Lao
Institute for
Renewable
Energy

Biofuel Series

SOME IMPORTANT FACTS ABOUT BIODIESEL STANDARDS

Report

120529_BFUEL_FR_035

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Vientiane

May 2012

Lao Institute for Renewable Energy

LIRE

REPORT 120529_BFUEL_FR_035

Some important facts about biodiesel standards

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DOCUMENT REVISION HISTORY				
Rev	**Date**	**Description**	**Author(s)**	**Reviewer(s)**
#1	29/05/2012	Internal report	L. Sourya Doré	L. Branlant

About us

LIRE is a non-profit organisation dedicated to the sustainable development of a self sufficient renewable energy sector in the Lao PDR. The institute offers agronomical, technological and socio-economic research services, and works to provide a free public resource of information and advice on the use of renewable energy technologies in Laos. LIRE strives to support the development of the country by exploring commercially viable means to establish renewable energy technologies in rural parts of the country, in areas without connection to the national grid and with little access to technical expertise.

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1. Major auto manufactures require the Biodiesel blends (B5 etc) to be made to a recognised international standard.

From Mitsubishi website:

Bio-diesel & Your Mitsubishi

Bio-diesel is a non-fossil fuel derived from renewable feed-stocks such as canola oil.
Diesel fuel mixed with bio-diesel in varying blends is sold in some areas of Australia. These blends are generally marketed as bio-diesel blends according to the amount of bio-diesel used. These include:

- B5 (95% diesel blended with 5% bio-diesel).
- B100 (100% bio-diesel).

Can I use a Bio-diesel blend in my Mitsubishi Vehicle?

All Mitsubishi diesel-powered vehicles can be used with diesel fuel blended bio-diesel provided it meets the requirements detailed below:

1. Amount of bio-diesel must be below 5% volume concentration (i.e. B5 or less).
2. Quality of bio-diesel must conform to the European Standard EN14214.

2. Recognised international standards

European	**EN 14214**
North America	**ASTM D6751**
Japan	JIS K2390:2008
Thailand	DOEB:2009

EN and ASTM specifications more globally recognised

Biodiesel standards measure over 20 different parameters of the biodiesel

- Parameters variable to the process
- Parameters constant from the feedstock variations in feedstock
- Parameters which can vary due to variations in the feedstock

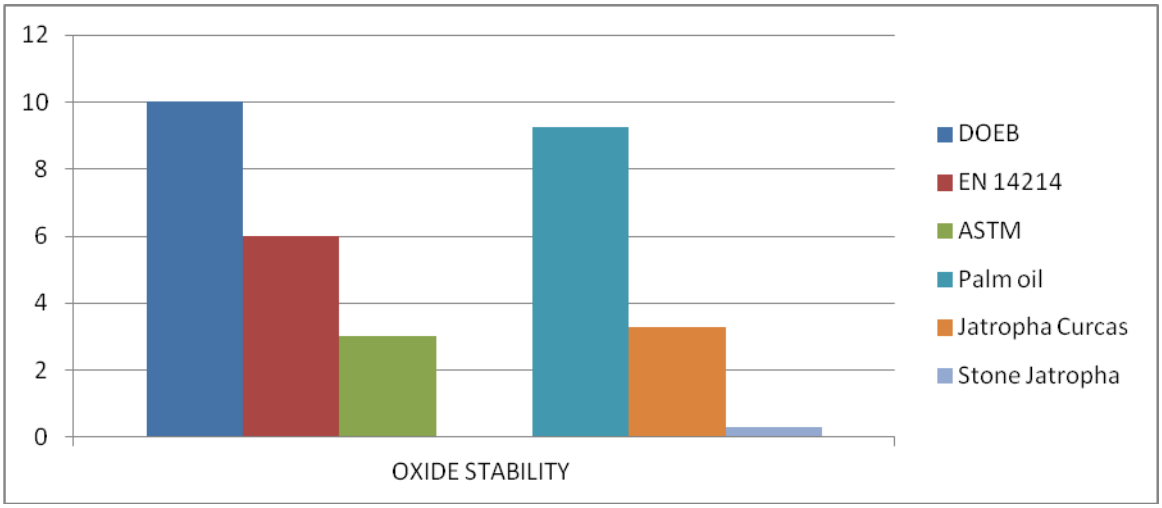
- Some parameters can be modified with further processing some can not

3. Oxide Stability

- Important parameter is Oxide stability, which is a property of the biodiesel relating to 'shelf life' and is a function of the feedstock

	Acid value	Iodine value	Kinematic viscocity	Density	oxidation stability	Sulphated ash	Flash point
	mgKOH/g	mgI2/100g	mm2/s	kg/m3	hours	%	°C
Jatropha Curcas	**0.38**	**101**	**4.34**	**879**	**3.27**	**0.013**	**135**
Vernicia montana	**0.11**	**159.36**	**9.17**	**905**	**0.3**		
Soy	**0.3**	**133**	**4.06**	**881.1**	**>8**		
Canola	**0.15**	**110 - 120**	**4.5**	**885.5**	**>8**		
Moringa oleifera	**0.39**		**4.83**		**3.61**		
Palm oil	**0,5 max**	**54.24**	**4.85**	**853.9**	**9.26**		**120**
Castor oil	**0.01**	**80**	**10.43**	**886**		**0.006**	**160**
Milttia Pinnata/ Pongamia	**0.62**		**4.8**			**0.005**	**150**
Beef tallow	**0.44**	**53.6**	**5**	**870**	**3.5**	**0.009**	**150**
EN14214	**< 0.5**	**120**	**3.5 - 5.0**	**860–900**	**> 6**	**0.02**	**> 101**
ASTM D6751	**< 0.5**	**-**	**1.9 - 6**	**-**	**> 3**	**0.02**	**> 130**

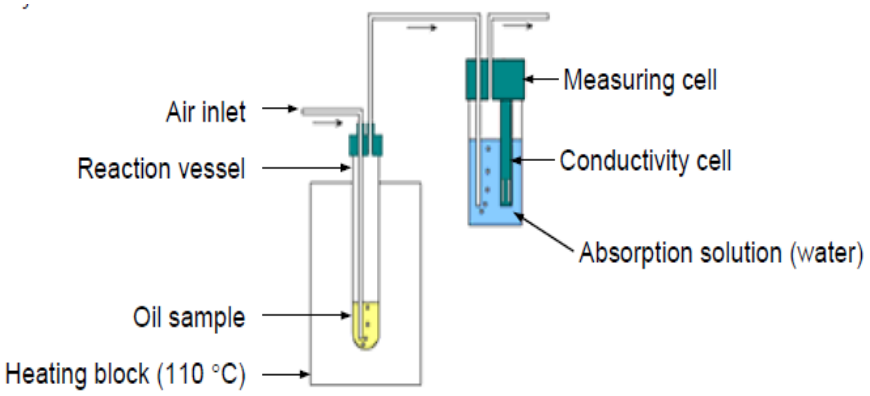
- Both EN 14214 and ASTM D6751 use the same test to measure Oxide stability
- Test is EN 14112 using a 'Rancimat test'
- Oxide stability is a 'function' of the feedstock. Some feedstocks such as Palm oil have good oxide stability, other feedstocks such as Stone Jatropha oil (Tung oil) have very bad oxide stability.
- Oxidation starts as soon as the SVO is exposed to air, the more exposure to air, the higher the oxidation.
- Oxide stability is not a property associated with petro diesel or hydrocracked biodiesel

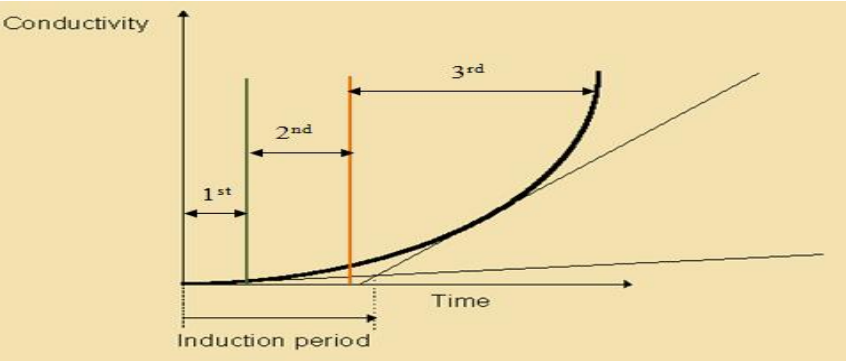


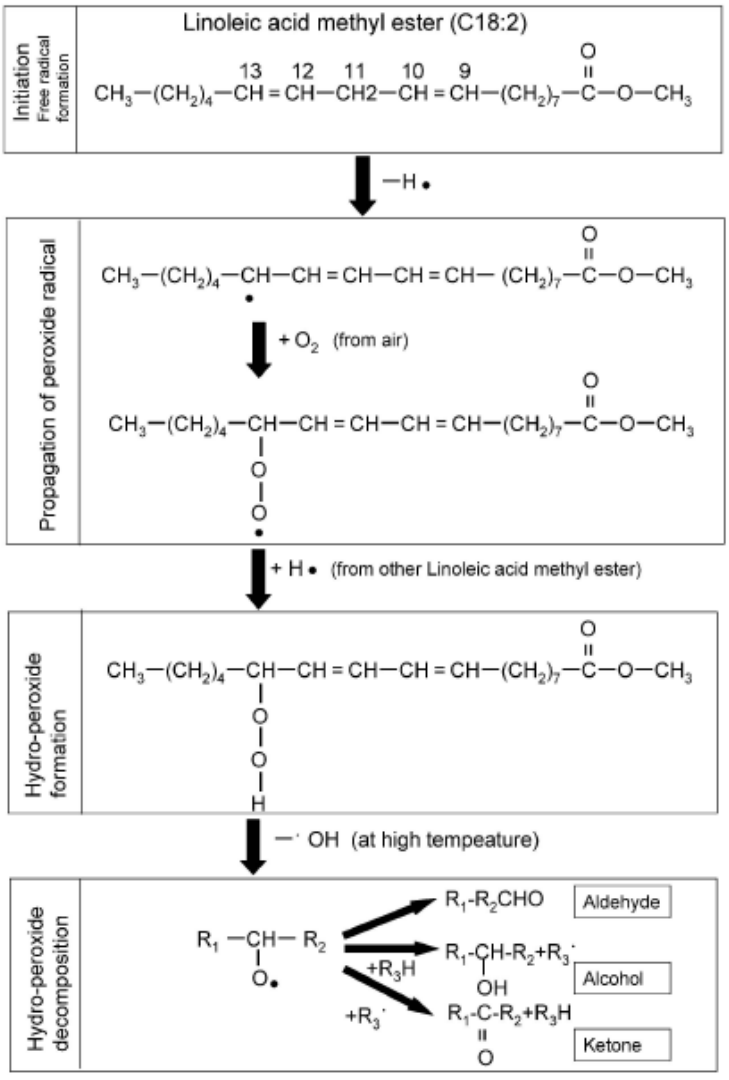
- **Stone Jatropha** is Vernicia Montana, it is not of the Jatropha Genus

4. EN14112 using a Rancimat test

A stream of purified air is pass through the sample which has been brought to a specified temperature. The vapours released during the oxidation process, together with the air, are passed into a flask containing deionize water (D.I water) . The flask contains a conduction cell (electrode) for measuring conductivity. The electrode is connected to the measuring and recording device. It indicates the end of the induction period when the conductivity begins to increase rapidly. This accelerated increase is caused by the dissociation of volatile organic compounds produced during the oxidation process and absorbed in the D.I water.




Conductivity
1st
2nd
3rd
Time
Induction period


Initiation
Free radical formation
Linoleic acid methyl ester (C18:2)
13 12 11 10 9
CH3—(CH2)4—CH=CH—CH2—CH=CH—(CH2)7—C(=O)—O—CH3
—H•
Propagation of peroxide radical
+ O2 (from air)
Hydro-peroxide formation
+ H• (from other Linoleic acid methyl ester)
—· OH (at high tempeature)
Hydro-peroxide decomposition
R1—CH—R2
O•
+R3H
+R3·
R1-R2CHO
Aldehyde
R1-CH-R2+R3·
OH
Alcohol
R1-C-R2+R3H
O
Ketone