
Goriva za motorna vozila - Mešanice z dizelskim gorivom z visoko vsebnostjo FAME (B11 - B30) - Osnove za zahtevane parametre, postavitev mejnih vrednosti in njihovo določevanje

Automotive fuels - High FAME (B11 - B30) diesel fuel blends - Background to the parameters required and their respective limits and determination

Kraftstoffe für Kraftfahrzeuge - Hochgehältige FAME (B11 - B30) Diesel Brenstoffmischungen - Hintergrund den geforderten Parametern und ihre respective Limiten und Beprüfung

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ICS 75.160.20

English Version

**Automotive fuels - High FAME diesel fuel blends (B11 - B30) -
Background to the parameters required and their respective
limits and determination**

Carburants pour automobiles - Mélanges de carburants
diesel ayant une teneur en EMAG élevée (B11 - B30) -
Contexte de l'élaboration des caractéristiques requises, de
leurs déterminations et de leurs limites respectives

Kraftstoffe für Kraftfahrzeuge - Dieselmotormischungen
mit hohem FAME-Anteil (B10 - B30) - Hintergrund zu den
geforderten Parametern und deren jeweiligen Grenzwerten
und Bestimmungen

This Technical Report was approved by CEN on 15 June 2013. It has been drawn up by the Technical Committee CEN/TC 19.

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Foreword

This document (CEN/TR 16557:2013) has been prepared by Technical Committee CEN/TC 19 "Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin", the secretariat of which is held by NEN.

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CEN/TR 16557:2013 (E)

1 Scope

This Technical Report provides background information to the deliberations within CEN that led to establish a specification for blending from more than 10 % (V/V) up to 30 % (V/V) of fatty acid methyl ester (FAME) in diesel fuel to be used in captive fleet application for designated vehicles. It gives guidance and explanations to the producers, blenders, marketers and users of high FAME diesel blends (B11 to B30).

The sole designation “Bxx” refers to a FAME-diesel blend where “xx” is the specific FAME content in volume percentage. The connotation “Byy fuel” is used in this document for a fuel with a defined range of FAME allowed and having “yy” volume percentage of FAME content as the maximum of that range.

NOTE For the purposes of this document, the term “% (m/m)” and “% (V/V)” are used to represent the mass fraction, μ , and the volume fraction, φ , respectively.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 116:1997, *Diesel and domestic heating fuels - Determination of cold filter plugging point*

EN 590, *Automotive fuels — Diesel — Requirements and test methods*

EN 12662:2008, *Liquid petroleum products - Determination of contamination in middle distillates*

EN 14078:2009, *Liquid petroleum products - Determination of fatty acid methyl ester (FAME) content in middle distillates - Infrared spectrometry method*

EN 14214, *Liquid petroleum products - Fatty acid methyl esters (FAME) for use in diesel engines and heating applications - Requirements and test methods*

EN 15195:2007, *Liquid petroleum products - Determination of ignition delay and derived cetane number (DCN) of middle distillate fuels by combustion in a constant volume chamber*

EN 15751:2009, *Automotive fuels - Fatty acid methyl ester (FAME) fuel and blends with diesel fuel - Determination of oxidation stability by accelerated oxidation method*

EN 16091:2011, *Liquid petroleum products - Middle distillates and fatty acid methyl ester (FAME) fuels and blends - Determination of oxidation stability by rapid small scale oxidation method*

EN 16329:2013, *Diesel and domestic heating fuels - Determination of cold filter plugging point - Linear cooling bath method*

EN ISO 2719:2002, *Determination of flash point - Pensky-Martens closed cup method (ISO 2719:2002)*

EN ISO 3104:1996, *Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity (ISO 3104:1994)*

EN ISO 3170, *Petroleum liquids - Manual sampling (ISO 3170)*

EN ISO 3171, *Petroleum liquids - Automatic pipeline sampling (ISO 3171)*

EN ISO 3405:2011, *Petroleum products - Determination of distillation characteristics at atmospheric pressure (ISO 3405:2011)*

EN ISO 3675:1998, *Crude petroleum and liquid petroleum products - Laboratory determination of density - Hydrometer method (ISO 3675:1998)*

EN ISO 5165:1998, *Petroleum products - Determination of the ignition quality of diesel fuels - Cetane engine method (ISO 5165:1998)*

EN ISO 6245:2002, *Petroleum products - Determination of ash (ISO 6245:2001)*

EN ISO 12185:1996, *Crude petroleum and petroleum products - Determination of density - Oscillating U-tube method (ISO 12185:1996)*

EN ISO 12937:2000, *Petroleum products - Determination of water - Coulometric Karl Fischer titration method (ISO 12937:2000)*

EN ISO 20846:2011, *Petroleum products - Determination of sulfur content of automotive fuels - Ultraviolet fluorescence method (ISO 20846:2011)*

EN ISO 20884:2011, *Petroleum products - Determination of sulfur content of automotive fuels - Wavelength-dispersive X-ray fluorescence spectrometry (ISO 20884:2011)*

3 Background of the High FAME diesel blends (B11 - B30) taskforce work

At the 2009 plenary meeting, CEN/TC 19 decided to register the following preliminary work item as described in its active programme of work: *Automotive fuels — High FAME diesel blends (B10 - B30) — Requirements and test methods*, under responsibility of WG 24, with the scope to finalise its feasibility study in time to allow WG 24 to report to TC 19 in order to make a final decision on activation at 2011 plenary meeting at the latest on the basis of existing related national standards and to consider and solve the comments as presented by SUTN during the PWI ballot.

An automatic link has been established between the diesel fuel and FAME standards (EN 590 and EN 14214 respectively) and the High FAME diesel blends standard so that modifications to one will be coherent with the other.

Captive fleets are in general considered as a group of vehicles that possess specific supply logistics, their own dedicated facilities for storage and distribution and adequate maintenance of the vehicles. As the definitions are widespread around Europe and the group does not wish to contradict specific legal situations in some countries, the technical definition of captive fleets is left to the national standardization bodies and will be required.

The provisional scope would thus read: "This European Standard specifies requirements and test methods for marketed and delivered high FAME (B30) fuel for use in diesel engine vehicles designed or subsequently adapted to run on high FAME (B30) fuel. High FAME (B30) fuel is a mixture of more than 10 % (V/V) up to 30 % (V/V) fatty acid methyl esters (commonly known as FAME) complying to EN 14214 and automotive diesel fuel complying to EN 590. For maintenance and control reasons it is to be used in captive fleets that are intended to have an appropriate fuel management."

The group agreed that the national captive fleet description requirement needed to be required in a point in the text.

4 Record of the work to date

4.1 Context

The European Commission is following a policy of promoting renewable energy use in Europe, and to this end is encouraging the extension of automotive diesel fuel with a proportion of renewably-sourced fatty acid methyl ester (referred to in this document as FAME).

In order to facilitate a transparent and stable market in FAME, it is necessary to establish a higher FAME diesel blend (B11 - B30) standard for Europe that will ensure a uniform high quality fuel for problem-free blends from more than 10 % (V/V) up to 30 % (V/V) of FAME in Diesel fuel to be used in captive fleet application for designated vehicles.

To this end, the Comité Européen de Normalisation (CEN) Technical Committee 19, responsible for Automotive Fuels Standards, has accepted a preliminary work item on its programme to be developed in Working Group 24, responsible for Automotive Diesel fuel management. The intention of CEN/TC 19 was to finalise a feasibility study in time to allow WG 24 to report to the Technical Committee in order to make a final decision on activation at 2011 plenary meeting at the latest to define a CEN standard based on the publication of EN 14214 and EN 590, also taking into account the developments in France[1] and Czech Republic[2]. Discussion in WG 24 had given indications that there were still test method questions to solve and thus national initiatives were not halted.

CEN/TC 19, having considered the proposal for a preliminary new work item, as documented in N 1441 and supported by WG 24 decided to register "CEN/TR, Automotive fuels – High FAME diesel blends (B10 - B30) - Requirements and test methods" in its active programme of work, under responsibility of WG 24. The scope of this work to finalise the feasibility study in time to allow WG 24 to report to CEN/TC 19 in order to make a final decision on activation at 2011 plenary meeting at the latest on the basis of existing related national standards and to consider and solve the comments as presented by SUTN during the ballot. The Task Force B30 was created.

The idea of CEN/TC 19 was that the standard should specify requirements and test methods for marketed and delivered high FAME (B30) fuel for use in diesel engine vehicles designed or subsequently adapted to run on high FAME (B30) fuel. High FAME (B30) fuel is a mixture of nominally 30 % (V/V) fatty acid methyl esters (commonly known as FAME) complying to EN 14214 and automotive diesel fuel complying to EN 590. HVO and XTL products can be included in this fuel if the final automotive diesel fuel part complies to EN 590.

B30 fuel is a mixture of nominally 30 % FAME and 70 % diesel fuel, but also including the possibility of having different seasonal grades. For maintenance and control reasons the high FAME (B30) fuel is to be used in captive fleets that have appropriate fuel management practices, for example high fuel turnover.

In 2011, the WG 24 chose to merge the TF FAME and the B30 TF. The new TF had been given the preparation work for EN 14214 revision and the task to continue the development on B30 fuel.

This Technical Report is based on the final report carried out by this B30 TF towards establishing the feasibility to reach a European standard for High FAME diesel blends (B11 - B30). On the basis of the report, CEN/TC 19 decided in November 2012 to activate the work item for a CEN specification for the fuel itself.

4.2 The Task Force

CEN/TC 19/WG 24 decided to convene a task force and to begin studying the feasibility to draft a high FAME diesel blends (B10 - B30) standard. A call was made to the industries concerned by the mandate for experts to participate in the B30 TF. After a first report to WG 24, it was felt that many discussions on

FAME product had overlapping technical content. It was decided in 2011 to merge the TF B30 with the existing TF FAME. The experts that have contributed to the work over the years are listed in Table 1.

Table 1 — Membership of the taskforce

Surname	Christian name	Company or Organisation	Member State
1. Alfredsson	Sara	Scania	Sweden
2. Alvarez	Beatriz	APPA Biofuels	Spain
3. Andreasen	Kjær	Daka Biodiesel Production	Denmark
4. Baldini	Luca	ENI	Italy
5. Balfour	Graham	Infineum	CEFIC-ATC
6. Baumgarten	Jens	Esso Deutschland	Germany
7. Borkes	Ruben	BP	Netherlands
8. Burrows	Aubrey	Downstream Fuel	United Kingdom
9. Buttle	Dermot	EBB	EBB
10. Cajete Garcia	Reyes	Acciona Biocombustibles	Spain
11. Catalano	Salvatore	SGS Italia	Italy
12. Roudot	Florence	AFNOR	France
13. Chrysafi	Sofia	Ford Motors Europe	United Kingdom
14. Costenoble	Ortwin	TF secretary	Netherlands
15. Crépeau	Gérald	PSA Peugeot Citroen	France
16. Diaz Garcia	Carlos	Repsol	Spain
17. Doermer	Wolfgang	BP	Germany
18. Elliott	Nigel	WG 24 convenor	United Kingdom
19. Engelen	Benoit	Total	Belgium
20. Eriksson	Henrik	Scania	Sweden
21. Faedo	Davide	SSC	Italy
22. Falciola	Michele	Assocostieri	Italy
23. Feuerhelm	Thomas	DIN-FAM	Germany
24. Fiolet	Gerard	Shell Nederland	Netherlands
25. Fischer	Juergen	ADM Research	Germany
26. Gomez Guenca	Felix	CLH	Spain
27. Gomez Martinech	Jose	CEPSA	Spain
28. Guirao Galinos	Beatriz	CLH	Spain
29. Guizouarn	Kristell	Diester Industries	France
30. Guizouarn	Gwenael	Diester Industries	France
31. Jackson	Alister	ExxonMobil	United Kingdom
32. Jeuland	Nicolas	IFP	France
33. Keasey	Alan	Biofuels Corp	United Kingdom

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Surname	Christian name	Company or Organisation	Member State
34. Kleijntjens	Rene	Argos Oil	Netherlands
35. Kupfermunz	Alain	Cargill	Belgium
36. Kvinge	Frode	Statoil	Norway
37. Lacey	Paul	Delphi Systems	United Kingdom
38. Lois	Evipidis	Technical University of Athens	Greece
39. Macrae	Colin	DFA	United Kingdom
40. Manuelli	Pascal	Total	France
41. Marcos	Jose Luis	Abengoa Bioenergy	Spain
42. Marthinsen	Geir	Exxon Mobil	Norway
43. Mittelbach	Martin	University of Graz	Austria
44. O'Connell	Adrian	EBB	EBB
45. Papachristou	Chariklia	Hellenic Petroleum	Greece
46. Pidot	Ludivine	IFP Energies Nouvelles	France
47. Schuermans	Kurt	Chevron	Netherlands
48. Scott	Mike	Argent Energy	United Kingdom
49. Stikans	Indulis	Bio-VENTA	Latvia
50. Stopper	Ingrid	OMV	Austria
51. Tamm	Ebba	SPBI Service	Sweden
52. Theeuwissen	Jan	ExxonMobil	Belgium
53. Ullmann	Jörg	Robert Bosch	Germany
54. Verdonck	Raf	OLEON Biodiesel	Belgium
55. Verschaeve	Michel	BNPé	France
56. Woldendorp	Jacco	Shell Global Solutions	Netherlands

The experts have discussed B30 fuel on the following occasions:

- 1) 21 May 2010, Brussels, 1st meeting of the B30 TF
- 2) 1 October 2010, Brussels, 2nd meeting of the B30 TF
- 3) 10 January 2011, Hamburg, 3rd meeting of the B30 TF
- 4) 1 March 2012, Paris, 20th meeting of the TF FAME
- 5) 9 October 2012, Paris, 21st meeting of the TF FAME
- 6) 26 March 2013, Brussels, 22nd meeting of the TF FAME

4.3 Planning

The planning was firstly for the B30 TF to finalise the scope and a feasibility study in time to allow WG 24 to report to CEN/TC 19 in order to make a final decision on activation at 2011 plenary meeting at the latest. For the renewed TF FAME, the planning was to establish a specification proposal to WG 24 for blending from more than 10 % (V/V) up to 30 % (V/V) of FAME in diesel fuel to be used in captive fleet application for designated vehicles.

5 The feasibility study

5.1 Background

Worldwide, energy policy makers are increasingly keen to move away from petroleum based fuels to more diverse and renewable sources of energy for reasons of environmental protection, energy security and continued economic development. As an alternative for diesel fuel many countries use fatty acid methyl ester (FAME) as a biologically based alternative. With this "biodiesel" good experience has been observed and it has resulted in many specification standards, of which EN 14214 (now in its third revision) is the best example. It is a specification fit for all type of diesel engines, where especially the demands of light-duty, Euro V and beyond engines scrutinise the biological product.

Investigation is done towards specifying a FAME quality that could be used at 10 % level (B10), but much higher levels for non-adapted light duty engines are not to be expected soon.

From a sustainability perspective, it would be beneficial to use much higher levels of FAME. In addition, use of FAME blends above 20 % would allow the oil industry to compensate for the supply of regular diesel or low blends for specific cases (protection grade, marine applications) or periods of the year. Especially, now that the EU directives require them to lower overall greenhouse gas emissions (FQD, 2009/30/EC[3]) and to reach 10 % of energy from renewable sources in transport in 2020 (RED, 2009/28/EC[4]).

About the certification fuels, the Euro V certification fuel for heavy duty vehicles is not allowed to contain any FAME at all. A truck manufacturer can, by adapting seals and tubing materials, service intervals, filter change intervals etc., make it possible to run the vehicle on B30 (or even up to B100) without bigger technical risks. This has been done by several European truck and bus manufacturers. With higher FAME-contents, it is possible that the legal limits for NOx emissions will not be fulfilled. Nevertheless, with the Euro V certification fuel for heavy duty vehicles "legal NOx limits are likely not to be met when B30...B100 is used". Moreover, the Euro VI certification diesel fuel shall contain 6 % - 7 % FAME. In addition, there is new fuel provision in Euro VI legislation: the so called "Universal fuel type-approval". This means that if a vehicle manufacturer wants to approve other fuels/ fuel blends (for instance B30...B50...B100), the full legal compliance shall be demonstrated also for this new fuel.

Some countries already have quality specification in place for B20 under ASTM, B30 in France[1] or even B31 in the Czech Republic for specific tax reasons[2]. Some car manufacturers already supply heavy or light duty diesel vehicles running on B20 fuel or B30 fuel in some EU countries, with particular lube and maintenance specifications. Moreover, some trucks fleet use B15 fuel.

However, a wide range of blends would make matters really difficult in view of fuel consumption and guarantee emissions. For these reasons, in order to find consensus, the group decided to work on a high FAME diesel blends (B11 - B30) and recommended to WG 24 to activate the work item as an EN specification for B11 - B30 with at least two grades of choice: a B20 fuel grade (11 % (V/V) – 20 % (V/V)) and a B30 fuel grade (21 % (V/V) – 29,5 % (V/V)). The taskforce had no specific preference whether the two grades should be presented in a single standard with national choices on the basis of climate or engine warranties, or in two separate standards for more clear pump labelling.

The TF agreed to have a maximum content of FAME of 29,5 % (V/V) as a start. This to avoid requesting a change of the definition of diesel in the FQD, or a change of the definition of CN-code via DG Taxud. This option is however still open to CEN.

On the other hand, DG CLIMA had set the maximum in the past to address the negative impact on NOx of higher density. This would need to be assessed from the environmental perspective. The convenor drafted a letter together with the CEN/TC 19 Chairman in order to convince the EC about the need to allow adaptation of the density requirements.

Due to the fact the scope for this B30 fuel is for captive fleet usage, i.e. a niche market, and the wish of car and truck manufacturer is to have low range FAME content to ensure emission regulations, and to