

Chapter 5

Benchmark Standard of Biodiesel Fuel in East Asia

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5. BENCHMARK STANDARD OF BIODIESEL FUEL IN EAST ASIA

5.1. Concepts of Harmonized Specification

To harmonize the specification of biodiesel fuel, the concepts were discussed as follows.

(1) Based on European standard (EN14214)

The subject of this WG is only focused on FAME (Fatty Acid Methyl Ester) as a biodiesel fuel. EN14214 is recognized as a comprehensive specification for FAME, and so this WG discussed the harmonized specification based on EN14214.

(2) Consideration of various oils

EN14214 is set for rapeseed oil only. There is a need to consider other feedstocks used in the East region, such as:

Coconut: low viscosity and flashpoint

Soybean: Iodine number

(3) Oxidation stability

Oxidation stability has critical impact on fuel tanks made of metals. In Europe, fuel tanks of vehicle are mainly made of plastics or resin. However in Asia, metal tanks are popular for vehicles. Oxidation stability value of “10 hours”, which was recommended by Japan Automobile Manufacturers Association, Inc. (JAMA), is based to prevent metal tank corrosion.

(4) Polyunsaturated FAME

Polyunsaturated FAME was mainly included in fish oil. It accelerates oxidation degradation and sludge production, however, the measurement method has not been developed. Polyunsaturated (more than 4 double bonds) FAME need to be excluded.

5.2. Benchmark Standard of Biodiesel Fuel in East Asia

WG for Standardization of Biodiesel Fuel for Vehicles in East Asia made an “EAS-ERIA Biodiesel Fuel Benchmark Standard”. This is a benchmark standard suggested for member countries for the purpose of harmonizing biodiesel standards in East-Asia.

This standard is for B100 aimed for low level blending with diesel fuel. In case of the use as a final fuel, further considerations are necessary, especially in regards to oxidation stability.

(1) Specification of Benchmark Standard of Biodiesel Fuel in East Asia

Table 5.2.1 shows “EAS-ERIA Biodiesel Fuel Benchmark Standard” compared to other existing standards.

Table 5.2.1 EAS-ERIA Biodiesel Fuel Benchmark Standard compared to other existing standards

Items	Units	U.S.	EU	Japan	EAS-ERIA Biodiesel Fuel Benchmark Standard: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%)	mass%	0.05 max.	-	-	0.05 max.
or		-	0.30 max.	0.3 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.

“JIS K2390:2008” was established based on “JASO M360:2006” in Feb. 20, 2008. These specifications using in JIS K2390:2008 are same values to JASO M360:2006.

(*) 130 deg.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 hours

(2) General comments for the standard

Oxidation stability

More data and discussion is necessary to determine the actual induction period, which will be between 6 to 10 hours. The oxidation stability of biodiesel fuel may vary to the climate and environment. So, engine test is needed to support and set the hours required for the oxidation stability. (In Thailand, tests concerning to the oxidation stability are conducted, right now.)

Cetane number

Normally, in case of which a specification value is set into a standard, the property

has to be measured. However, cetane numbers of FAME are almost always higher than 51. There were some comments about the necessity to set the cetane number into the standard.

(3) Additional opinions

From Indonesia

The proposed specification is considered

- too complicated
- contain too many parameters
- is presumed still not very effective

It requires the measurements of the individual concentration of many substances accused to cause a few deleterious effects of the biodiesel rather than the direct measurements of the tendencies to result in those few deleterious effects.

As such, the proposed standard also neglects the possibility of synergistic and antagonistic interactions between those undesirable substances/contaminants.

If the following two test methods could be developed, these would probably replace such quality parameters as iodine value and concentrations of methyl linolenate, polyunsaturated FAME, mono-, di-, and triglycerides.

- a direct thermal stability test
- a satisfactory oxidation stability test

ERIA Working Group is suggested to cooperatively develop these two stability test methods.

From Philippines

- It is need to provide test methods for the different properties/parameters. As earlier indicated, the Philippines have developed a modified method for tests using the AOCS as base standard.
- It is also need to categorize items/parameters as mandatory or suggested (periodic, for information/record purposes only). This will avoid very high cost for the biodiesel producers because tests shall be required for all mandatory items for all batches of production.