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Automotive fuels — Ethanol (E85) automotive fuel — Background to the parameters required and their respective limits and determination

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National foreword

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Automotive fuels - Ethanol (E85) automotive fuel - Background to the parameters required and their respective limits and determination

Carburants pour automobiles - Essence pour automobile Ethanol (E85) - Informations sur les paramètres requis et leurs limites et détermination respectives

Kraftstoffe für Kraftfahrzeuge - Ethanol-Kraftstoff (E85) - Hintergrund der geforderten Parameter und deren jeweiligen Grenzwerte und Bestimmung

This Technical Report was approved by CEN on 21 May 2011. It has been drawn up by the Technical Committee CEN/TC 19.

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Foreword

This document (CEN/TR 15993:2013) 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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This document supersedes CEN/TR 15993:2010.

The original Technical Report presented all decisions that led to the proposed draft of prCEN/TS 15293:2009 in order to support the enquiry ballot. This document includes all decisions that have been made following comments and further investigations leading to the effective publication of the ethanol (E85) automotive fuel specification as CEN/TS 15293:2011. In addition, it presents all further details leading to the effective revision of that CEN/TS into a full European Standard.

1 Scope

This Technical Report explains the requirements and test methods for marketed and delivered ethanol (E85) automotive fuel according to CEN/TS 15293 [3]. It provides background information to judge the (approval of the) final text of the standard and gives guidance and explanations to the producers, blenders, marketers and users of ethanol (E85) automotive fuel.

NOTE 1 This document is directly related to CEN/TS 15293:2011 [3] and will be updated once further publications take place.

NOTE 2 For the purposes of this document, the terms "% (*m/m*)" and "% (*V/V*)" are used to represent the mass fraction, μ, and the volume fraction, φ, respectively.

2 Summary of the ethanol fuel (E85) taskforce work

At the 2007 plenary meeting, CEN/TC 19 decided to register the following work item as described in its active programme of work: "Automotive fuels — Ethanol E85 — Requirements and test methods", under responsibility of WG 21. The scope was to develop a CEN Standard on the basis of CWA 15293 [4]and existing related national standards and to check for the most appropriate wording of the title of the standard.

The work on the specification was developed during a series of Ethanol (E85) automotive fuel Task Force (TF E85) meetings between October 2007 and May 2009, and is presented by means of this Technical Report. The draft standard, referenced by the identification CEN/TS 15293, comprised a set of properties and limit values to define an adequate quality of the ethanol (E85) automotive fuel and recommendations for precautions to be taken (see Table 1 in CEN/TS 15293:2011 [3]).

The draft standard was presented to CEN/TC 19/WG 21 in November 2008, together with a request to allow the TF some additional time to finalise discussions and to study data that still needed to be generated from field experience, both of refinery and ethanol production. Following that November meeting, a draft enquiry text was developed and this was presented in January 2009 to WG 21 and thereafter to CEN/CCMC.

It should be noted that the draft standard had been considered on the basis of the ethanol blend component specification EN 15376 2007 [2] and the former version of the EN 228 (unleaded petrol) standard [1]. Revision discussion on those documents has been included in the discussions in the last two years. However, CEN/TS 15293 still contains some pending issues, which are noted as such in the text.

Many of the test methods proposed by the test methods experts are being examined to determine their applicability to ethanol (E85) fuel and to determine if their precision is sufficient to support the limit values proposed. This activity is being undertaken in several other CEN working groups where the specialists in methods are present.

An automatic link has been established between the gasoline and ethanol (EN 228 and EN 15376 respectively) standards and the ethanol (E85) automotive fuel (CEN/TS 15293) standard so that modifications to one will be coherent with the other.

3 Record of the work to date

3.1 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 gasoline fuel with a proportion of renewably-sourced ethyl alcohol (referred to in this document as ethanol).

In order to facilitate a transparent and stable market in ethanol, it is necessary to establish an ethanol (E85) automotive fuel standard for Europe that will ensure a uniform high quality fuel for problem-free ethanol use as a gasoline fuel.

To this end, the Comité Européen de Normalisation (CEN) Technical Committee 19, responsible for Automotive Fuels Standards, accepted the CWA revision as a work item on its programme to be developed in Working Group 21, responsible for Automotive Gasoline management.

The intention of CEN/TC 19 was to redraft the CWA into a CEN standard based on the publication of EN 15376 and EN 228, also taking into account the developments in Sweden, France and Germany. Discussion in WG 21 had indicated that there were still test method questions to be solved and thus national initiatives were not halted.

CEN/TC 19, having considered the proposal for a new work item, as documented in N 1318 and supported by WG 21, noting the request from UPEI in document N 1326R, decided to register the following work item as described in N 1318 in its active programme of work: "Automotive fuels — Ethanol E85 — Requirements and test methods", under the responsibility of WG 21. The scope was to develop a CEN Standard on the basis of CWA 15293 and existing related national standards and to check for the most appropriate wording of the title of the standard. The Task Force E85 was created.

The aim of the CWA was to keep the specification simple and straightforward, allowing cars to be introduced into the market. The original idea was to ensure basic car functionality, for which the existing CWA succeeded. However, as flexi-fuel vehicles were soon to fall under the Emission Legislation, more stringent fuel requirements were needed. The existing CWA was not able to support EURO V vehicles.

CWA 15293 and its successor(s) should specify requirements and test methods for marketed and delivered Ethanol (E85) automotive fuel. It is applicable to Ethanol (E85) for use in spark ignition engine vehicles designed to run on Ethanol (E85). Ethanol (E85) is a mixture of nominally 85 % ethanol and 15 % petrol, but it also includes the possibility of having different 'seasonal grades' containing more than 50 % ethanol.

This document is the report on the work to date carried out by the TF E85 (see 3.2) towards establishing a European Standard for Ethanol (E85) automotive fuel.

3.2 The Ethanol (E85) automotive fuel Task Force

CEN, in anticipation of a mandate from the Commission, requested TC 19/WG 21 to convene a task force and begin work on a draft ethanol (E85) automotive fuel standard. A call was made to the industries concerned by the mandate for experts to participate in the TF E85. The experts who have contributed to the work over the years are listed in Table 1. Revision work on CEN/TS 15293 had been discussed from meeting 9 onwards, whereas the former version of this document had been finalised at meeting 8.

Table 1 — Membership of the taskforce

Name	Organisation	Country
Auger Celine (from meetings 2 to 9)	Renault	France
Baldini Luca	ENI	Italy
Bennett John	Afton Chemical	United Kingdom
Bernard Joerg	Suedzuecker	Germany
Betlejewski Marek (from meetings 2 to 7)	PKN Orlen	Poland
Colbert Dane	Ethanol Union	France
Costenoble Ortwin (TF Secretary)	NEN	Netherlands
Crépeau Gerald (Convenor)	PSA Peugeot Citroën	France
Elliott Nigel	Exxon Mobil	United Kingdom
Engelen Benoit	Total	Belgium
Feuerhelm Tom	DIN/FAM	Germany
Gameson Thomas	Abengoa Bioenergia	Spain
Gibarroux Germain (since meeting 10)	Renault	France
Grand Jean-Gabriel (until meeting 2)	Renault	France
Hermans Pierre (until meeting 10)	Exxonmobil	Belgium
Jeuland Nicolas (since meeting 5)	IFP	France
King Stan (until meeting 9)	Afton Chemical	CEFIC-ATC
Koppen Piet (since meeting 8)	PAC	Netherlands
Kronström Börje	Svenska Shell	Sweden
Lloyd Robin (until meeting 4)	Argent Energy	United Kingdom
Leber Edwin (until meeting 8)	Opel	Germany
Manuelli Pascal	Total	France
Mirabella Walter	Lyondell	Italy
Nilsson Magnus (until meeting 10)	General Motors Powertrain	Sweden
Olofsson Mathias (until meeting 10)	SEKAB	Sweden
Pollak Vanda (since meeting 6)	Hungrana	Hungary
Rantanen – Kolehmainen Leena (since meeting 6)	Nesteoil	Finland
Rappange Aly (until meeting 10)	Royal Nedalco	Netherlands
Suanders Bob (since meeting 8)	EI	United Kingdom
Schuermans Kurt (since meeting 7)	Chevron	Netherlands
Sijben Jo (from meetings 4 to 10)	Proces Design Center	Netherlands
Skret Iwona (until meeting 6)	Instytut Technologii Nafty	Poland
Sniegula Agnieska (since meeting 8)	PKN Orlen	Poland
Spaans Han (until meeting 9)	AC Analytical Controls	Netherlands
Tittarelli Paolo	SSC	Italy

Following his retirement as TF project leader, due to his change of profession, Mr. Bennett handed over the work to Mr. Crépeau during the 2nd meeting and his contribution to the work and initiatives of this TF is hereby warmly acknowledged.

The task force has met on the following occasions:

a) 30th October 2007 Brussels, 1st meeting,

b) 15th January 2008 Brussels, 2nd meeting,

c) 5th March 2008 Hamburg, 3rd meeting,

d) 18th April 2008 London, 4th meeting,

e) 3rd July 2008 Brussels, 5th meeting,

f) 11th September 2008 Brussels, 6th meeting,

g) 4th/5th December 2008 Paris, 7th meeting,

h) 23rd April 2009 Paris, 8th meeting,

i) 23rd September 2009 Paris, 9th meeting,

j) 18th February 2010 Brussels, 10th meeting.

Following the finalisation of the ethanol specification at the level of 10 % blending, it was debated and concluded to merge the TF 85 with the Ethanol TF. At the end of 2010, both taskforces were disbanded.

3.3 Planning

The initial planning was: enquiry text ready in August 2008, the comments known in April 2009 and the final text to be delivered to CEN/CCMC in November 2009.

WG 21 had advised the use of EN 228 as the blending component and had supported a six month extension allowance for the E85 specification for the necessary updating of test methods and seasonal grades. Next, it agreed that no shortened procedure, such as a UAP, should be used. Thus, renewed planning was pursued and prEN 15239 was published for ballot in May 2009.

However, the TF encountered several open issues due to the uncertainty of the guarantee of the octane in the future with the integration of Blending Oxygenate Base-stock (BOB) in all European markets and its impact on ethanol (E85) fuels. In addition, the test methods precision for chlorine content at 1 mg/kg or below and the high-boiler requirement were under evaluation. Furthermore, time was required to collect data on the current market, resulting in a better specification proposal. At the end of 2009, the TF still planned to aim at a submission for formal vote halfway through 2010; although being revised, this CEN Technical Report shall, support the ballots. After the CEN enquiry, considering the technical comments and the suggested necessary updates, the deliverable on prEN15293 had been changed into a CEN Technical Specification with its submission to CEN/CCMC on 27th of March, 2010.

CEN/TS 15293 was ratified by CEN on 28th September 2010 and was published as CEN/TS 15293:2011. CEN/TC 19 intends to further revise this Technical Specification, but it needs to rely on test method precision data (availability).

4 The draft ethanol (E85) automotive fuel specification

4.1 Parameters included

Ethanol (E85) automotive fuel should be based on unleaded petrol complying with EN 228 and ethanol complying with EN 15376.

The parameters chosen by the TF E85 are those presented in Table 1 (general requirements) and Table 2 (seasonal requirements) of CEN/TS 15293:2011. After the 10th meeting, all the parameters were agreed upon in full consensus. The applicability of all the test methods had been checked within CEN/TC 19 or were under an improvement process (like the oxygenates content determinations), with the exception of octane. An overview of the assessment is presented in Table 2. Nevertheless, for octane, it was suggested to include any new or adapted methodology in the next revision like the alternatives indicated in DIN 51617-1. If this were to be done during the first quarter of 2011, all the parameters would be in line with an applicable method.

Table 2 — Test method assessment

E85 Property	Test Method	Applicability for E85 fuel	Annex A to be completed
Density	EN ISO 12185		
Oxidation stability	EN ISO 7536		
Existent gum content (solvent washed)	EN ISO 6246		
Copper strip corrosion (3 h at 50 °C)	EN ISO 2160		
Acidity, (as acetic acid CH3COOH)	EN 15491		
pHe	EN 15490		
electrical conductivity	EN 15938		
Methanol	EN 1601		
Higher alcohols (C3–C5)	EN 1601		
Ethers (5 or more C atoms)	EN 1601		
Water content	EN 15489		
	EN 15692		
Inorganic chloride content	EN 15492		
Copper content	EN 15488		
	EN 15837		
Phosphorus	EN 15487		
	EN 15837		
Sulfur content	EN 15485		
	EN 15486		
Sulphate	EN 15492		
Ethanol + higher saturated alcohols content	EN 1601		
Vapour pressure	EN 13016-1		

Table 2 — Test method assessment *(continued)*

Further works	Methods	Applicability for E85 fuel	Annex A to be completed
Research octane number Motor octane number	EN ISO 5164 EN ISO 5163		
Research octane number Motor octane number	DIN 51756-7 DIN 51756-7		
High boiling component			

Legend

- Applicability OK
- Applicability OK but revised method standard necessary (prEN 15293, Annex A to be completed)
- Applicability NOK
- Comments to be integrated very soon
- Comments already integrated

NOTE For rejected parameters see 4.3.

4.2 Considerations on the parameters

4.2.1 Denaturants

The presence of petrol that conforms to EN 228 is generally considered sufficient to render Ethanol (E85) a denatured product. The taskforce E85 considers it necessary to follow the same line of requirement as set out before by CEN/TC 19 regarding denaturants in EN 15376 and thus that requirement is copied.

4.2.2 RON MON

In Europe, E85 Flex Fuels Vehicles (FFV) are engineered to take advantage of the higher octane value of 85% ethanol. Originally, the CWA was drafted on the assumption that EN 228 would be used for blending and the engine ignitions are tuned to these specification limits. The difference between E0 to E85 RON range were analysed and the combustion potentials with higher octane fuels were demonstrated. The impact of energy content loss, the knocking effect and the ignition timing was explained. The car manufacturers calibrated for E0 and E85 fuels based on an oxygen (ethanol) sensor. It was necessary to limit the variation on RON/MON for the E85 fuel because a lower value on RON/MON was not suitable for engine calibration and could potentially damage the engine. Furthermore, it was impossible to test for EN 228 quality at the fuelling station in E85. If in the future EN 228 at E10 level is used, it will be the finished E10 that meets the EN 228 boundaries. FFVs needed to be able to run on RON 95, but for optimisation reasons (car makers calibrate on the full range of fuels used in the FFV) they would need a minimum of 104/90 for the E85. If the octane was not measured (and EN 228 would not be required for the petroleum part), other elements like paraffin needed to be limited and calorific value needed to be tested. Moreover, it was shown that the 104/90 RON/MON proposal was also for optimisation of the fuel economy.

The European automobile manufacturers (ACEA) suggested 104,0 RON and 90,0 MON minimum limits and the ethanol producers agreed to support the car makers in their need to use the better octane.

The oil industry mentioned that the only available petrol for blending would be BOB, which meets EN 228 after addition of ethanol. They suggested defining an alternative proposal requiring blending with EN 228 minus the octane specification. After a lot of discussion inside TF E85 covering several meetings, all stakeholders concluded that the final RON/MON depended on the quality of the BOB (typical BOB RON could be down to 92), but suspected that in E85 it would be close to 104/88.

This issue warranted a MON/RON limit in the specification to maximise the benefits in the market, besides having sufficient blend stock available at economical conditions to allow the market to grow.

The group agreed to consider a higher RON/MON based on the proposal of the engine manufacturers and agreed on setting a MON/RON limit with the actual CFR engine test, include a BOB- ethanol calculation table as information for the blenders and to do a BOB- ethanol base blend check to further define the E85 limit. After discussions, an E85 based on a fuel with 91 of RON and 83 of MON that can reach the 104 and 88 targets was accepted by the group. Tests on two batches of low MON and RON implied that the MON/RON requirement (104/88) was safely set. Oil industry confirmed these values and that sufficient flexibility for the refinery remained.

Due to the uncertainty of the future value of RON and MON with the introduction of the BOB, a new debate on the subject appeared. Following additional information, EU car makers designed vehicles in order to exploit higher octane when available in the tank, for example, with a RON of 106 vs. 98, a CO_2 gain of 5 % on mixed cycle. However, if car makers are sure of the higher RON value, fuel consumption could be reduced by 40 % to 25 %, particularly if driven on highways due to a better knocking resistance.

As car makers and ethanol producers believed this would make E85 fuels more attractive for the customer, it was agreed to leave the 104 as indicative in the table in the first instance. Once there would be sufficient confidence with actual field data, the values could become mandatory. It was agreed to replace the octane requirements in Table 1 with a separate clause following the suggestions as presented during the meeting. Both additions to Annex A on the test method updates and an extra informative Annex B with the background would be included.

During the 10^{th} meeting, the group agreed that §5.5.2 would remain as it is and that both MON and RON requirements would be re-evaluated once the test methods were upgraded towards applicability for E85.

The current ISO 5164 test can measure at the level of 106 of RON. It was suggested to specify 104 based on the precision at that level. However, two steps should be taken notice of: estimation of the octane number and the depiction of the specific nozzle on the CFR engine. As all engines should be certified for their specific nozzle, it was agreed not to clarify the specific *r* and *R* in the specification. A correction should not be included in the E85 specification.

It was suggested to include any new or adapted methodology in the next revision such as the alternatives indicated in DIN 51756-1.

CEN/TC 19/WG 9 should check if a GC method could be an alternative to determine RON/MON. ISO/TC 28 and ASTM D02 have also initiated revision studies on the octane engine test.

4.2.3 Ethanol content and higher alcohols

The ethanol content is specified as a minimum to ensure a correct degree of purity for its use in automobiles, and to qualify for Custom and Excise recognition. As the ethanol coming from the production facility may contain small quantities of higher saturated alcohols C3 – C5 that are not considered harmful to engines, they are included within this parameter. The higher saturated alcohols are also limited by a maximum content as a separate parameter.

TF E85 supported allowing more flexibility on the amount of petrol to achieve the necessary performance. It was suggested to include the French limits and to use different indications of grades to prevent confusion with EN 228 climate classes.

The French Customs required a maximum range of 10 % from a consumer protection viewpoint. Yet the flexibility in the DVPE would be lost if the range of ethanol were limited to 10 %. It was suggested to first define the volatility grades and see if the ethanol content needed similar or additional grades.

Since the summer period seemed to give the constraints, ethanol producers suggested leaving out the requirement of maximum ethanol percentage and limiting it by the vapour pressure. However, in winter, a limit of 75 % seemed to give optimum results, as the more gasoline the better.

The group agreed to further address the need for a maximum ethanol limit and the French 10 % range requirement, based on information from the car makers.

The engine needs vapour pressure for a cold start and DVPE is a way to measure it. Once running, the broad distillation characteristics become more critical and driveability is assisted by high front-end distillates. The usefulness of the Driveability Index was debated. It was feared that we would deviate too much from the original model with such high ethanol quantities.

Referring to the work in CEN/TC 19/WG 9 on three different methods, the GC test should report: oxygenates only or also hydrocarbons. A reliable ethanol determination could be made with only minor updating of the existing test methods.

It was suggested that the definition of the effective ethanol content be improved, which was a calculation of 100 % minus the rest. The group felt that the ethanol content meant ethanol plus higher alcohols. The oil industry, referring to the fact that it needed to be measured in volume, reckoned that ethanol has higher alcohols in it. Ethanol producers indicated that the denaturants should be excluded and administrators referred to the needs of the tax authorities.

The TF E85 agreed to limit the ethanol and higher content, using EN 15721 or another test suggested by WG 9, and not the EN 15376 content, since there was a maximum on the higher alcohols content in the specification table.

Limiting the content of unleaded petrol, the suggestion to delete the petrol content requirement from the table was accepted since Ethanol (E85) is defined as a mixture of ethanol and petrol.

Ethanol producers favoured the original principal of actually blending 85% and lowering the percentage too much would make the product less commercially attractive. In the US, 70% was required as a minimum. Regarding E85 volatility in very cold conditions, it could be necessary to use block heaters.

To be sure that the complete range of EN 228 products can be used to ensure the vapour pressure requests (see 4.2.4), a consensus proposal with four grades was presented and discussed. A wide range of limits on ethanol and higher alcohol content was proposed: grade “a” from 70 % to 85 %, grade “b” from 70 % to 85%, grade “c” from 60 % to 85 % and grade “d” from 50 % to 85 %.

The debate was on acknowledging the French experience and allowing a wider ethanol content range (70% to 85%), whereas the ethanol producers preferred the 75 % ethanol minimum. The oil industry argued that with the E10 requirement becoming the new market situation, having a low DVPE BOB in stock was essential. CONCAWE members would not approve a 75 % ethanol limit and additional data would be provided by the French oil industry. On the b, c and d grades consensus was achieved, as were the DVPE values. For the lower limit of ethanol content in grade a, this was to be dealt before the end of the enquiry.

BOB in France had not been available until April 2009, and acquiring new data would take time. The group agreed to await further data at the next meeting and requested the CONCAWE members to provide further field data. The oil industry tabled that the French oil industry goal was, motivated by tax incentives on ethanol quantity, to have the maximum amount of ethanol in E85, but they would not like to be blocked by availability of gasoline in stock.

Based on a study with three base fuels with different vapour pressures done with the regular test, the data showed differences between the model and the actual blends. For low vapour pressures, the model overlapped (taking into account the precision) with the actual data. For the highest VP base fuels, the model largely overestimates the actual vapour pressure in the lowest blend percentages.

Taking into account the fact that flexibility was needed during the seasonal changes, the RED requirements would push the blenders to use the highest ethanol percentages and that a no-risk approach would be necessary, the group agreed to 70 % minimum of class a. To emphasise the importance of vapour pressure it would be presented as the first row of Table 2.

4.2.4 Vapour pressure

Car makers gave further details on the DVPE test results and engine impact regarding emissions and cold start. The data showed that in winter the ethanol content should be above 75 %. With regard to the exhaust emissions, a discussion on the catalyst adaptations needed and the delay in the combustion took place. The group concluded that the fuel needed to be compatible with flexible-fuel vehicles. Further discussions on the optimisation of the ignition timing and relation to the emissions also took place. As mentioned previously, the ethanol content was closely linked to the DVPE.

With regard to the winter conditions, car makers tabled the (new) emission regulations were not taken into account in the former CWA and specific heating systems would be needed for the 50 kPa now required in Sweden. Hence, the car makers wished for 60 kPa.

Regarding the summer grades, some car makers worried about early winter starts with 35 kPa summer grade still available at the fuelling stations. Referring to the -7 °C Euro 5b regulation, a reference fuel (linked to an actual market fuel) would be legally required. Euro 5 would be applicable from 2009 with a E5 and E85 fuel test at 20 °C and, for Euro 5b, at -7 °C also with E5 and E85 reference fuel (not yet defined). The Comitology process on Euro 5b had not yet been settled.

The convenor had proposed as an alternative solution introducing a third, intermediate grade with a 70 % ethanol and a 50 DVPE minimum; this was agreed by the group. The TF experts considered the EN 228 different grades and deducted the ethanol content from the vapour pressures required by the different grades.

EN 228 allowed regional grades which could take care with the expected risks of having -15 °C in late summer in certain areas.

The oil industry showed empirical data on the strict DVPE - ethanol window that had to be met; with an analysis of the hydrocarbon part it is possible to calculate the actual vapour pressure.

In winter, the oil blenders generally blend to the upper limit, but during transitional periods this may change.

The oil industry gave an overview of the current situation and explained BOB. They presented the risk that a blender would first make EN 228 and then add 15 % to ethanol, and as such might end up with a higher percentage of ethanol than 85 %. They suggested a 40 kPa minimum combined with a 65 % to 85 % ethanol content range or a 35 kPa minimum combined with a 70 % to 85 % for the summer grade.

TF E85 experts considered whether not achieving 85 % ethanol with a 40 kPa was a market issue. Further discussion on what could be achieved based on the vapour pressure took place. It was remarked that the specification should not be closed for blenders using a higher VP gasoline and that refinery ethanol blending is an option. It was agreed that setting a lower end VP and a reasonable higher end VP would provide market flexibility. Referring to the Swedish experience with 35 kPa, it was commented that an increase to 40 kPa would be a costly operation.

After an overview of the chosen grades for each country and the CONCAWE data showing the absolute minimum temperature measured in each country, TF E85 agreed to set the grade for each country and recalculate the EN 228 classes into E85 grades for ethanol blending limits, provided all the E85 grades include all European reasonable temperatures.

When the driveability data for different vapour pressure ranges were shown, the group's discussion accepted -13 °C as the engine starting requirement. The grade C is for inter seasonality or for winter for the countries with a minimum temperature superior to -10 °C. Car makers repeated that at such low temperatures the catalyst would not operate correctly and compliance with future emission regulations needed to be assured. The oil industry indicated that a requirement of 85 % of ethanol cannot be compatible with a 60 kPa requirement for all countries. Car makers indicated that the margins in winter would be small due to starting issues. A compromise on the vapour pressure grades was sought for resolution during the 6th TF 85 meeting. Car maker accepted a decrease from 40 kPa min for the grade A to 35 kPa to allow an increase in the ethanol content and the minimum vapour pressure for the grade C to 50 kPa min and for the grade D to 60 kPa. At these limits, the impact on vapour pressure for the new emissions regulation at -7 °C was raised. Each grade has to be linked to temperature range of use and season period. The season period has to be defined by national authorities.

Ethanol producers proposed having the actual grade C renumbered as b and introducing a new grade c with a minimum of 60 % ethanol and a minimum DVPE of 55 kPa. The oil industry agreed to the expansion of the amount of grades and mostly aimed at the high limit of the volatility.

A consensus proposal with four grades was presented and discussed. An agreement was reached: grade a 35 kPa to 60 kPa, grade b 50 kPa to 80 kPa, grade c 55 kPa to 80 kPa, grade d 60 kPa minimum.

Vapour pressure test methods measure the total pressure (Ptot) of the sample. The actual result reported by these test methods is Dry Vapor Pressure Equivalent (DVPE). A correlation equation would be needed to convert (Ptot) to (DVPE). The original correlation equations in these vapor pressure test methods were developed using a very large data set of neat gasoline and E10 samples. The correlation equation appears to be linear from E0 (neat gasoline) to E10. The unknown was whether the correlation equation in these test methods is linear all the way to E85.

At the time, it was suggested that Ptot be reported instead of DVPE. The advantage of reporting Ptot is that correlation equations to convert values to DVPE are no longer needed.

4.2.5 Density

Car makers prefer a narrow range of density for a good driveability. They use it to calibrate fuel systems and consequently set the flow in the various critical parts (nozzles, pumps…). While density is primarily influenced by ethanol and aromatics, the quantity of fuel injected is linked to density. Additionally, during the cold start, variations on density alter the air/ fuel ratio, with the potential for knocking. For durability, a minimum limit and for exhaust emission a maximum limit was important; therefore the range should be maximum 45 points.

E85 density field data were shown in the range between 760 and 800. The proposed range of 760 to 800 was accepted by the group and EN ISO 12185 seemed applicable.

4.2.6 Sulfur content

It was questioned why sulfur should be checked when the two blending components (EN 228 and EN 15376) were required and already meet the sulfur requirement. The oil industry responded that downstream contamination could have an impact and it is an extra check. Since sulfur contamination causes catalyst problems and it is a political issue, it was sensible to specify it. This did not mean every batch needed testing.

The group accepted to include the 10 mg/kg limit and to consider a note indicating that good housekeeping and fuel management with the use of specified fuels assures the blender that the specification was fulfilled.

The test method experts remarked that sulfate, considered as the more critical matter, still is a concern using UVF sulfur testing. If the petrol was according to EN 228, the sulfur in E85 is far below 10 mg/kg. WG 27 experts noted that the WDXRF (EN 15485) method was only applicable when the total oxygenate content is known (range of 23 % to 30 % of oxygen content in the actual proposed specification). Thus, they suggested using EN 15486 (UVF). TF 85 declined developing a new test for E85 and supported the UVF method although the sulfate problem is known. It was proposed that the total sulfur requirement be deleted as sulfate needed to be measured and EN 228 petrol would be the other sulfur origin, only having 10 mg/kg but TF 85 concluded that sulfur is an environmental requirement and could not be skipped.

Analytic experts agreed that the matrix effect could be solved. For sulfur, the direct ICP test (under development at that time [18]) still showed problems, because the volatile sulfur species would dissolve in the petrol, making it difficult to retrieve dry residue. They thus suggested not using ICP as an E85 test method for sulfur or other species. The conclusion was that the two ethanol test methods could be applied, where for WDXRF a specific calibration with an E75 internal standard to correct for the matrix effect should be applied. The group, hearing the experts' recommendation that the precision and performance would not be hampered, agreed to refrain from a new precision study. The two test methods with a scope extension and procedure updates were revised.

4.2.7 Oxidation stability

Since the applicability of EN ISO 7536 was questionable, testing on the applicability and checking for discrimination based on the suggestion to add copper oxide was conducted. The results showed that all five samples (including two that were spiked with 100 mg/kg copper as requested by the TF) were stable for 12 h, which was double the time limit adopted for the European petrol standard. The results provided a first indication that E85 could comply with a 6 h minimum limit for oxidation stability. However, undertaking a full-scale statistical analysis to determine whether the results were consistent was necessary.

Ethanol producers suggested removing the requirement as the test would not allow discrimination, but car makers remarked that additives could present a problem. The group thought that this issue was covered by the additives clause, whereas the rest would be covered by requiring EN 228. The car makers' proposal was to keep it in order to have more experience on this parameter. The oil industry supported setting the limit that had worked in EN 228 for years, noting the questions around the actual validity of that requirement, and added that it prevented blenders from using off-spec petrol. Based on the off-spec prevention and the EN 228 experience, the group accepted the 360 min minimum limit.

4.2.8 Existent gum content (solvent washed)

Even at ambient temperature, the fuel can undergo an oxidation process which leads to the formation of gums. These gums can cause several incidents, such as engine fuel pump locking, nozzle obstruction, piston rings sticking, etc. The group agreed to retain the 5 mg/100 ml.

EN ISO 6246 seemed applicable but there was a risk of explosion during the test. However, the problem had been solved by placing a valve in the equipment. The group agreed that the risk of explosion was not a major issue.

In the CEN/TC 19/WG 21/Ethanol Taskforce, the parameter had been replaced by dry residue, because the ethanol producers had that test available. Dry residue should however not be considered for CEN/TS 15293, as fuel suppliers would have the gum content test available.

4.2.9 Oxygenates content

4.2.9.1 Higher alcohols (C3 - C5) content

The maximum value of higher saturated alcohols (C3 – C5) is limited to 2,0 % (*V/V*), this being an acceptable value normally seen from ethanol production. They also assist in maintaining water in the solution and lowering the DVPE of ethanol blends to a certain extent. They are thus regarded as beneficial impurities resulting from the industrial production process for ethanol, and therefore should be limited only to obtain an adequate purity of ethanol.

The higher mono alcohols that can be found in ethanol are: propan-1-ol, butan-1-ol, butan-2-ol, 2-methylpropan-1-ol (isobutanol), 2 methylbutan 1 ol, and 3 methylbutan 1 ol. These mono-alcohols can also contain traces of C6 - C8. But it was not considered necessary to limit the latter individually as their presence is naturally contained within the limit of 2,0 % for C3 - C5.

Due to the possibility of denaturants in this list in a national excise regulation (examples from Hungary and Finland have been presented within the group), in the case of methanol, higher alcohols, ethers and petrol the maximum limits will be set by the theoretical maximum that origin from EN 15376 ethanol and EN 228 petrol. The amount included in the denaturant will not be considered. For example, in the case of higher alcohols, including isobutanol, the maximum amount in the ethanol is 2 % and the maximum amount in petrol depends on the 3,7 % (*m/m*) oxygen limit.

For the sake of the example, we imagine that it may be about 10 %. If the minimum ethanol content were set at 50 % as proposed by the convenor, then the maximum higher alcohol limit would be (0,5 * 2) + (0,5 * 10) = 6 %. The calculation as presented in N40 towards 6,0 % (*V/V*) was accepted.

Three candidate tests were studied, EN 1601, EN 14517 and EN 15721 (all in modified format). Precision data were however not good. EN 15721 was studied for further improvement. It was agreed to require EN 1601, the O-FID test as it was most widely known to all laboratories.

4.2.9.2 Methanol content

Methanol is naturally present in industrially produced ethanol in small quantities, and can as oxygenate contribute to the combustion. However, methanol is toxic, it has a very high heat of vaporisation, it is strongly hydroscopic and contributes strongly to the formation of azeotrope and thus high vapour pressure, and it may require a co-solvent to prevent separation and can be aggressive towards certain metallic and non-metallic materials in the fuel systems. Thus its volume should be limited.

The ASTM specification D4806 [30] for ethanol as a blending component limits methanol content in ethanol to 0,5 % maximum. The European gasoline specification EN 228 permits up to 3 % methanol in the gasoline, with the presence of co-solvents to prevent separation.

It was reported that the fuel injection manufacturers are hostile to the presence of methanol in the fuel, for the reasons of material compatibility noted above.

Car makers wanted to lower methanol and the ACEA agreement had been 0,2 % (*V/V*). The revised ethanol set a 0,5 % *(m/m)* limit, while for EN 228 it was 3,0 % (*V/V*). The oil industry, referring to the possible production contamination and denaturising requirement in some Member States, suggested to either align it with a denatured E100 at 1,0 % (*V/V*) or follow EN 228 at 3,0 %. Currently the volume percentage (as the EC and EN 228 require) was accepted. The group agreed to have a recalculated value on the basis of the combined EN 15376 plus denaturing requirements as a momentarily solution, with the intent to consider lowering it in the future.

The proposal to have a 2,0 % methanol content (being 0,5 * 1 % out of EN 15376 and 0,5 * 3 % out of EN 228) was discussed in relation to the requirement for national denaturing. The oil industry thought it better to use the enquiry for obtaining indications from Member States on problems with their denaturants.

If the methanol content varies significantly, there is a risk of leakage from seals. Moreover, if the methanol content increases, there is the possibility of salt introduction which cause corrosion. Car makers agreed that it would increase risks for pit corrosion. The oil industry warned of traders using methanol in addition to EN 15376 and EN 228. Ethanol producers wished to have a specification for an ethanol fuel that would bring the message that one should not use methanol. The ether industry, referring to the biofuel driving force behind E85, asked if we could limit an eventual biomethanol inclusion without technical reasoning. Looking at the aim to maximise ethanol and the fact that the car makers wished minimum variation in the methanol content, the group agreed to set the limit at 1,0 %.

Therefore, the O-FID, FIA and the reformulyzer did not work for E85. CEN/TC 19/WG 9 was working on a two column adaptation of EN 15721 (to be published). It was noted that the method would cover all oxygenates. Tom Feuerhelm's proposal to introduce the O-FID (EN 1601) instead was accepted, with the indication that a new test method development was under way.

4.2.9.3 Ether (five or more C atoms) content

The proposed limit of 5,2 % (*V/V*) maximum for ethers from CWA 15293 had been based on the Swedish denaturant plus the content allowed in EN 228. The minor part of the E85 product needed to be a hydrocarbon matrix, but added that EN 228 as required by a national annex was insufficient to get at the correct DVPE during summer time. The more the hydrocarbons deviate from EN 228, the more difficult it becomes for the car makers to optimise their engines.

Ether producers had made several calculations for the ether content and had come to 7,7 % (*V/V*), which was accepted by the TF 85. The TF agreed to maintain the consistency between EN 228 and E85 limits for ethers and other oxygenates.

Ethers (ETBE, MTBE etc.) are used as ethanol denaturants, at least in Finland. Therefore, some experts pointed out that the concentration calculation method agreed upon for higher alcohols (see above) should also be used for ethers. This would respectively mean (0,5 * 2 % + 0,5 * 15 %) = 8,5 % (*V/V*) for ethers based on the present denaturising (2 % (*V/V*)) and EN 228 ether content. It was also indicated that the future concentration of ethers in EN 228 would be allowed to increase to a 3,7 % (*m/m*) oxygen limit by the revised Fuels Quality Directive (2009/30/EC).

It was commented that ETBE and ethers should be handled at the same level as oxygenates. With 50 % of gasoline in grade "d" allowing for 22 % of ethers under the revised Directive, it is possible that a blend could consist of 11 % of ETBE + 1 % (*V/V*) of denaturants. In principle, the TF objected to tax incentives overruling technical fitness for purpose of the product. Ethanol producers recalled their earlier position on the butanol that the amount of the denaturant should not be considered as a matter of simplification towards defining only gasoline (EN 228) and ethanol (EN 15376). The group agreed that 11 % (V/V) should be the limit for ethers.

A Round Robin was organised during 2010 with E85 to evaluate four methods to determine the oxygenate contents:

— Method EN ISO 22584 Reformulyzer modified by 1/4 of E85 dilution with nC12 or nC13 before analysis;

— Method OFID EN 1601 modified by dilution to the 1/5 of E85 (few participants);

— Method UNDGA with two columns in series (CPSil 13 CB + CPWax 57 CB) in a GC after dilution of the sample at the 1/20 and by external calibration;

— SudZuecker method with two distinct GC analyzers (Column CPMS1701 of 60 m to proportion ethers by external calibration, Column of TCEP of 50 m to proportion alcohols by calibration interns).

Results of this work are to be used for further decisions towards revision of CEN/TS 15293.

4.2.10 Phosphorus

EN 228 prohibits the inclusion of phosphorus containing compounds (performance additives) in unleaded gasoline in order to protect automotive catalyst systems from deactivation. Phosphorus is limited to 0,5 mg/l for the neat ethanol. This value may need revising if the ethanol content in gasoline exceeds the current 5 %. Phosphorus content was agreed to become provisionally 0,5 mg/l. in line with EN 15376. Therefore, it was agreed to align the paragraphs referring to additives containing phosphorus with EN 228. Since this agreement, the ETF has adopted the limit of 0,15 mg/l following data presented by car makers describing the problem with achieving the exhaust emissions. Lowering the limit to 0,15 largely solved the problem. Thus, the TF agreed to adopt the 0,15 mg/l limit.

EN 15487 requires a drying step. It was agreed to adopt EN 15487 without additions. The newly developed ICP method should be able to measure copper, sulfur and phosphorus in ethanol (E85) fuel in one single test. It works provided the matrix is known. This would mean that the ethanol content determination should be done first. CEN/TC 19/WG 27 had found an adaptation of prEN 15837 (ICP) to allow it measuring phosphorus and copper. Thus the method was added to the specification table. WG 27 responded to the comments received on prEN 15837 (P, Cu and S by ICP-OES), after which the text was updated.

As ICP-OES was available for most of the (actual) suppliers; the group agreed to use EN 15837 as the method of dispute. Following the formal vote, the final 2009 publication of the method was accepted for publication [18].

4.2.11 Water content

Ethanol is hygroscopic, and can collect water both from its distribution system and from ambient air. Blends of fuel ethanol and gasoline have a limited solvency for water, depending on ethanol content, the temperature of the blend and the aromatic content of the base gasoline. In unfavourable circumstances, a separation of the ethanol will occur and form a lower phase in both the storage tank and the vehicle fuel tank that may cause operating problems for the engines. Water causes a separation of ethanol from gasoline. Most of the water will enter the lower ethanol-rich phase, but the water concentration there will only be a few percent, hence not an aqueous phase. The car makers, in order to minimise the risk of such problems occurring, ask the E85 producers to limit the water content of their product to the lowest practical value.

It was agreed to recalculate the limit into mass percentage. The recalculation into mass percentage was requested following the reporting required by both test methods. Such would bring the limit closer to 0,2 %, thus it was suggested to copy the 0,300 % (*m/m*) of the ethanol specification. Car makers would set the limit at 85 % of 0,3, as water could be picked up in the distribution line. Moreover raising the water level too high was cautioned, as it may dissolve contaminants. Swedish ethanol producers repeated their plea for reconsideration of the water content limit, looking at the limit in the US and Brazil. 0,3 % (*m/m*) was close to the mean they had found via a German market survey, where 0,6 % (*m/m*) came forward as a maximum. The phase separation is no problem in E85.

Further discussion took place on the problems with water and the eventual resulting increased conductivity. However, the water content has no influence on the conductivity but the higher the water content the higher the risk of dissolving the acidic components. It could be critical regarding the material corrosion. The water content can also have an influence on vapour pressure (up to 5 kPa more).

Ethanol producers did not favour a higher water limit, which might give advantages for other properties. The risk of E85 taking up water in the supply chain was debated. The Swedish (and other markets') situation showed that E5 and E85 on the market did not give problems. The manufacturers had no need to require a limit different from E5. Dane Colbert calculated the 0,300 % down to 0,25 %, which would allow 0,05 % for the distribution. The oil industry recommended a higher bandwidth, as the distribution lines where much longer than those in the ethanol producers. The majority of the car experts could accept with the suggestion of 0,400 % (*m/m*) which was accepted as the maximum water content level.

Ethanol producer's suggestion to include EN 15692 was accepted. The RR data on ethanol for EN 15692 had been statistically evaluated. A RR was done with ethanol (E85) fuels.

4.2.12 Chloride content

Inorganic chlorides are contaminants that are corrosive to metals even in low concentrations. Corrosion of stainless steel exhaust systems were reported by a constructor at a level of 8 mg/kg of inorganic chloride in the fuel. The constructors also commented on problems of material corrosion in direct injection gasoline engine fuel systems, as reported from fuel injection equipment manufacturers. The latter suggested than no more than 1 mg/kg of inorganic chloride should be allowed in the finished fuel. Such a level, it was remarked, may cause problems of precision of measurement. The US constructors were asked to comment on the ASTM specification level [36], and they replied with the opinion that the level in finished fuel should not exceed 1 mg/kg. Consistent with this point of view, the ethanol specification proposes an inorganic chloride maximum value at 5,0 mg/l.

Ethanol producers currently cannot guarantee below 5,0 mg/l, however pending further data collection the issue could be discussed in the ETF at future meetings. It was added that logistics were part of the issue and, linked with the water content, an initial higher limit was requested. Considering the market survey in which many results were lower than 1 mg/l, the group agreed to adopt the ethanol (E85) fuel requirement of 5,0 mg/l for inorganic chloride. Nevertheless car makers objected because the market showed (and all existing standards required) lower levels. They had seen problems with engines at lower levels, and thought that setting such a high level would make the situation worse.

Paolo Tittarelli proposed to name the property "chloride content". That was accepted for the future when both the test method scope and the ethanol specification would include the same re-wording.

Paolo Tittarelli, unsure about the correct applicability of the ASTM IC test method [32], proposed to check for the possibilities of the CEN test before May 2009. The measurement limit for EN 15492 would be 2 mg/l, but after confirmation by Mr. Tittarelli, extrapolation of the precision data he believed that a limit of 0,9 mg/l could be acceptable. Car makers accepted this and promised to provide labs for the RR. An action was set for WG 27 to assess all techniques available for the 1,0 mg/l level and report back before the enquiry ballot is finalised.

It was questioned whether this method will be validated, as the current surveys determine the quality of the E85 fuel using this method. It was agreed to retain EN 15492 as the single test and the 5,0 mg/l (recalculated in 6,0 mg/kg for the benefit of alignment of units) limit with the note that it might become 1,0 mg/l once the test method and the production have been assessed for confidence (the lower limit is based on the fact that the car maker studies had shown corrosion problems above the 1,0 mg/l).

Paolo Tittarelli foresaw an optimal timeframe of having a copy of the revised EN 15492:2008 ready in October 2010. Therefore, a revised EN 15492 would not have been available for reference in CEN/TS 15293 in time, as the ethanol producers still needed to test at that level including the logistics. The ethanol producers requested a standstill period on the discussion for a minimum of half a year to further assess their logistic chain.

German and European market surveys gave the conclusion that all fuels had very low chloride and sulfate limits. Based on the actual test method precision and the need to further assess both test method and production, it was agreed to introduce 1,2 mg/kg as the limit with a footnote indicating further assessment of the study.

Following the formal vote, the revised method was accepted for publication. The data of fidelities thus determined cover all the range of concentration, from approximately 1 mg/l chloride up to approximately 20 mg/l.

4.2.13 Copper strip corrosion

With a 10 mg/kg sulfur limit, the copper strip corrosion was still needed, especially if a grade 2 needed a highly problematic fuel. WG 21 had discussed the replacement in favour of a silver strip test. Experts indicated that problems with corrosion mostly originated from chloride and thought that the copper strip requirement was merely a copy from EN 228. The possibility that the copper strip corrosion requirement could be dropped in the future was accepted. No problems could be expected with the test.

4.2.14 Total acidity

Discussion in the TF E85 took place on the need for a limit on both weak acid (the acetic acid constraint) and the pHe for strong acid. The strong acid property will show a propensity for rapid corrosion of engine parts, whereas the total acidity (weak acidity) will generate corrosion more slowly and may affect the long-term durability of the engine.

The gasoline specification EN 228 and the ethanol specification EN 15376 require an acidity limit of 0,007 % (*m/m*) (as acetic acid) for fuel ethanol as a blend stock, according to EN 15491 method, in order to limit the acidity of the gasoline. The ASTM standard for ethanol, D 4806 [30], requires the same limit value to be respected.

EN 15491 was found applicable, so this method and the suggested limit of 0,005 % (*m/m*) (derived from the 0,007 % in EN 15376) were accepted.

4.2.15 Copper content

To quote the ASTM specification, "copper is a very active catalyst for the low-temperature oxidation of hydrocarbons. Experimental work has shown that copper concentrations higher than 0,012 mg/kg in commercial gasoline may significantly increase the rate of gum formation". The ASTM and Polish ethanol specifications limited copper content to a maximum of 0,1 mg/kg; DIN FAM AA632 set it at 0,07 mg/kg.

The origin of copper in the ethanol would be the process infrastructure. The ethanol producers proposed to adopt the ASTM limit [35], as it is already applied in their industry. The oil industry commented that the reduction of sulfur in fuel would decrease the amount of oxidation inhibitors used, thus making the fuel more sensitive to gum formation. In this scenario, the lowest level of copper is advisable.

EN 15488 would be useful to a limit down to 0,1 mg/kg; only the scope of EN 15488 needed to be adapted. The group adopted this advice.

CEN/TC 19/WG 27 had found an adaptation of prEN 15837 (ICP) allowing it to measure both phosphorus and copper, so that method was added to the table. WG 27 responded to the comments received on prEN 15837 (P, Cu and S by ICP-OES); the text had been updated.

As ICP-OES was available for most of the (actual) suppliers, the group agreed to use EN 15837 as the method of dispute. Following the formal vote, the final method was accepted for publication.

4.2.16 Sulfate content

Increasingly stringent regulations limit the amount of regulated pollutants which a motor vehicle may emit. Three-way catalysts are inhibited by the presence of sulfur oxides in the engine exhaust.

On sulfates the discussion in the TF was still about whether to define it in mg/kg or mg/l (depending on how the test method reports). Therefore, the alignment issue needed to be settled first, but the intention was to have a limit of 4,0 mg/kg which eventually needed to be converted at a later stage. The request of WG 21 to have all units in mass percentage will be followed. The request to have a limit at 1,0 mg/kg was discussed due to the impact of sulfates on injector deposit. As with chlorides, for the sulfates the actual ethanol test methods could be made applicable with the extraction procedure already indicated method.

German and European market surveys gave the conclusion that all fuels had very low chloride and sulfate limits. Nevertheless, due to issues in Sweden in 2009 - 2010, this item needs to be discussed again in future revision meetings.

4.2.17 Conductivity

This requirement was introduced as an alternative for the acidity testing, as investigated in the ETF, which seemed not to work or deliver a test method soon, although an ASTM and a DIN method existed. The car makers need a method of predicting the corrosion properties, where doubt had arisen on the applicability of pHe and acidity (see 4.2.14 and 4.2.18). These methods were based on water resistance, which might not work on fuels. Injector equipment suppliers preferred limitation to 2 µS/cm, at which level they regularly observe corrosion. It was remarked that a simple contamination in the distribution system could have a much larger impact on the conductivity. Car makers recalled a fleet test in the nineties showing that strong acids induced pump failures.

Car makers presented the conductivity field data, which indicated that a 2,5 µs/cm limit would be a reliable limitation. Joerg Bernard presented results of his work on DIN 51627-4 [40]. The conductivity test seemed to work for E85. He wanted to start a RR and invited labs to participate. From his work, he deduced two conclusions: this conductivity test could replace the pHe test and a 2,5 µs/cm limit would capture the majority of the anions above a limit of 2 mg/l. The impact of different acids in ethanol or E85 is different, as the pHe is not really measuring the protons. All industries could accept a lower conductivity limit in order to remove the pHe requirement.

However, a corrosion inhibitor treated ethanol was also blended to produce an E85 blend, where it was observed that the increase in conductivity was greater than might have been expected.

It was agreed to use the DIN Standard with a provisional limit of 2,5 µs/cm for the moment and propose direct adoption as a CEN test method at a later stage. Ethanol producers asked for a six month period of testing to assess that matter.

The electrical conductivity enquiry started on 16th April 2009. The test method prEN 15938 had been used by the TF allowing the E85 suppliers five months of time to check production. The oil industry tabled the fact that they would need to check different gasolines and additives and could not promise a specific date to provide sufficient data that would underline a correct limit choice.

During the 10th meeting, it was agreed to temporarily remove the pHe and lower the conductivity limit to 1,5 µS/cm pending the studies regarding corrosion inhibitor impacts. A footnote to the table would be added that if 1,5 µS/cm limit was not met, the lab has to check if the pHe was between 6,5 and 9,0 using any of the two existing test methods.

4.2.18 pHe

pHe is a way to determine the high acidity and alkalinity compounds content in order to decrease the risk of corrosion inside the fuel systems of the FFV. The whole ethanol producers did not test for pHe on a regular basis. Edwin Leber knew from his American colleagues that the method worked if the correct equipment was used and not a conventional electrode as many people use. TF E85 experts wondered whether the ASTM test method would work in terms of reproducibility and if it was not too equipment specific. The group agreed that another RR was needed for the pHe using the CEN method (after a comparison with the ASTM method). Next, the use of the proper equipment needed to be checked. The problem encountered: there was no active group on this matter and the equipment was not generally available.

If conductivity appears to be a more simple way to analyse the risks of corrosion, the majority of the taskforce membership believe this parameter in the future will become obsolete .

During the 10th meeting, it was agreed to temporarily remove the pHe and lower the conductivity limit to 1,5 µS/cm pending the studies regarding corrosion inhibitor impacts. A footnote to the table would be added that if 1,5 µS/cm limit was not met, the laboratory has to check if the pHe was between 6,5 and 9,0 using any of the two existing test methods ([13], [38]).

4.2.19 High boiling components

EN ISO 3405 was not suitable for these high levels of ethanol. The heating programme is optimised for petrol so it would be necessary to check the method. It was also remarked that the final boiling point requirement of 210°C might also be useless, as there is not enough material to determine it.

Regarding the distillation, the French work had indicated the inapplicability of EN ISO 3405, thus E85 experts wondered about the added value of the distillation point when EN 228 was defined as the blend component. Some experts knew of biodiesel found in E85 due to the co-mingling and considered the distillation as a prevention of a high temperature residue. The group agreed to include a limit for high boiling components requirement by copying the same caution note as in EN 228. Next, the note on good housekeeping should be included. With regard to further information on the fact that the FBP should be checked before blending, the oil industry responded that such would always be the case and the risk was only during the distribution.

This would allow removal of the FBP requirement from Table 2 in prEN 15239 until an alternative test was developed. Analytic experts agreed to write a short paper on alternative tests that could give indications for the presence of high boiling components. It was expected to have a full RR report and a test method for high boilers by May 2009. It seemed that EN 15721 could be improved with some modifications on EN 15721 to distinguish between the different alcohols. The TF would await further details from CEN/TC 19/WG 9.

Regarding high boiling components, the preliminary work item had been accepted. WG 9 would work on that and laboratories were invited to participate for the petrol and the E85 fuel RR. It was approved to cover the range from 50 % to 85 % ethanol.

It was decided that all the compounds between the 1 methylnaphthalene and the nC30 were related to the presence of diesel fuel or FAME. The analysis was done by GC/FID on a non-polar column of 10 m, but required a perfect control of the subtraction of the white of analysis. The calibration was carried out with the 1 methylnaphthalene, the nC30 and of the EMAG. The percentage of high boiling components was brought back to that of the solution of calibration.

4.2.20 Additives

TF E85 agreed with the use of similar sentences as in EN 228.

4.2.21 Biologically sourced ethanol

The biofuels policy of the Commission intends that biofuels be obtained from renewable sources. It may be the case that the origin of the ethanol will determine the exemption of the ethanol from Customs duties, or that a method is required to resolve cases of dispute. Therefore a test method was sought that would determine the biological or other origin of the ethanol to be used for blending into gasoline.

The CEN/TC 19/WG 21/Ethanol Taskforce had considered this point, and had identified a method for distinguishing mineral from biological ethanol, drawn from the Wine Market Mechanisms EC Regulation 625/03, method 13. This is a radioactive C14 scintillometer method. This test is capable of discriminating between biological and fossil alcohols. Where this method may be too laborious for frequent testing, it may be considered as a useful tool to determine cases where the Audit Trail approach is contested. The TF 85 does not think the method should be developed into a CEN method, but will recommend it to Customs and Excise as an aid to resolve contested situations.

4.2.22 Guidelines

Some guidelines for application of seasonal grades on national level exist. These should aim at vapour pressure and ethanol content in relation to temperature and relate to safety devices applied at the fuelling stations.

4.3 Parameters considered and not included in the draft specification

4.3.1 Appearance

The same requirements as for gasoline, clear and bright by visual inspection, are set for ethanol (E85) automotive fuel. The TF E85 agreed on using the EN 15591 method. This is intended to establish that the ethanol (E85) fuel is free of suspended or precipitated contaminants. The origin of the colour is mainly proteins which may give problems; the yellowness as such does not present problems for the oil or automobile industry.

Due to the questions surrounding the test temperature (which had also been debated in WG 21) and the fact that there had been no crystal wax issues in the field, it was agreed to remove the requirement.

4.3.2 Chlorine as chlorides

The suggestion to remove this requirement, as chlorides were already specified, was accepted.

4.3.3 Lead

The group agreed to not set a requirement on lead as it is covered by EN 228. The group noted the objections by Mr. King on the fact that iron and manganese should not be mentioned separately.

5 Acknowledgement

The kind contributions of all the TF 85 experts and Mr. Barry Cahill, the convenor of the ethanol task force and the writer of the ethanol task force report which is the base of this document, are warmly acknowledged.

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