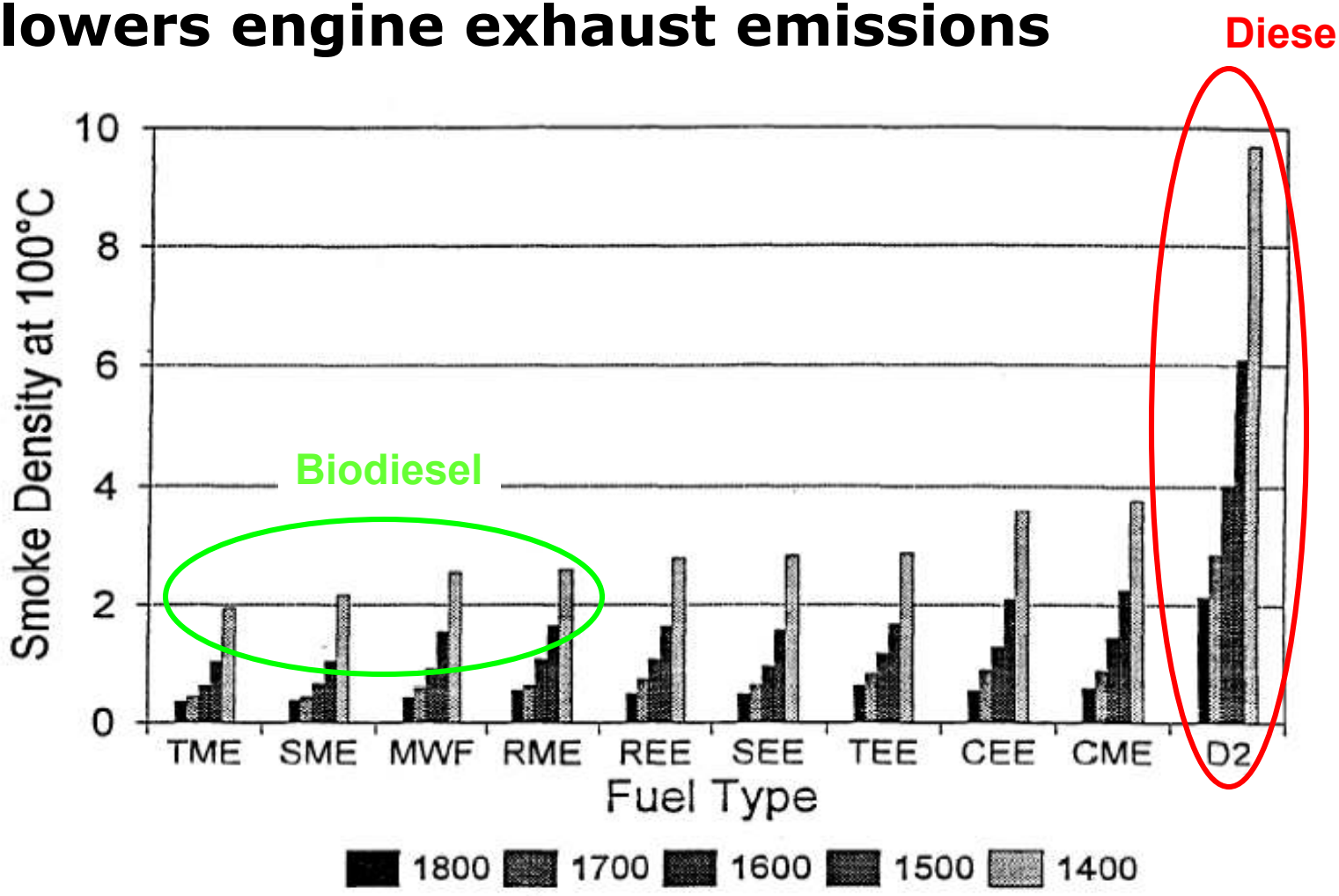
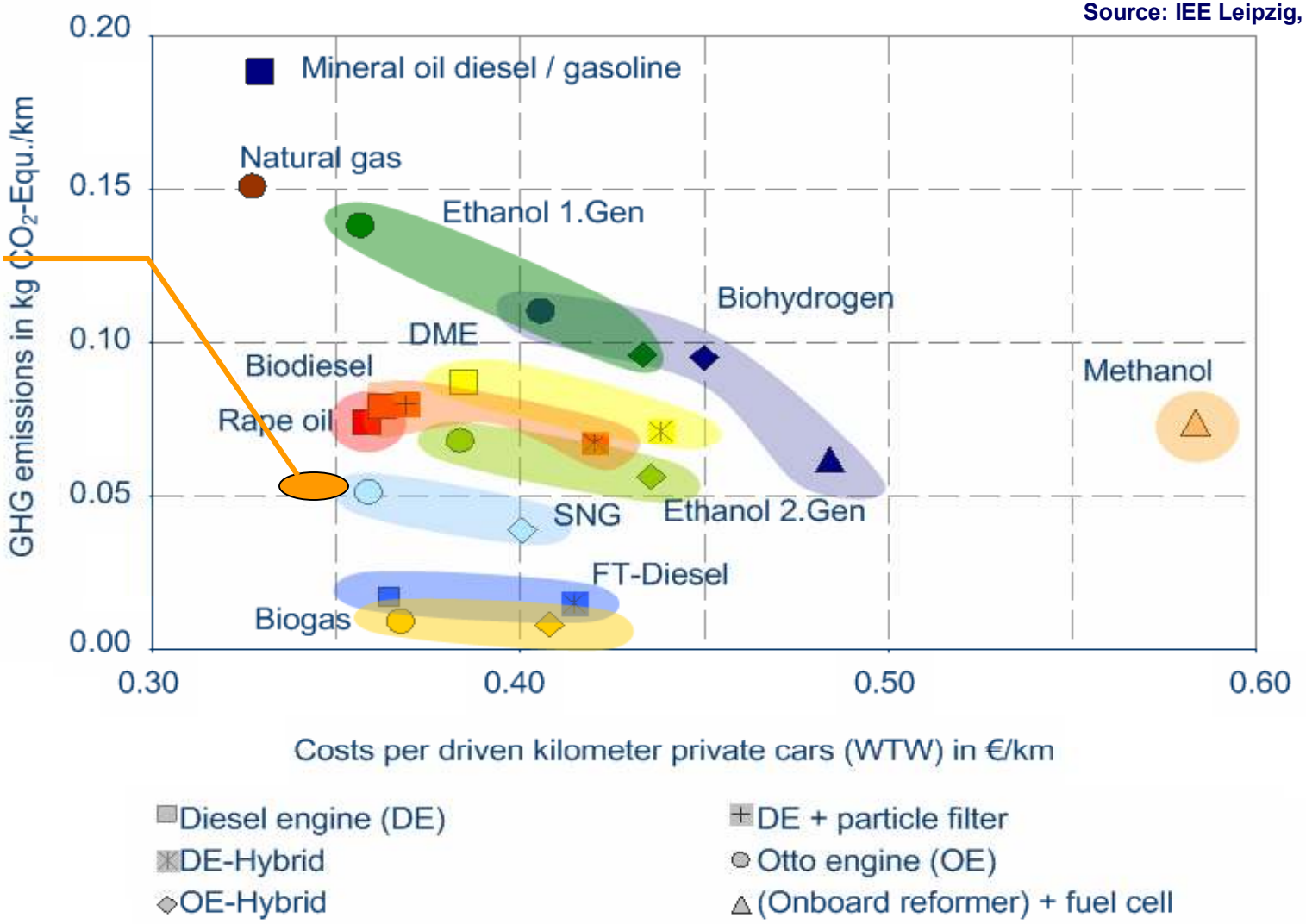


Figure 6. Smoke Density from 9 Biodiesel Fuels and D2 as Measured in a Torque test. Data shown is for 1800 to 1400 RPM.

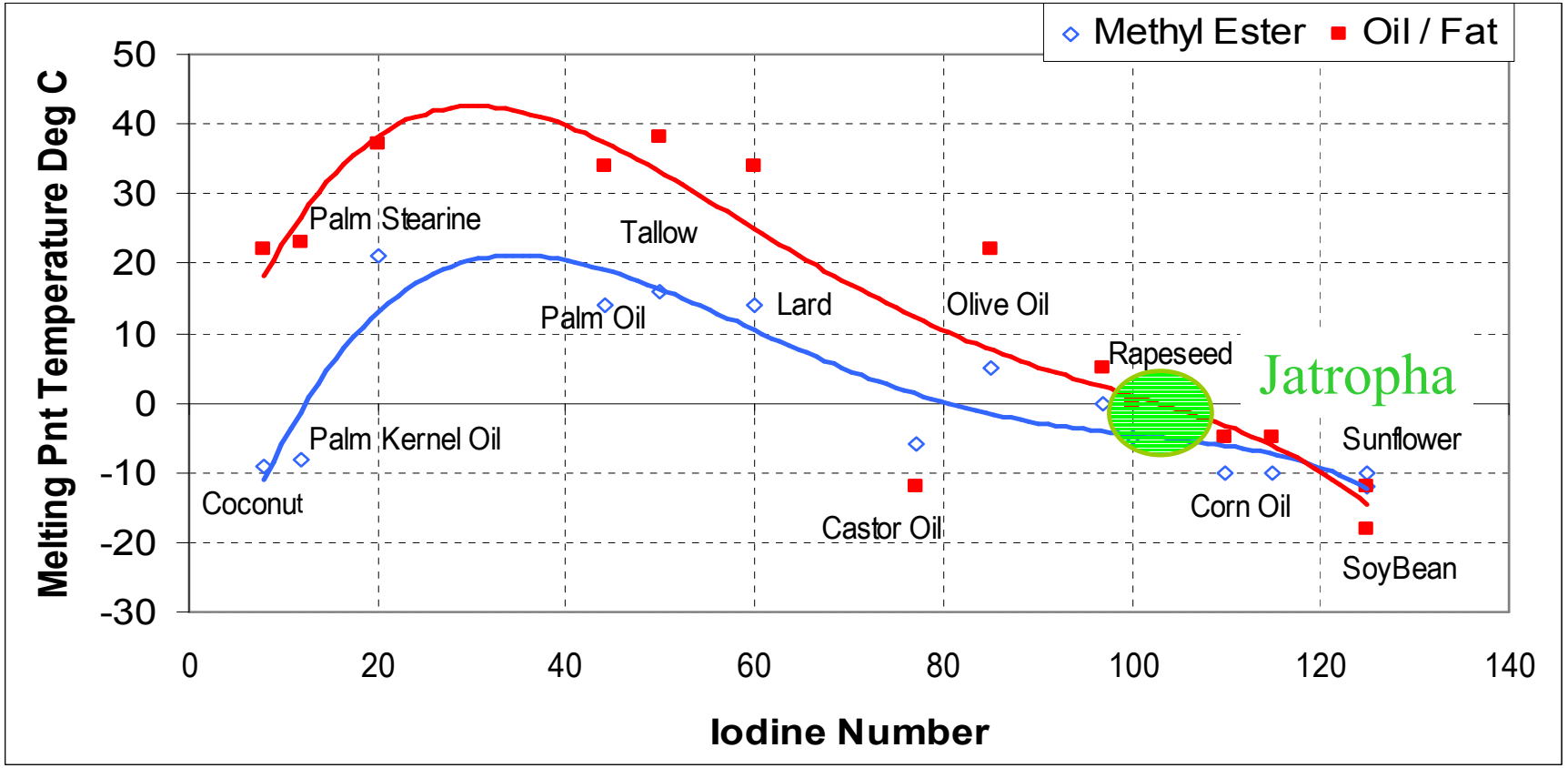
Comparison of technologies
Economic versus environmental aspects

Source: IEE Leipzig, 2007



Biodiesel from Used Cooking Oil

Physical Properties of Common Oils & Fats and Biodiesel



- Pure Biodiesel has inferior cold flow properties to that of normal diesel viz. some types of biodiesel may freeze in the vehicle fuel tank and result in filter plugging problems
- This aspect can be managed by cold flow additives, using suitable blend levels or choice of feedstock.
- B5 to B10 blends have been used successfully in Europe for many years. In the USA a B20 blend is common. There are also numerous successful B100 case studies

Cautionary Notes pertaining to the use of Biodiesel

- Solvent action
- Hydroscopic nature
- Fuel economy
- Power
- Cold Weather Properties
- What could go wrong and why ?

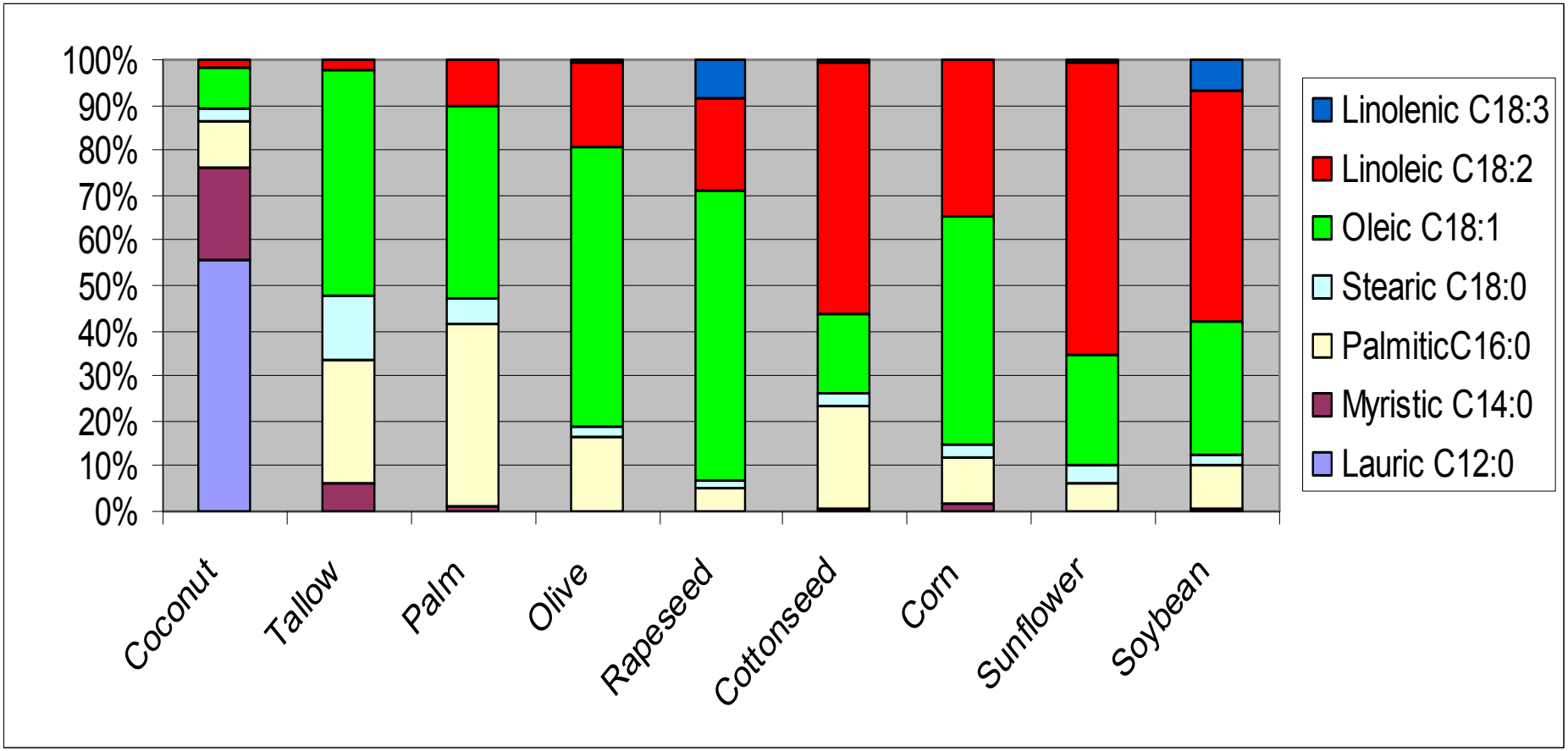
B100 Materials compatibility.doc

properties of fuel table.pdf

Biodiesel_Blends_Above_20_Final.pdf

FIA_Submission.pdf

Fatty Acid composition of common Oils & Fats



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NZ Ester Fuels – the sustainable choice

Process Design & Capability

- Zone 2 design consideration
- Simple rule – No Hot Work
- No fresh water nor trade waste sewer connection
- Rainwater collection system
- Magnesol Dry Wash technology
- Diverse team with broad depth of expertise

….. Biodiesel is a superior fuel that offers some great benefits

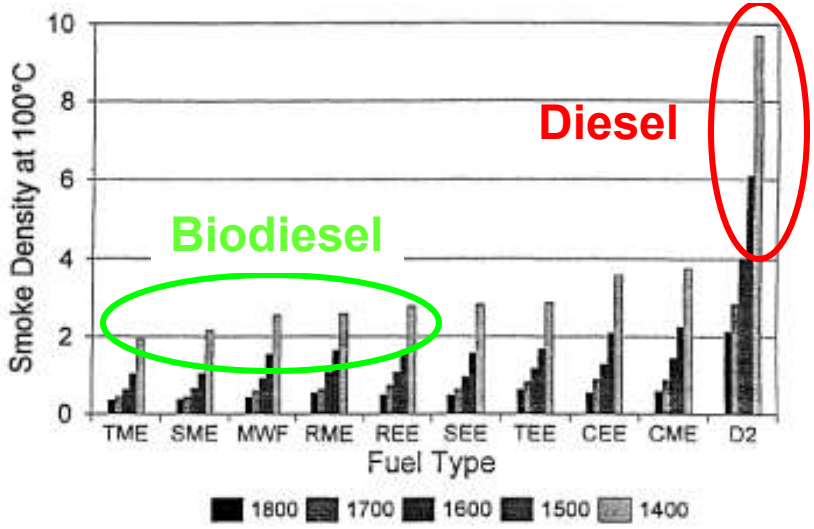


Figure 6. Smoke Density from 9 Biodiesel Fuels and D2 as Measured in a Torque test. Data shown is for 1800 to 1400 RPM.

What do we do ?

-We offer a Used Vegetable Oil collection service to our customers

-We convert this feedstock via a sustainable manufacturing process into quality Biodiesel and other co-products

-We distribute our product to discerning customers with a view to establishing long term relationships with tangible benefits

-Our 2 million litre pa Biodiesel facility is designed to process a range of feedstocks, from Used Cooking Oils to tallow and high FFA materials using novel technologies.

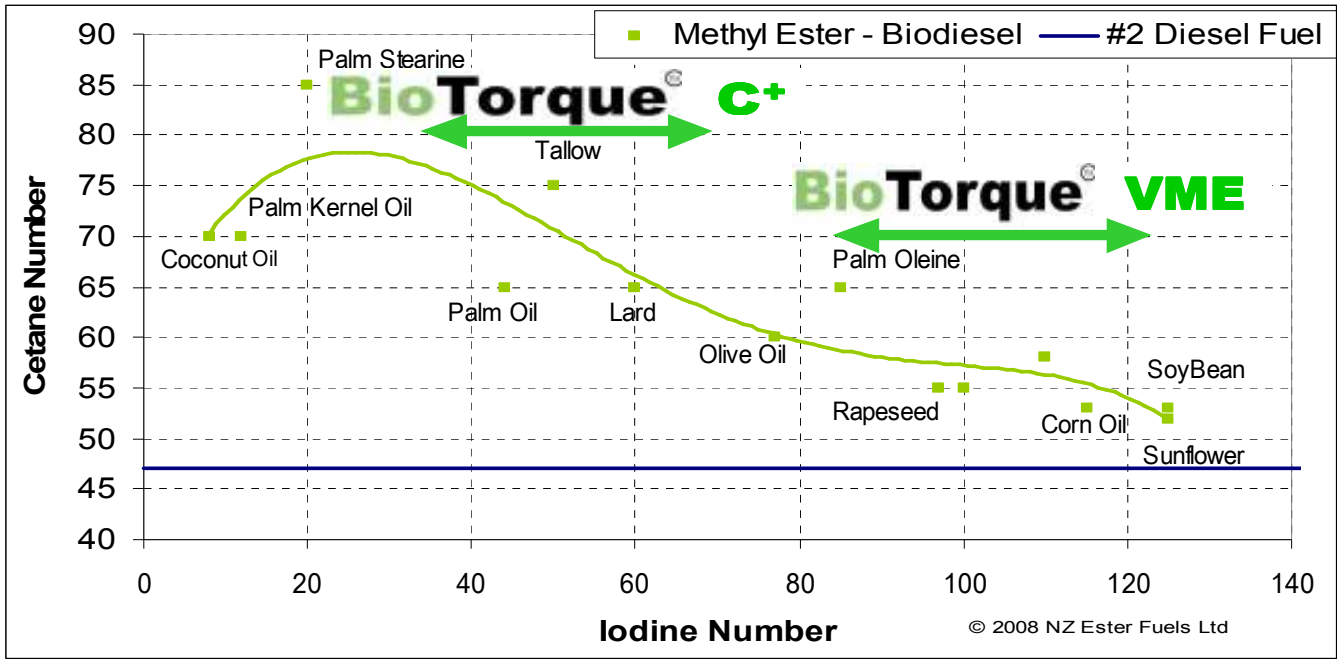
Our Product Offering

BioTorque® VME

A vegetable oil based Biodiesel having very favourable cold flow properties and is well suited for B20 to B100 blend applications in vehicles, stationary motors and burners

BioTorque® C+

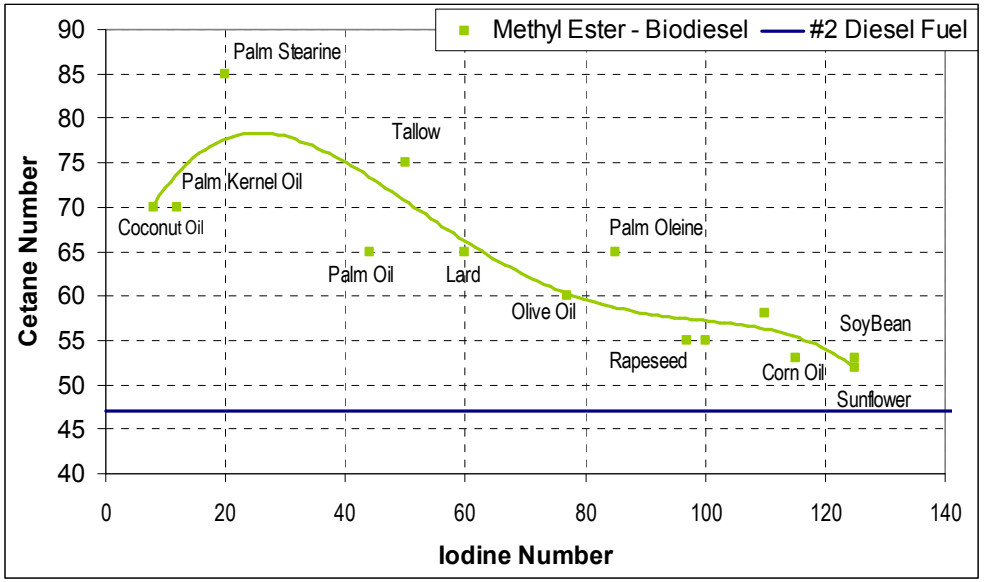
A custom Biodiesel blend of fats & vege oils having a high cetane number and thus well suited for B5 to B20 blend applications in heavy vehicles and stationary equipment

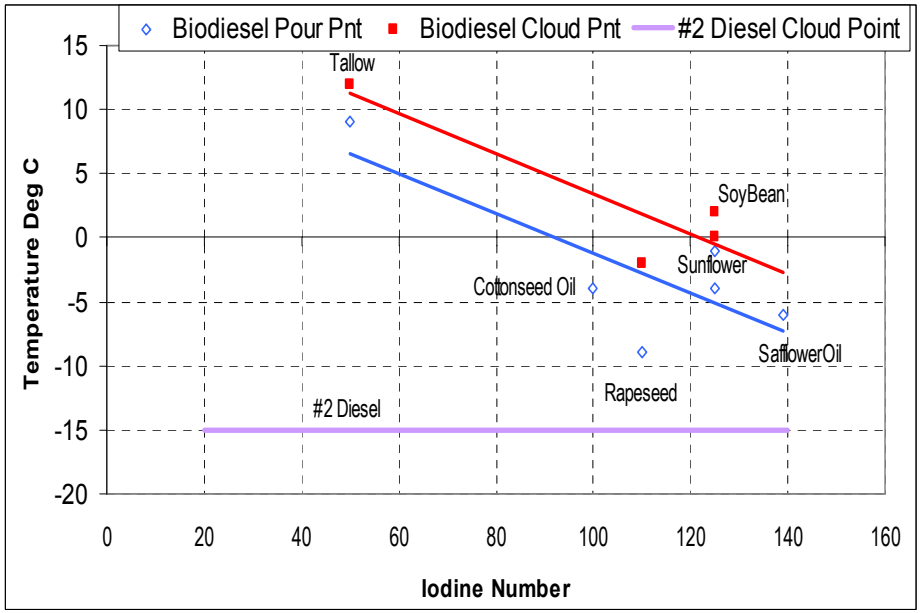


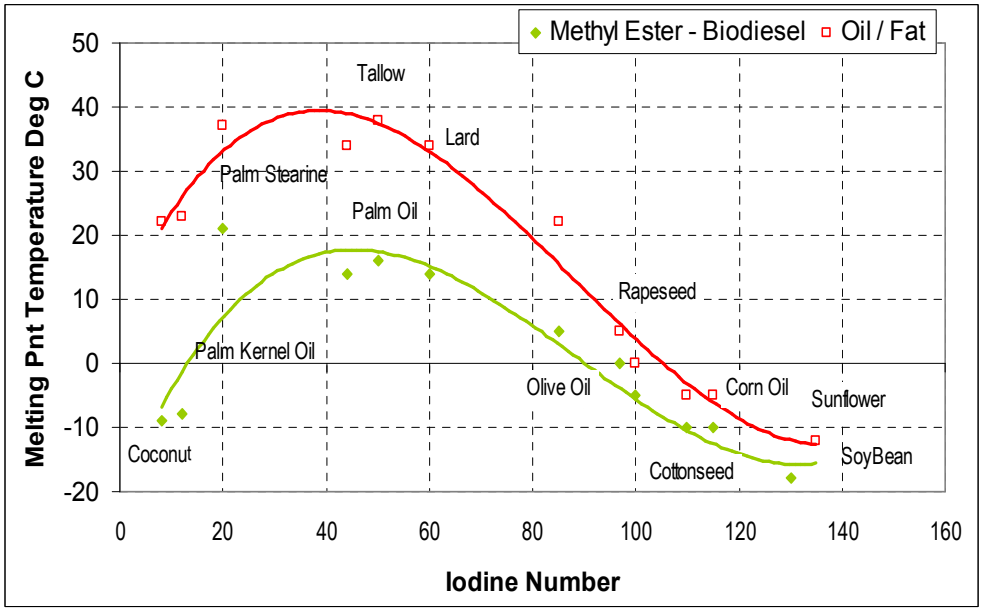
Cetane number is a measure of the ignition quality of fuels. A high cetane number results in good cold start behavior, smoother engine running (lower diesel "knock") and lower particulate emissions due to more complete combustion

Thank you – Any Questions ?

Physical Properties of Biodiesel & Fats/Oils







NZEF project – Dry Wash™ technique

Prepared by Andrei Hamman

MAGNESOL, a magnesium silicate absorbent, is used to purify Biodiesel without the use of any water.

Thus zero liquid process effluent is quite feasible

Unfortunately, some Biodiesel producers put this wash phase down the drain

Table 1. Influence of Processing Stages on Final Biodiesel Quality

B100 Biodiesel Standard NZS 7500:2005			Type of Fats & Oil	Feedstock Preparation	Process Reaction	Wash & Purification
Density 15°C	g/cm³	.86-.9	■		■	
Viscosity 40°C	mm²/s	2-5	■			
Flashpoint	°C	100	■			■
CFPP	°C		■	■	■	■
Cloud point	°C		■	■	■	■
Sulphur	mg/kg	10	■			■
Carbon residue	%mass	0.3 max	■	■		■
Sulphated ash	%mass	0.02 max	■	■		
Water	mg/kg	500 max	■	■		■
Total contamination	mg/kg	24 max	■	■		■
Cu corrosion max	3h/50°C	1	■			■
Oxidation stability	hrs;110°C	6	■	■		■
Cetane number		51	■			
Acid value	mgKOH /g	0.5 max				■
Methanol	%mass	0.2 max				■
Ester content	%mass	96.5		■	■	
Monoglyceride	%mass	0.8			■	
Diglyceride	%mass	0.2			■	
Triglyceride	%mass	0.2			■	
Free glycerol	%mass	0.02 max				■
Total glycerol	%mass	0.25			■	■
Iodine value		140 max	■			
Linolenic acid ME	%mass		■			
C(x:4) & greater unsaturated esters	%mass	12 max	■			
Phosphorus	mg/kg	5 max	■	■		■
Alkalinity	mg/kg	5 max				■
Gp I metals (Na,K)	mg/kg	5 max				■
GpII metals (Ca,Mg)	mg/kg	5 max	■	■		■