



ERIA Energy project: Benchmarking of Biodiesel Fuel Standardization in East Asia



Palm



Jatropha



Coconut



Rapeseed



Soybean

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- ERIA is a new kind of international organization to conduct policy research and make policy recommendations to promote economic integration in East Asia.
- ERIA will intellectually support the role of the ASEAN Secretariat to give shape to regional policy directed by leaders at the East Asia Summit.
- ERIA will make policy recommendations as a “Center of Excellence” in the region in strong partnership with governments in the region, other related international organizations, research institutes and the business community.

Intellectual Contribution for Economic Integration in East Asia



Toward Deepening Integration

- 1 Deepening East Asian Economic Integration (Development of Test-Run Projects)
- 2 Research for the business-related Legal Environment in East Asia
- 3 Project for Internationally Comparable Statistics in East Asia
- 4 Project for Establishment of Secure & Reliable Market in East Asia

Toward Narrowing the Development Gaps

- 5 Project for Development of Regional Production and Logistic Networks in East Asia
- 6 Research for Development of Strategy for CLMV countries

Toward Sustainable Development

- 7 Comprehensive East Asia Environment Policy Review
- 8 Project toward the "Sustainable Automobile Society" in East Asia
- 9 Projects on Energy Efficiency, Biomass and Bio-fuels <Here, we are!>**
- 10 Project for Sustainable and Efficient Fossil Fuel Utilization in East Asia

ERIA Energy Project

**EAS-ERIA BDF Standard:2008
(FY2007-2008)**

**ERIA BDF Trade Handbook:2009
(FY2008-2009)**

**Future Plan XXX
(FY2010 ~ ?)**

- Impurities and the oxidation of biodiesel fuel caused serious influences on engine performance.

Examples of mechanical defects caused by using “inferior biodiesel fuel”



Injector
(source : JAMA)



Fuel tank
(source: Fuel Policy Subcommittee)



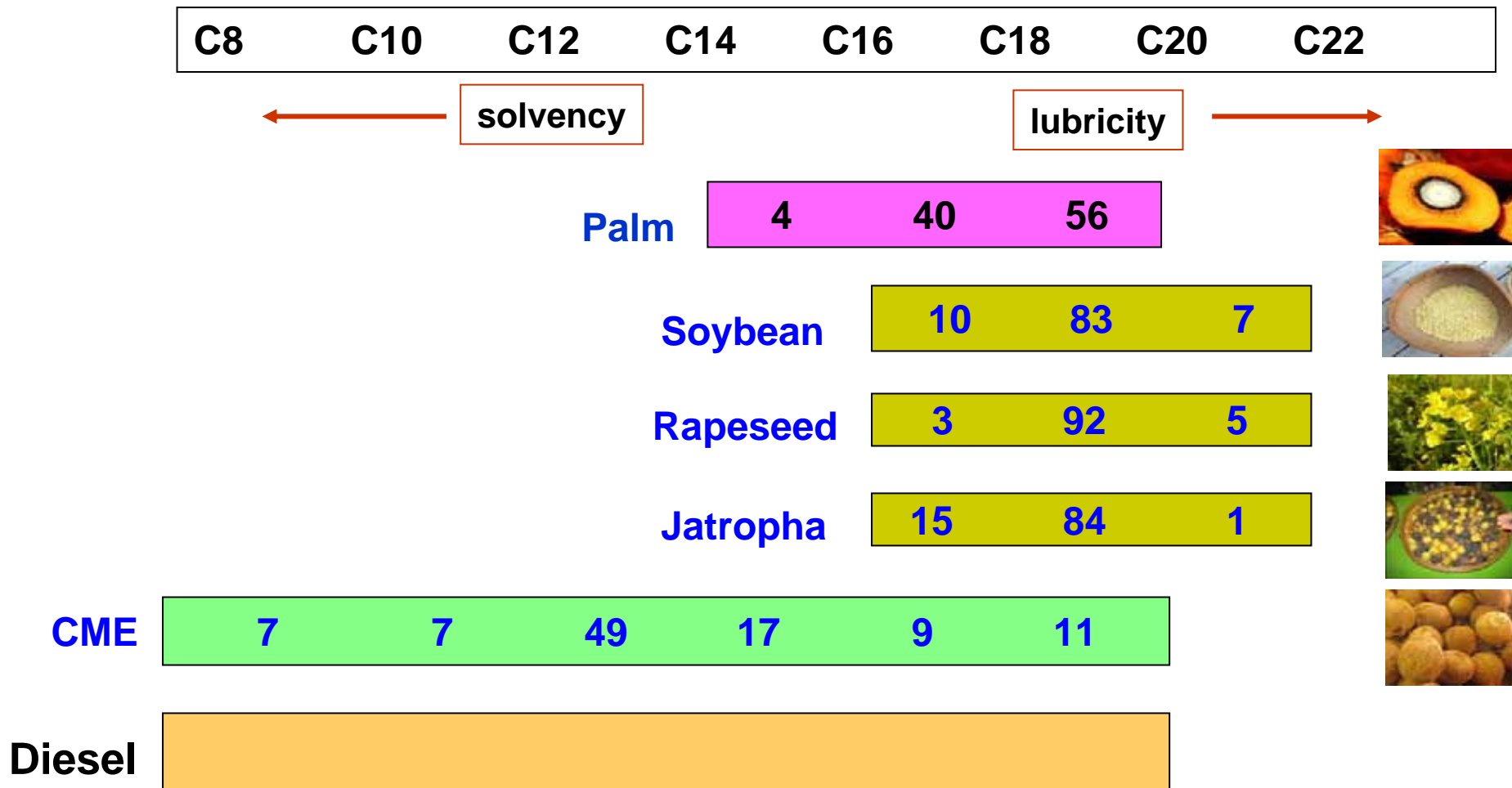
Engine
(source: JAMA)

**It is necessary to use “high-quality biodiesel fuel”
to prevent these troubles.**

**Harmonization of standards in the East Asia region will facilitate
the use and trading of high-quality biodiesel fuel.**

- The different feedstocks have different composition/ level of saturation and therefore different properties

Carbon Chain Profile Of Fatty Acid (By Group) in %



Source: AIPSI

- Based on EU standard (EN14214) and JIS standard
 - Cover a whole of factor in BDF
 - EU's standard: Focusing Rapeseed oil only
 - JIS Standard examined all of the important items

- Consideration of various oils
 - Coconut : Viscosity and Flashpoint
 - Soybean : Iodine number

- Oxidation stability
 - Critical impact on metal fuel tanks
 - Metal tanks are popular for vehicles in Asia
 - Oxidation stability of 10 hours prevented metal tank corrosion in Japanese conformity test

- Polyunsaturated components
 - Mainly included in fish oil
 - Risk of sludge formation
 - Measurement method hasn't developed yet

Items	Units	U.S.	EU	Japan	EAS-ERIA BDF Standard (EEBS):2008
		ASTM D6751-07b	EN14214:2003	JIS K2390:2008	
Ester content	mass%	-	96.5 min.	96.5 min.	96.5 min.
Density	kg/m ³	-	860-900	860-900	860-900
Viscosity	mm ² /s	1.9-6.0	3.50-5.00	3.50-5.00	2.00-5.00
Flashpoint	deg. C	93 min.	120 min.	120 min.	100 min.
Sulfur content	mass%	0.0015 max.	0.0010 max.	0.0010 max.	0.0010 max.
Distillation, T90	deg. C	360 max.	-	-	-
Carbon residue (100%) or Carbon residue (10%)	mass%	0.05 max. -	- 0.30 max.	- 0.3 max.	0.05 max. 0.3 max.
Cetane number		47 min.	51.0 min.	51.0 min.	51.0 min.
Sulfated ash	mass%	0.02 max.	0.02 max.	0.02 max.	0.02 max.
Water content	mg/kg	0.05[vol%] max.	500 max.	500 max.	500 max.
Total contamination	mg/kg	-	24 max.	24 max.	24 max.
Copper corrosion		No.3	Class-1	Class-1	Class-1
Acid value	mgKOH/g	0.50 max.	0.50 max.	0.50 max.	0.50 max.
Oxidation stability	hrs.	3 min.	6.0 min.	(**)	10.0 min. (****)
Iodine value		-	120 max.	120 max.	Reported (***)
Methyl Linolenate	mass%	-	12.0 max.	12.0 max.	12.0 max.
Polyunsaturated FAME (more than 4 double bonds)	mass%	-	1 max.	N.D.	N.D. (***)
Methanol content	mass%	0.2 max. (*)	0.20 max.	0.20 max.	0.20 max.
Monoglyceride content	mass%	-	0.80 max.	0.80 max.	0.80 max.
Diglyceride content	mass%	-	0.20 max.	0.20 max.	0.20 max.
Triglyceride content	mass%	-	0.20 max.	0.20 max.	0.20 max.
Free glycerol content	mass%	0.020 max.	0.02 max.	0.02 max.	0.02 max.
Total glycerol content	mass%	0.240 max.	0.25 max.	0.25 max.	0.25 max.
Na+K	mg/kg	5 max.	5.0 max.	5.0 max.	5.0 max.
Ca+Mg	mg/kg	5 max.	5.0 max.	5.0 max.	5.0 max.
Phosphorous content	mg/kg	10 max.	10.0 max.	10.0 max.	10.0 max.

(*) 130deg.C of flashpoint is available instead of measuring methanol content

(**) Meet diesel oil specification

(***) Need data check and further discussion

(****) Need more data & discussion from 6 to 10 hrs.

Joint Ministerial Statement of 2nd EAS-Energy Ministers Meeting
(August 7, 2008 @Bangkok - Thailand)

Biofuels for Transport and Other Purposes Work Stream

14. The Ministers reaffirmed their strong interests in biofuels, which have great potential in addressing some of the energy security concern, particularly high oil prices while recognizing the need of their compatibility with sustainability. With this in mind, the Ministers endorsed the “Asia Biomass Energy Principles” for production and utilization of environmentally and socially sustainable biomass energy in the region. They welcomed the broad perspectives of the Principles including quality control, respect for natural diversity, minimum impact on food supply, compatibility with environment, stable supply of biomass energy and cost efficiency. The Ministers affirmed to promote production and utilization of biofuels, so long as it does not compromise food security and regional cooperation to this end in line with these Principles, taking into account relevant international debates and activities. The Ministers requested the ERIA to develop a methodology for assessing environmental and social sustainability in production and utilization of biomass taking into account specific regional circumstances. The Ministers also welcomed “EAS-ERIA Bio-Diesel Fuel (BDF) Standards” as a valuable benchmark reference in developing respective national standards of EAS countries.

<http://www.aseansec.org/21853.htm>

Worldwide Fuel Charter (WWFC), B100 Guidelines for B5

Items	Units	EAS-ERIA BDF Standard (EESB):2008	WWFC Guidelines specifications
Ester content	mass%	96.5 min.	<==
Density	kg/m3	860-900	report
Viscosity	mm2/s	2.00-5.00	<==
Flashpoint	deg. C	100 min.	<==
Sulfur content	mass%	0.0010 max.	<==
Carbon residue (100%) or Carbon residue (10%)	mass%	0.05 max. 0.3 max.	0.05 max.
Cetane number		51.0 min.	<==
Sulfated ash	mass%	0.02 max.	0.005 max.
Water content	mg/kg	500 max.	<==
Total contamination	mg/kg	24 max.	<==
Copper corrosion		Class-1	
Acid value	mgKOH/g	0.50 max.	<==
Oxidation stability	hrs.	10.0 min. (***)	<==
Iodine value		Reported (***)	130 max. May unnecessarily preclude certain feed stocks.
Methyl Linolenate	mass%	12.0 max.	
Polyunsaturated FAME (more than 4 double bonds)	mass%	N.D. (***)	1 max.
Methanol content	mass%	0.20 max.	<==
Monoglyceride content	mass%	0.80 max.	<==
Diglyceride content	mass%	0.20 max.	<==
Triglyceride content	mass%	0.20 max.	<==
Free glycerol content	mass%	0.02 max.	<==
Total glycerol content	mass%	0.25 max.	<==
Na+K	mg/kg	5.0 max.	<==
Ca+Mg	mg/kg	5.0 max.	<==
Phosphorous content	mg/kg	10.0 max.	4.0 max.

• Oxidation stability of 10hrs min. applied same as WWFC

↳ **One of important items**

Australia

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India, Cambodia, Laos, Myanmar
(to be confirmed)

Black characters: Members from 2007

Red characters: New members from 2008

Japanese members

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ERIA Energy Project

**EAS-ERIA BDF Standard:2008
(FY2007-2008)**

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**Future Plan XXX
(FY2010 ~ ?)**

(1) Discussions (WG meeting)

- Continuous more discussions - on properties/parameters & limits (e.g. Oxidation Stability, Iodine Number, Polyunsaturated FAME...)
- Determination of how to control biodiesel fuel quality on each country's real market



Jatropha

(2) Feasibility study/site visits

- Potential sustainable feedstocks, incl. inedible materials (jatropha, micro algae, waste biomass ...)
- Utilization technology (incl by-products)

- ### (3) Making a “ERIA Biodiesel Fuel Trade Handbook”, including all results of discussion and feasibility study



5th WG (11-12 November 2008) Jakarta Meeting & Site Visit

Visiting at a *Jatropha curcas* nursery



Visiting at Pakuwon Jatropha plantation site



Contents

1. Introduction
2. Energy Situation in the World
3. Biodiesel Fuel Standardization Activities
 - 3.1 EAS-ERIA Biodiesel Fuel Standard: 2008
 - 3.2 World Wide Fuel Charter - Biodiesel Guideline: March 2009
 - 3.3 Measurement Method of Biodiesel Fuel Characteristics
 - * Comparison of existing testing method.
 - * New method of oxidation stability, “Petro-Oxi” vs “Rancimat”.
4. Biodiesel Fuel Quality
 - 4.1 Oxidation Stability
 - 4.1.1 Introduction
 - 4.1.2 Antioxidant Additives
 - 4.1.3 Upgrading of FAME by hydrogenation
 - 4.2 Fluidity
 - 4.2.1 Introduction
 - 4.2.2 Fluidity Improvers
 - 4.2.3 Other countermeasures: blending with another fuels & winterization

5. Potential of Other Sustainable Feedstock

5.1 Jatropha Curcas L. including toxicity and its countermeasures

5.2 Rice Bran

5.3 Outline of Micro Algae

6. Importance of Quality Control and Market Acceptance

6.1 Fuel Quality Check at the pump

6.2 Quality Control of BDF-Blended Fuels at the Pump in Philippines

6.3 Field Test of BD5, BD20 and BD100 Vehicles in Korea

6.4 Biodiesel Fuel Experience in China

6.5 Community BDF Standard for Agricultural Machine in Thailand

6.6 Guideline for the use of high concentration FAME

7. Current Status of Biodiesel Fuel in East-Asian Countries

❑ Policy and Measures of BDF

❑ Standardization of BDF

7.1 Australia

7.5 Malaysia

7.9 South Korea

7.2 China

7.6 New Zealand

7.10 Thailand

7.3 Indonesia

7.7 Philippines

7.11 Vietnam

7.4 Japan

7.8 Singapore

8. Trade and Market Dynamics of Biodiesel Fuel

9. Future Vision

10. References

Joint Ministerial Statement of 3rd EAS-Energy Ministers Meeting
(July 29, 2009 @Mandalay - Myanmar)

*"11. The Ministers reaffirmed their strong interests in biofuels while ensuring sustainability of supply and compatibility with environment., protecting natural diversity and minimising impact on food security. They appreciated the progress made in the establishment of a biofuels database in East Asia as well as in the development of **ERIA Biodiesel Fuel Trade Handbook** for standardisation, sustainable supply, and wide deployment of biofuels in EAS region. They also welcomed the Guidelines to assess sustainability of biomass utilisation in East Asia. The Ministers encouraged further efforts by the Biofuels Work Stream, including all its components."*

<http://www.aseansec.org/JMS-3rd-EAS-AMEM.pdf>

- Finalizing ERIA BDF Trade Handbook
- Establishing the Biofuel Analysis Center in AIST
- Supporting the Engineers' skill-up in Asia Region
- Contribution to CO2 Reduction in Transportation fields

6th WG (23 February, 2009)

Kota kinabalu Meeting & Site Visit; Yanmar Res. Laboratory



Asia Biomass Office

THE 9th EAS ENERGY COOPERATION TASK FORCE MEETING

24 March 2009, Kuala Lumpur, Malaysia

<http://www.asiabiomass.jp/>



Asia Biomass Energy Researchers Invitation Program

Toru Nagao

Asia Biomass Energy Cooperation

Promotion Office

New Energy Foundation

Tokyo, Japan

Research Field

1. Sustainable Utilization and Production Technology of Biofuel for Asian Countries

Research and development of bioresources and biofuel. In Asia, Biomass conversion process (Bioethanol / BTL production technology) are focused by the total systemization that has both economical and environmental advantages.

2. Quality Standards, Quality Control and Distribution Management of Biofuel

Asian standard of biofuel not giving adverse effect to existing engines are studied to realize stable transportation and industrial infrastructures in Asian countries.

3. Environmental and Socio-Economic Impact Assessment of Biofuel and Energies

Utilization systems best suited to each region are studied for effective use of biomass resources in Asian countries. Aims to develop evaluation technologies including environment problems and socio-economic aspect.

Country	2008		2009	
	Goto's Team	Yoshimura's Team	Goto's Team	Yoshimura's Team
1 Thailand	3	3	2	
2 Indonesia	1	1	3	1
3 Philippines	2			
4 Singapore	1		1	
5 Viet Nam			2	
6 Australia				
7 China				
8 India				
9 NZ				
10 S Korea				
Sub total	7	4	8	1
Total	11		9	

IEA Bioenergy



**IEA Task 40 / ERIA Workshop:
Trade activities and opportunities for liquid and solid
biofuels in the SE Asian region and implications for policy
28-30 October 2009**

Workshop Website: <https://unit.aist.go.jp/nfv/cie/iea-eria-ws/index.html>

Members only (You can get the PDF files.):

ID:ienws2009

Password:joint2009







7th WG (28-29 June, 2009)
Tsukuba Meeting



5th WG (11-12 November, 2008)
Jakarta Meeting

Thank you for your kind attention!

FY2007

- **WG1 (17-18 July 07) @Tsukuba, Japan**
- **WG2 (2-3 Oct 07) @Bangkok, Thailand**
- **WG3 (29-30 Nov 07) @Kyoto/Osaka, Japan**
- **WG4 (21-22 Feb 08) @Manila, Philippines**

FY2008

- **WG5 (11-12 Nov 08) @Jakarta, Indonesia**
- **WG6 (23-24 Feb 09) @Kota Kinabalu, Malaysia**
- **WG7 (28-29 Jun 09) @Tsukuba, Japan**
- **WG8 (27-30 Oct 09) @Tsukuba, Japan**