



Indo-Japanese Conference on Fuel Quality and Vehicular Emissions

Bio-Fuels (Bio-ethanol / Bio-Diesel) Specifications in India

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Biofuel usage in Motor Gasoline and Diesel fuel

- Two grades of fuels are marketed to meet requirements of vehicles meeting BS II (Euro II) and BS III (Euro III) emission norms
- Motor Gasoline and Diesel specifications are in line with respective EN specifications with minor modifications
 - Motor Gasoline - IS 2796 : 2008
 - Permits ethanol blending of 5% V/V
 - E10 (10% ethanol blend) is included as a separate grade in 2008
 - Automotive Diesel Fuel - IS 1460 : 2005
 - Permits Biodiesel up to 5%
- Union Cabinet approved National Policy on Biofuel
 - Indicative target of 20% by 2017 proposed for blending of bioethanol and biodiesel proposed



Initiatives of Govt. of India

Blending of Ethanol in Motor Gasoline (MG)

- 5% Ethanol blended Motor Gasoline was mandated in 9 major sugar cane growing states and 4 union territories from 1st Jan 2003
- Ethanol Blending programme could not take off to the full extent for want of adequate supplies
- 5% ethanol blending mandate was modified effective 27th October 2004 - subject to
 - Indigenous ethanol industry making the ethanol available to the oil industry at a price comparable to alternative uses and import parity price of MG
- 5% ethanol blending in MG was extended to 20 States and 4 Union Territories from 1st Nov 2006 subject to commercial viability
 - Requires around 0.56 M KI of ethanol
- 10% ethanol blending in MG is expected to be introduced



Specification of anhydrous Ethanol for use in automotive fuel-IS 15464:2004

- BIS issued anhydrous ethanol specs in 2004
 - Scope: It is denatured and meant for use as such or in admixture with motor gasoline or diesel for automobile engines
- Denaturants used are as prescribed by law
- Denaturants having adverse effect on fuel stability, automotive engines and fuel systems are not permitted
- Purity of ethanol is $\geq 99.5\%$ v/v
- Water content including denaturant and other impurities is $\leq 0.5\%$ v/v

Specification of anhydrous Ethanol for use in automotive fuel-IS 15464:2004

Property	Requirements
Ethanol, %V/V, min	99.5
Specific gravity, max	0.7961
Miscibility with water	Miscible
Alkalinity	Nil
Acidity as acetic acid,mg/l,max	30
Residue, % mass, max	0.005
Aldehyde, mg/l, max	60
Copper, mg/Kg, max	0.1
Conductivity, μ S/m, max	300
Methyl alcohol, mg/l, max	300
Appearance	Clear and bright

Biodiesel Specification- IS 15607: 2005

- It is a fatty acid alkyl (methyl or ethyl) ester intended for use as blend component (up to 20% v) in automotive diesel fuel (IS 1460)
- It was envisaged that vegetable oil from Jatropha & Pongamia seeds would be used for Bio-diesel production
- Specification was finalised considering end use, and requirements of ASTM D 6751-02 and EN 14214-03
- Changes made in ASTM and EN Bio-diesel specifications subsequent to issue of Indian Bio-diesel specifications in 2005

ASTM Biodiesel & Diesel Fuel Specification

- Biodiesel Specifications
 - Definition – Mono alkyl (methyl or ethyl) esters of long chain fatty acids vegetable oils or animal fats (B 100)
 - Scope - Use as a blend component in middle distillate fuels
 - Revised Bio-diesel specifications and published in Oct 2008 as ASTM D 6751-08
 - Changes compared to ASTM D 6751-02
 - Flash point
 - Control on alcoholic content
 - Acid value
 - Controls on Na, K, Ca, Mg
 - Oxidation stability included
 - Cold soak filterability included
- Revised D 975-08, Diesel Fuel Oils (up to 5%v biodiesel)
- Issued new specification D 7467-08 for Diesel Fuel Oil, Biodiesel blend (B6 to B20)



CEN Biodiesel & Diesel Fuel Specification

- **Biodiesel Specifications**

- Biodiesel specifications EN 14214 – 2003 revised in November 2008
- Scope – It is a fatty acid methyl ester intended for use as 100% fuel or as an extender of automotive fuel in diesel engines
- Changes
 - Suitable limits and test methods as a result of EU-funded research programmes “BIOSTAB” and “BIOScopes”
 - Esters
 - Glycerides
 - Stability characteristics

CEN Biodiesel & Diesel Fuel Specification

- **Biodiesel Specifications - Changes (contd....)**
 - Phosphorus limit reduced from 10 to 4 ppm
 - Automatic PMCC test method allowed as an alternate with change of limit from 120 deg C to 101 deg C
 - “Cold flow” requirement not applicable when used as extender
 - Possible replacement of iodine value still under discussion in CEN/TC 19
- **Automotive Diesel Fuel EN 590 – Expected Changes**
 - Provision for using up to 7% v/v of B 100 as an extender as against 5% v/v
 - Other changes like S 10ppm max from Jan 09 addition of ignition quality alternate to CFR etc

Biodiesel Specification- IS 15607: 2005

- Considering its use as a blending component
 - Some parameters are not included
 - Mono-, di- and tri-glycerides
 - Poly unsaturated methyl ester
 - Linolenic acid methyl ester
 - Cold flow properties (CFPP)
 - Iodine value - only to be reported
 - Limits on both methanol and ethanol included



Biodiesel Specification- IS 15607: 2005

Property	Requirement
Ester, %mass, min	96.5
Density at 15 °C, kg/m ³ , max	860-900
KV at 40 °C, cSt	2.5 to 6
Flash point, (PMCC) °C, min	120
Sulphur, mg/Kg, max	50
Carbon residue (Ramsbottom), %mass, max	0.05
Cetane number, min	51
Water, mg/Kg, max	500
Sulphated ash, %mass, max	0.02
Total contamination, mg/Kg, max	24

Biodiesel Specification- IS 15607: 2005

Property	Requirement
Cu strip corr. (3h at 50 °C), max	Class 1
Oxidation stability (110°C),h, min	6
Acid value, mg KOH/g, max	0.5
Iodine value	To report
Methanol, %mass, Max	0.2
Free Glycerol, %mass, max	0.02
Total Glycerol, %mass, max	0.25
Na + K, mg/Kg, max	5*
Ca + Mg, mg/Kg, max	5*
Phosphorous, mg/Kg, max	10.0
Ethanol, %mass, max	0.2

*Being included through amendment

Biodiesel Specification- Comparison

Paramaeter	ASTM	ASTM	BIS	CEN
	D 6751-03	D 6751-08	IS 15607- 05	EN 14214-03
Ester content, %mass, min		-	96.5	96.5
Density at 15 deg C, Kg/m3		-	860-890	860-900
KV at 40 deg C, cSt		1.9-6.0	2.5 - 6.0	3.5 - 5.0
Flash Point (closed cup),deg C, min	130	93	120	120 (#)
Alcohol control		0.2 or Flash point (closed cup) of 130 min		
Methanol Content, %m, max	-		0.2	0.2
Ethanol Content, %m, max		-	0.2	-
Sulphur, ppm, max		15/500	50	10
CCR (10% bottom), %mass, max		0.05 (100%)	0.05(100%)	0.3
Cetane Number, min		47	51	51
Sulphated Ash % mass, max		0.02	0.02	0.02
Water Content ppm, max		500	500	500
Total Contamination ppm, max		-	24	24
Copper Strip 3hr 50 deg C, max		3	1	1
Oxidation Stability at 110 deg C, hrs, min	-	3	6	6
Acid Value, mg KOH/g, max	0.8	0.5	0.5	0.5
Iodine Value, max		-	to report	120

(#) by prEN ISO 3679, different from PMCC

Biodiesel Specification- Comparison

Parameter	ASTM	ASTM	BIS	CEN
	D 6751-03	D 6751-08	IS 15607- 05	EN 14214-03
Linolenic Acid methyl ester, %m, max	-	-	-	12
Poly unsaturated methyl ester % mass, max	-	-	-	1
Monoglyceride content, %m, max	-	-	-	0.8
di-glyceride content, %m, max	-	-	-	0.2
tri-glyceride content, %m, max	-	-	-	0.2
Free Glycerol, %m, max	0.02	0.02	0.02	0.02
Total Glycerol, %m, max	0.24	0.25	0.25	0.25
Sodium And Potassium ppm, max	-	5	5 (*)	5
Calcium and Magnesium ppm, max	-	5	5 (*)	5
Phosphorous content ppm, max	10	10	10	10
90% recovered (atmospheric equivalent temperature), deg C, max	360	-	-	-
Cold Filter Plugging Point, deg C, max	-	-	-	+5 to -20 depending on grade
Cold soak filterability, sec, max	-	360 (200 for ≤ -12 deg C)	-	-

(*) being revised through amendment from original status of "Report"

Summary

- Govt. of India encouraging use of biofuels
 - National Policy on Biofuels approved on 11th Sept 2008
 - Indicative target of 20% by 2017 proposed for blending of bioethanol and biodiesel
- Motor Gasoline and Diesel specifications permit blending of ethanol and biodiesel resp. at 5%
 - E10 included as a separate grade in Motor Gasoline Specifications
- Ethanol and Biodiesel specifications are in place
 - Biodiesel specification was drawn considering that it is intended as a blending component in automotive diesel fuel

Acknowledgements



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Thank You