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ENVIRONMENTAL SCIENCE FOR THE EUROPEAN REFINING INDUSTRY

report

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Concaawe Market Fuel Survey: 2015-2016





Concaawe Market Fuel Survey 2015 - 2016

Prepared for the CONCAWE Fuels and Emissions Management Group by its Special Task Force FE/STF-24 with special thanks to Silvia Faccini and ENI for their additional support in compiling this report:

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ABSTRACT

Concaawe conducted a market fuel survey on petrol and diesel qualities, taking samples from seventeen European countries during mid-2015 – early 2016. A total of 244 samples (100 petrol and 144 diesel) were sampled - petrol samples were collected in the summer of 2015 and the diesels were sampled in the winter of 2016. This report summarises the data by country and illustrates the data in charts for comparison purposes.

KEYWORDS

Petrol, diesel, market survey

INTERNET

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SUMMARY

The quality of liquid fuels continues to be important particularly in light of continuing pressures to reduce emissions and improve efficiency of vehicles both in terms of tank to wheels carbon dioxide emissions and tailpipe emissions. These pressures mean that vehicle manufacturers are working to improve the performance of vehicles which may involve new hardware that the fuel will come into contact with including injectors and injection systems, fuel pumps, seals etc. This may require increased manufacturing tolerances and increased stress on the fuel including increased temperatures and pressures. The fuel also has to be able to successfully interact with aftertreatment systems which are becoming increasingly common for both petrol and diesel. Concaawe published in early 2017 a historical compilation of market surveys carried out in 2008, 2010 and 2012. More recently Concaawe has conducted a new survey during the years mid - 2015 – early 2016. The current report summarizes this new data. The main conclusion from this survey is that fuels in Europe appear to be meeting the fuel standards for the specifications tested and overall quality appears to be consistently good.

1. INTRODUCTION

The quality of liquid fuels continues to be important particularly in light of continuing pressures to reduce emissions and improve efficiency of vehicles both in terms of tank to wheels carbon dioxide emissions and tailpipe emissions. The pressures mean that vehicle manufacturers are working to improve the performance of vehicles which may involve new hardware that the fuel will come into contact with including injectors and injection systems, fuel pumps, seals etc. This may require increased manufacturing tolerances and increased stress on the fuel including increased temperatures and pressures. The fuel also has to be able to successfully interact with aftertreatment systems which are becoming increasingly common for both gasoline and diesel. In addition to these considerations the Fuels Quality Directive (FQD) [1] and the Renewable Energy Directive (RED) [2] were first published in 2009 and have since been updated in the form of the so called ILUC Directive in 2015 [3] and another directive 2015/652 which pertains to calculation methodology of greenhouse gas emissions [4]. The FQD gives requirements to fuel suppliers for a number of environmental properties that fuels must adhere to and the RED requires the use of renewable fuels up to 2020. The introduction of new fuel components to help fuel suppliers meet these Directives has meant that there are now additional challenges in meeting fuel quality requirements.

The major fuel specifications used in Europe are produced by Centre for European Normalization (CEN) and are the EN 228 [5] which covers petrol containing ethanol up to 5% and 10% and EN 590 [6] which covers automotive diesel with fatty acid methyl ester (FAME) levels up to 7%. In addition there are standards for ethanol (EN 15376) [7], FAME (EN14214) [8], paraffinic diesel fuels (EN 15940) [9], diesel fuel with FAME levels up to 10% (EN 16734) and diesel fuel with FAME levels up to 20% and 30% (EN 16709).

Concaawe has a history of carrying out market surveys at regular intervals with different focuses reflecting the fuel quality events or issues that are being observed at the time. A compilation of data consisting of market surveys conducted in 2008, 2010 and 2012 [10] was recently published. The current report consists of data which was collected from mid-2015 to early 2016. The 2015-16 survey test protocol was designed to study the effect on product quality of the increased use of bio-derived components in both petrol and diesel as well as elements which could come from production of these components or which could be introduced from normal fossil fuel processing.

For petrol the samples were collected in August 2015. Petrol tests carried out by ASG Analytik in Germany were density, distillation, unwashed gum, calorific value, elemental analysis, high boiling fraction and FAME fraction (to look for indication of potential low level cross-over incidents in the supply chain). In addition, the samples were tested for the full range of petrol range oxygenates.

The diesel samples were collected in January – February 2016. Elemental analysis was also carried out on the diesel samples as well as some additional properties – density, oxidation stability (Rancimat, PetroOxy) aromatic hydrocarbons composition, total contamination, fatty acid methyl esters (FAME) composition, calorific value as well as FAME content and EHN content, both of which are thought to influence oxidation stability. Filter Blocking Tendency (FBT) was carried out as a new test for this survey as there have been filter blocking problems reported in several European countries with the most severe having been experienced in the UK during 2013-2016. These problems seem to be very complex in nature with no one failure mode to blame but FBT has been used in the UK and appears to have helped mitigate the problem.

2. EXPERIMENTAL PROCEDURES

2.1 SAMPLING LOCATIONS

The fuels evaluated in this study were picked up from service stations in European countries. The countries selected for this survey represent a significant fraction of the total European fuel consumption. The distribution of fuel sampling locations within each country was selected with sensitivity to various issues, including:

- Regions in the country where bio-components are most likely to be in use
- Supply and distribution logistics

The numbers of samples were chosen to reflect the overall market for fuel grades of the particular country and of Europe as a whole. As a result the majority of the samples were regular grades rather than premium grades reflecting the market for these grades. **Table 1** shows detailed information on the numbers of samples collected over the period of time in the different countries.

2.2 SAMPLING METHODOLOGY

Instructions were sent to those identified to do the sampling as follows:

- Before selecting a pump and nozzle, it was requested that the fuel sampler should identify a vehicle that is already actively dispensing at least 20L of fuel into their vehicle from this pump and nozzle.
- It was requested that as soon as the vehicle leaves the pump, the fuel sampler should then collect at least 1.0L of fuel into one or more suitable containers.
- It was requested that the containers be clean and preferably rinsed before sampling with the same fuel. After filling the container, there should also be a minimum unfilled space in the container.
- Fuel samples were shipped to the testing laboratory as soon as possible after pick-up. It was requested that if some time would elapse before the samples are sent to the 3rd party lab, then the containers containing fuel should be stored safely in a cool location.

Table 1. Number of samples

Country	Country code	Petrol	Diesel
Austria	AT	5	5
Belgium	BE	5	11
Croatia	HR	2	4
Czech Republic	CZ	3	3
Finland	FI	5	5
France	FR	10	20
Germany	DE	10	14
Hungary	HU	5	5
Ireland	IE	5	5
Italy	IT	10	15
Netherlands	NL	5	6
Romania	RO	5	5
Slovakia	SK	3	4
Slovenia	SI	2	2
Spain	ES	5	20
Sweden	SE	5	5
United Kingdom	GB	15	15
Total		100	144

3. TEST METHODS

The tests completed on the petrol and diesel samples are described below.

3.1. ELEMENTAL ANALYSIS

Inductively coupled plasma-mass spectrometry (ICP-MS) was used for both petrol and diesel samples during this survey. ICP provides details of the elements contained within a sample. It is used to determine trace levels of metals and other elements of interest in a sample of test material. Samples must be able to be solvated. Its main advantage over alternative techniques is the low level of background readings from the instrument itself.

ICP-MS. The ICP source fragments chemicals in a different way to other MS techniques, making ICP-MS particularly suitable for isotope ratio studies. It is suitable for the ultra-trace analysis of metal elements (0.0005-100ppb), and a limited number of non-metallic elements (e.g. S, P). The technique is sensitive to the method of sample preparation.

3.2. DETERMINATION OF OXYGENATES (ISO 22854)

ISO 22854 specifies the gas chromatographic (GC) method for the determination of saturated, olefinic and aromatic hydrocarbons in automotive motor gasoline. Additionally, the benzene content, oxygenate compounds and the total oxygenate content can be determined.

3.3. UNWASHED GUM (EN ISO 6246)

This test method foresees the evaporation of a measured test portion of petrol under controlled conditions of temperature and flow of air or steam. The resulting residue is weighed, and may be subject to further treatment by solvent washing and further weighing.

3.4. DISTILLATION (EN ISO 3405)

This test method determines the distillation characteristics of light and middle distillates derived from petroleum and having initial boiling points above 0 °C and end points below approximately 400 °C. Light distillates are typically automotive engine petrols, automotive engine petrols with up to 10 % (V/V) ethanol and aviation petrols. Middle distillates are aviation turbine fuels, kerosenes, diesel, diesel with up to 20 % (V/V) FAME (fatty acid methyl esters), burner fuels and marine fuels that have no appreciable quantities of residua.

3.5. VAPOUR PRESSURE (DIN EN 13016)

This standard specifies a method for the determination of the vapour pressure of low viscosity petroleum products e.g. petrol. This procedure calculates the partial pressure of the air dissolved in the test portion during the triple expansion process. The equipment is not wetted with water during the test, and the method described is therefore suitable for testing samples with or without oxygenates; no account is taken of dissolved water in the sample. A dry vapour pressure equivalent (DVPE) is calculated from the measured air saturated vapour pressure (ASVP).

3.6. VAPOUR LOCK INDEX (VLI)

Vapour lock is a problem which mainly occurs in petrol vehicles containing a carburetor when the fuel turns from liquid state into gas in the fuel delivery system disrupting the operation of the fuel pump. Vapour lock index gives an indication of the propensity for this problem and is calculated from the vapour pressure and the E70 as follows:

$$\text{VLI} = 10 * \text{DVPE} + 7 * \text{E70}$$

3.7. HIGH BOILING FRACTION IN PETROL – SIMULATED DISTILLATION

Simulated distillation is a GC method used to characterize petroleum fractions and products, since it permits the quick determination of their boiling range distribution. Samples are analyzed on a non-polar chromatographic column that separates the hydrocarbons in order of their boiling points. These are correlated with the retention times, through a calibration curve obtained by running under the same conditions a known mixture of hydrocarbons, usually n-alkanes, covering the boiling range expected in the sample. Results are reported as a correlation between the boiling points and the percentages of the sample eluted from the column.

3.8. FAME FRACTION IN PETROL

This was measured using infrared spectroscopy using an ASG in-house method.

3.9. DENSITY (DIN EN ISO 12185)

This gives a method for the determination, using an oscillating U-tube densitometer, of the density of crude petroleum and related products within the range 600 kg/m³ to 1 100 kg/m³ which can be handled as single-phase liquids at the test temperature and pressure.

3.10. FAME CONTENT IN DIESEL (EN 14078)

This test method involves determination of fatty acid methyl ester (FAME) content in middle distillates using the technique of infrared spectrometry.

3.11. EHN CONTENT (DIN 51449)

This method specifies a procedure for the determination of alkyl nitrate in diesel fuel in the concentration range 0,03% to 0,30%. It should be noted that the presence of nitrate esters, inorganic nitrate ions and nitrogen oxides will interfere with this determination.

3.12. RANCIMAT STABILITY AT 110 °C (EN 15751)

This test method (EN 15751) can be applied to neat FAME and to FAME blends as long as the FAME content of the blend is higher than 2% (V/V) FAME. In this test, air is passed through a fuel sample that has been heated to 110°C. The induction period before the onset of rapid oxidation is taken as a measure of stability.

3.13. RANCIMAT STABILITY AT 120°C (EN 15751 MODIFIED)

Identical to Rancimat stability at 110°C (EN 15751) except performed at a higher test temperature of 120°C.

3.14. PETROOXY TEST (EN 16091)

The PetroOxy test as carried out on diesel measures the time required for the onset of severe oxidation as reflected by a decrease in oxygen pressure over the fuel or biofuel sample. The test may be performed over a range of temperatures, but in EN 16091 it is performed at 140°C.

3.15. AROMATIC HYDROCARBONS COMPOSITION (EN 12916)

This method identifies a procedure for the determination of the content of mono-aromatic, di-aromatic and tri+-aromatic hydrocarbons in diesel fuels that may contain FAME up to 30 % (V/V) and petroleum distillates (polycyclic aromatic hydrocarbons are defined as the sum of di- and tri+-aromatic hydrocarbons). The method is based on a liquid chromatography determination through a polar column with little affinity for nonaromatic hydrocarbons.

3.16. FILTER BLOCKING TENDENCY (IP 387)

The FBT method is intended to analyze the filter blocking tendency of FAME as a blend component for diesel and of diesel fuel containing up to 30% (V/V) FAME. The procedure is based on a filtration of the fuel at a constant rate whilst the pressure difference across the filter and the filtered fuel volume are measured. The test is ended either when the pressure difference reaches 105 kPa or when the volume of fuel passing the filter reaches 300 ml. The pressure difference and volume of fuel filtered are then used to calculate the filter blocking tendency (FBT).

3.17. TOTAL CONTAMINATION (EN 12662)

The total contamination test measures the content of undissolved substances, in middle distillates, in diesel fuels containing up to 30% (V/V) fatty acid methyl esters (FAME), and in neat FAME. A sample portion is weighed and filtered under vacuum through a pre-weighed filter. The filter with the residue is washed, dried and weighed. Contamination is calculated from the difference in mass of the filter and expressed relative to the sample mass as mg/kg.

3.18. FAME COMPOSITION (EN 14331 OR EN 14103)

These methods are applied to determine the ester content in fatty acid methyl esters (FAME) intended for incorporation into diesel and for quantitative determination of the individual esters by gas chromatography. EN 14331 is applicable to FAME of vegetable or animal origin that contain methyl esters between C14 to C24 while EN 14103 is suitable for FAME which contains methyl esters between C6 and C24. These were measured in this study but will be the subject of a separate report.

3.19. CALORIFIC VALUE (DIN 519000-2)

This method determines the gross calorific value of fuels using an isoperibol or static jacket calorimeter followed by a calculation procedure.

4. RESULTS AND DISCUSSION – PETROL SURVEY

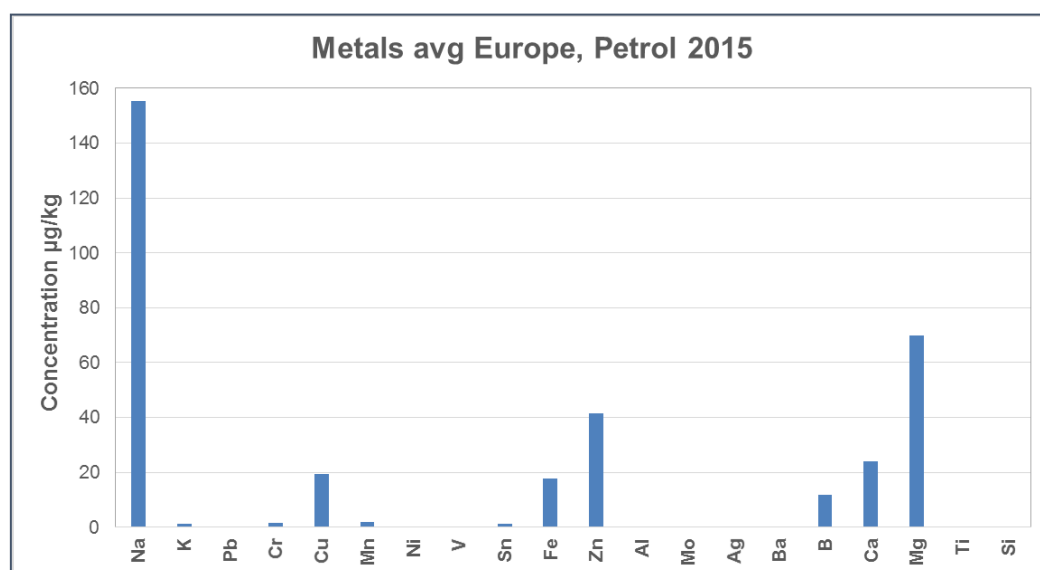
On these petrol samples collected in 2015 properties have been determined such as individual oxygenate content, volatility and distillation characteristics and high boiling fraction. Apart from the metals determination, the circle in the figures represent the country average value, the bars indicate the minimum and maximum value observed. Where there is a definite pan-European limit (or individual country limit in some cases) it is indicated by the red line on the chart.

4.1. ELEMENTAL ANALYSIS

The elemental analysis determined on 100 petrol samples collected in seventeen European countries in 2015 has been determined by ICP-MS in $\mu\text{g}/\text{kg}$. Averages are shown in **Figure 1**. The elements V, Al, Mo, Ag, Ba, Ti, Si for all sampled countries were not detected or negligible.

The presence of metals can derive from a variety of different sources for example additive packages, processing of crude, catalysts used in processing of biofuels and in materials used in the distribution system. In general the results are very low with sodium being the highest level at a factor of 2 times the next highest metal (magnesium) although this is still lower than levels which might be considered elevated. The detailed results from individual countries averaged in **Figure 1** are given in the appendix.

Figure 1. Metals in Petrol in 2015

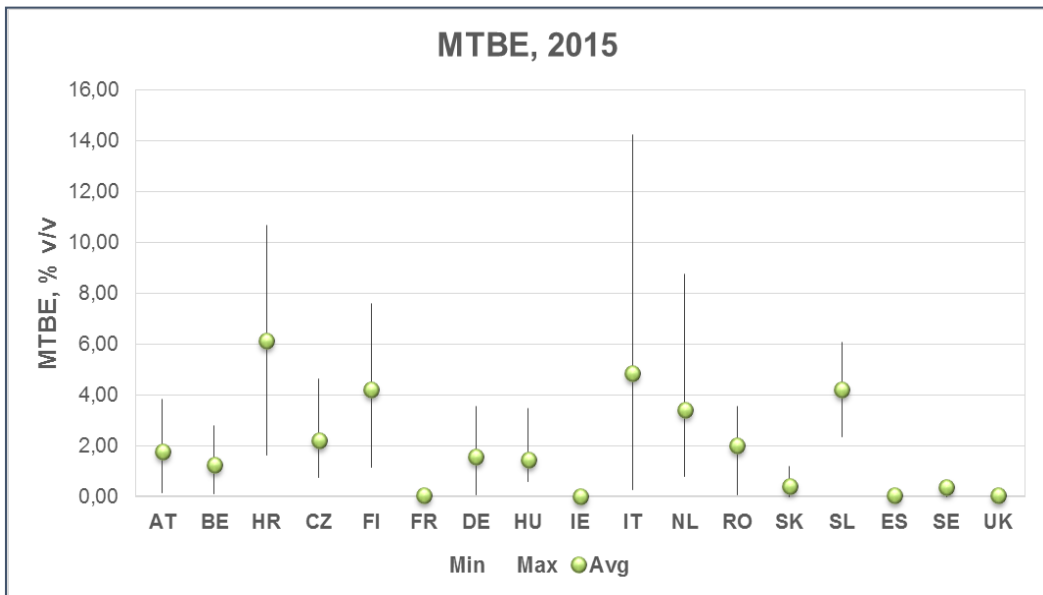


4.2. OXYGENATES IN GENERAL

In the previous surveys it was determined that Tert-Butanol and Tert-amyl alcohol are not present in petrol so they were not tested in the present survey.

4.3. ETHERS AND ALCOHOLS

Figure 2. MTBE content in 2015



As shown in **Figure 2** all countries tested gave MTBE levels below 15 vol% and the averages were all under 7 vol%. ETBE levels were variable as shown in **Figure 3** and generally 5% and below apart from Spain which had the highest result with an average of around 13%. **Figure 4** shows the TAME content which is much lower than either MTBE or ETBE content except that for Finland.

Figure 3. ETBE Content in 2015

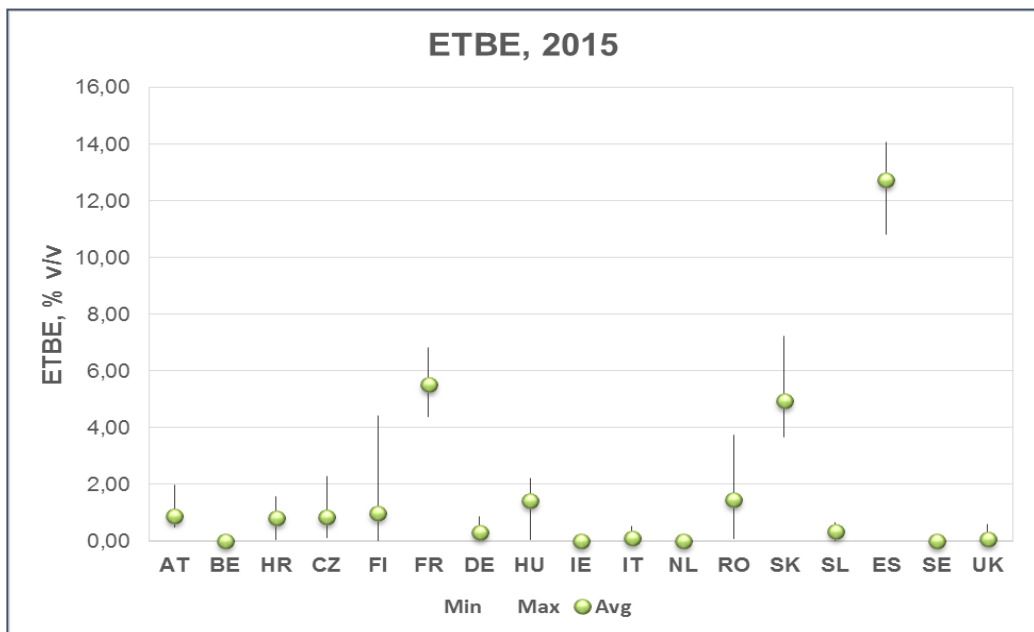


Figure 4. TAME content in 2015

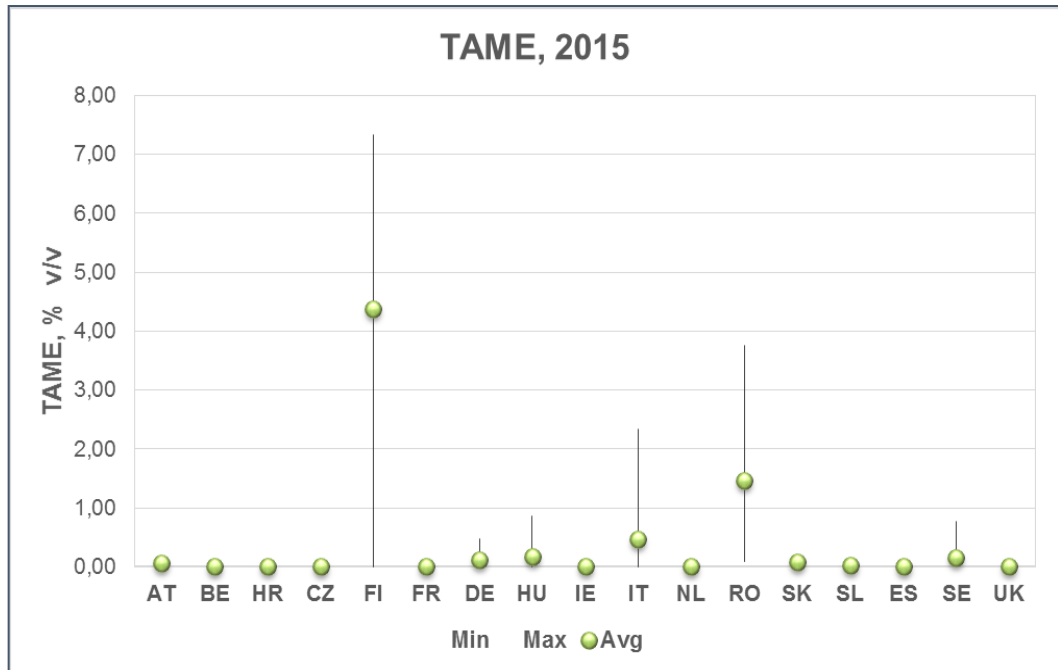


Figure 5 shows the methanol content in 2015 which was only observed to a small degree in Finland, UK and Italy (<1 vol %). This is likely to be coming from impurities in the ethers rather than being intentionally added particularly in Finland. Ethanol content, shown in **Figure 6**, is generally around 5% or below except that for those countries where E10 grades are distributed for example France, Germany and Finland.

Figure 5. Methanol Content in 2015

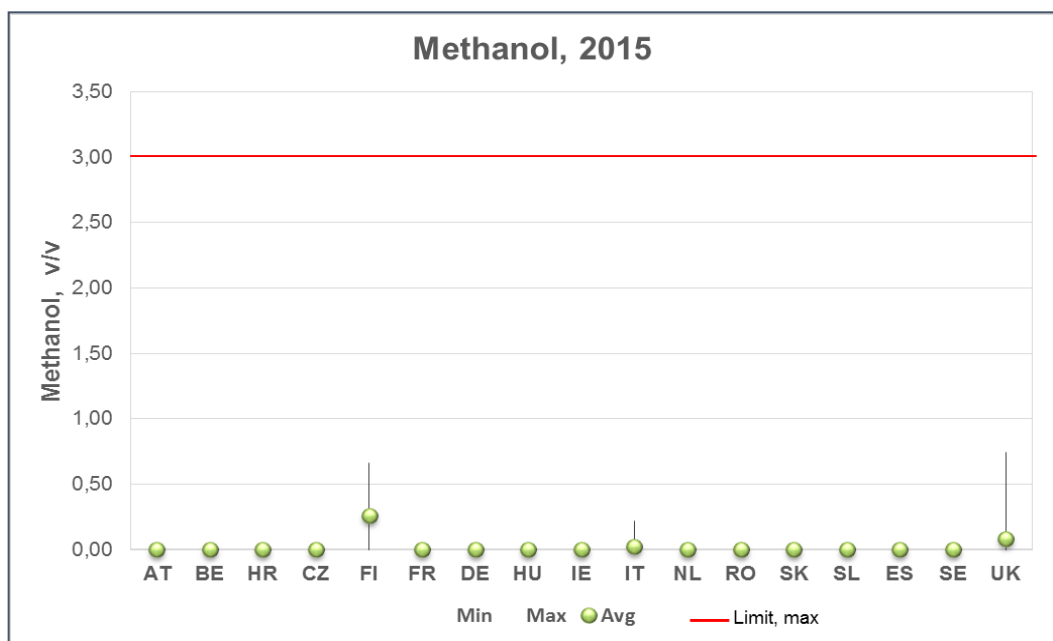
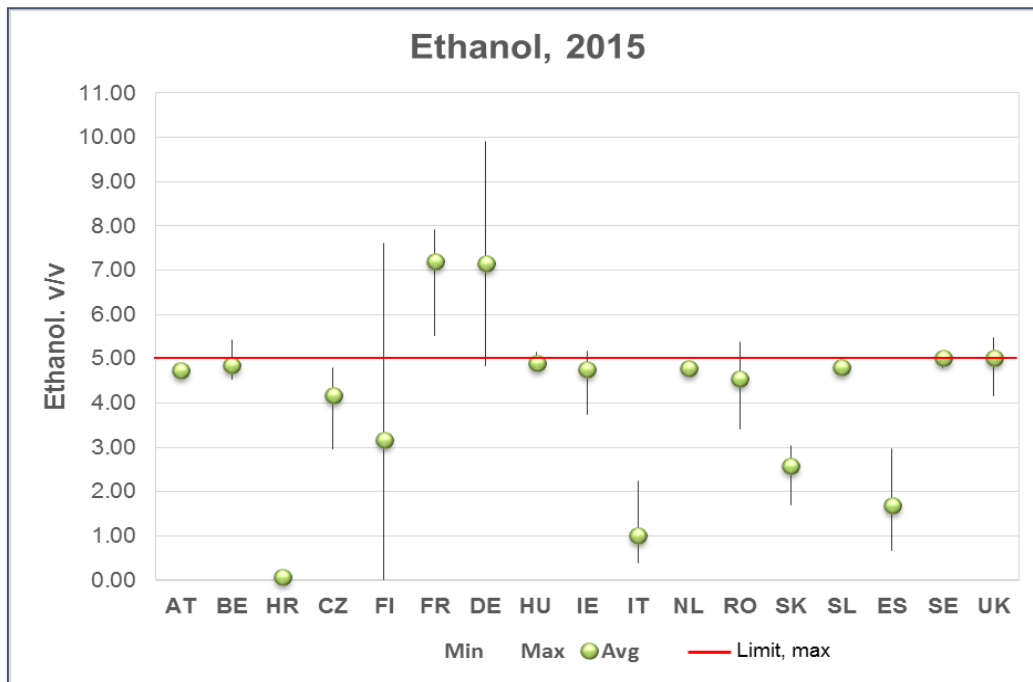


Figure 6. Ethanol content in 2015



4.4. DISTILLATION CHARACTERISTICS

Samples were well within the limits for the distillation parameters (**Figures 7-10**).

Figure 7. Petrol E70 in 2015 (the limits indicated apply to classes A and B for E5)

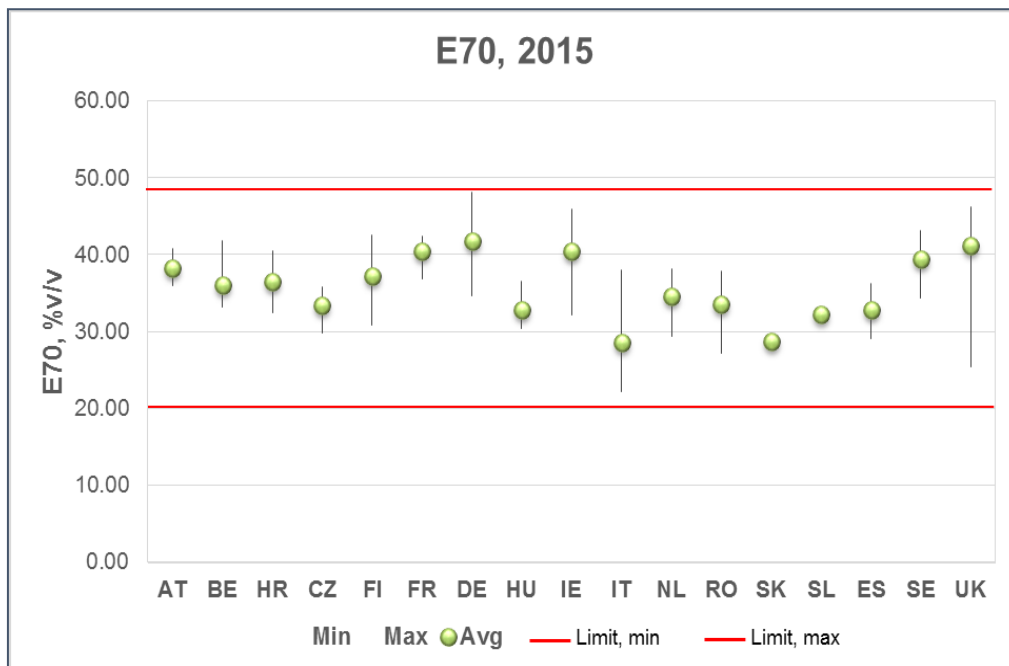


Figure 8. Petrol E100 in 2015

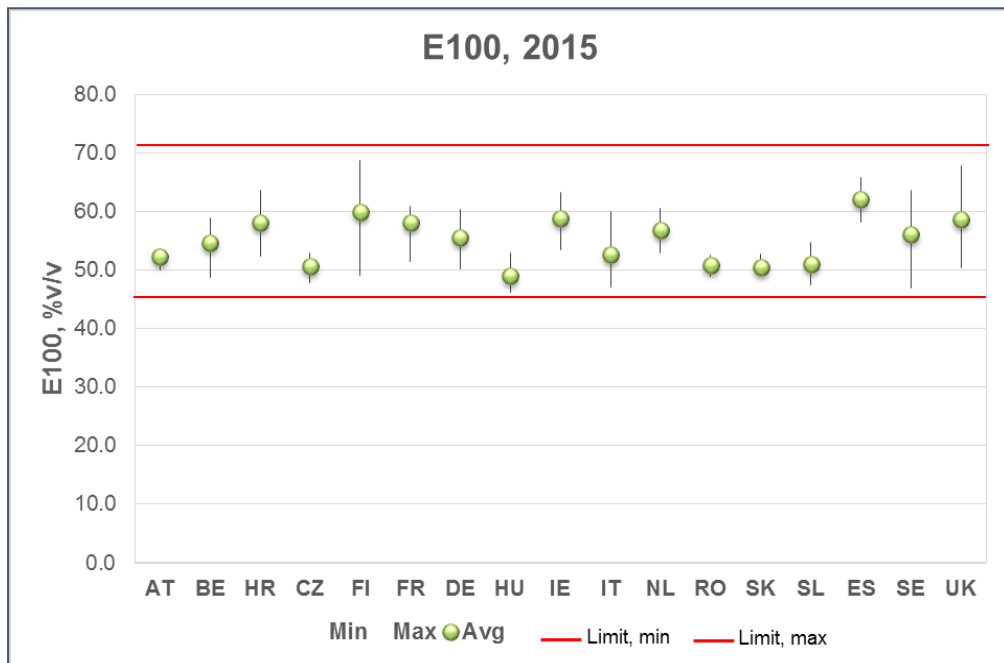


Figure 9. Petrol E150 in 2015

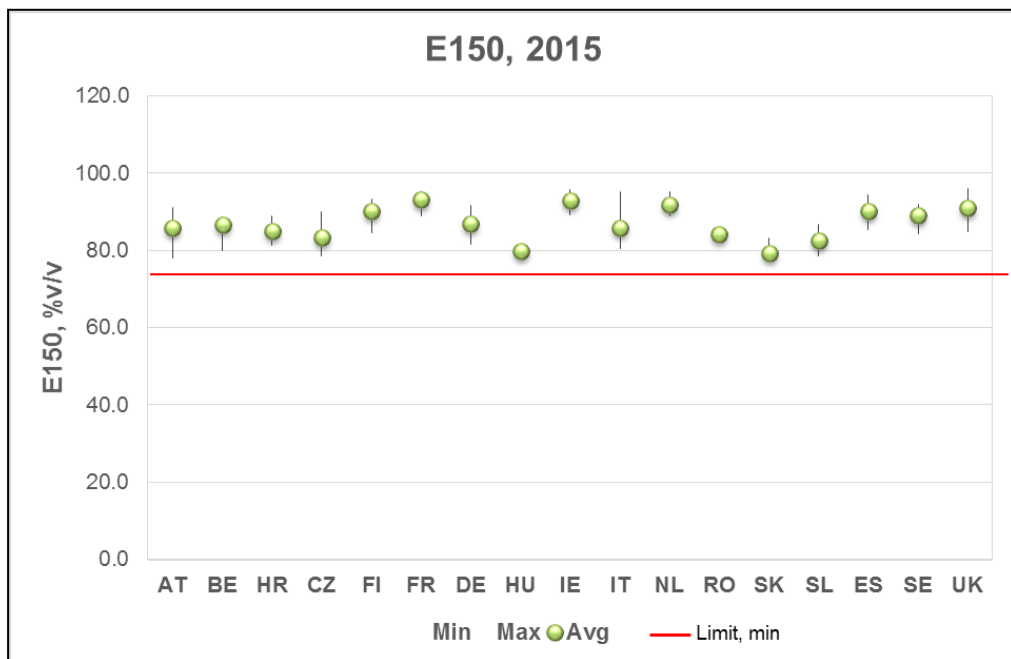
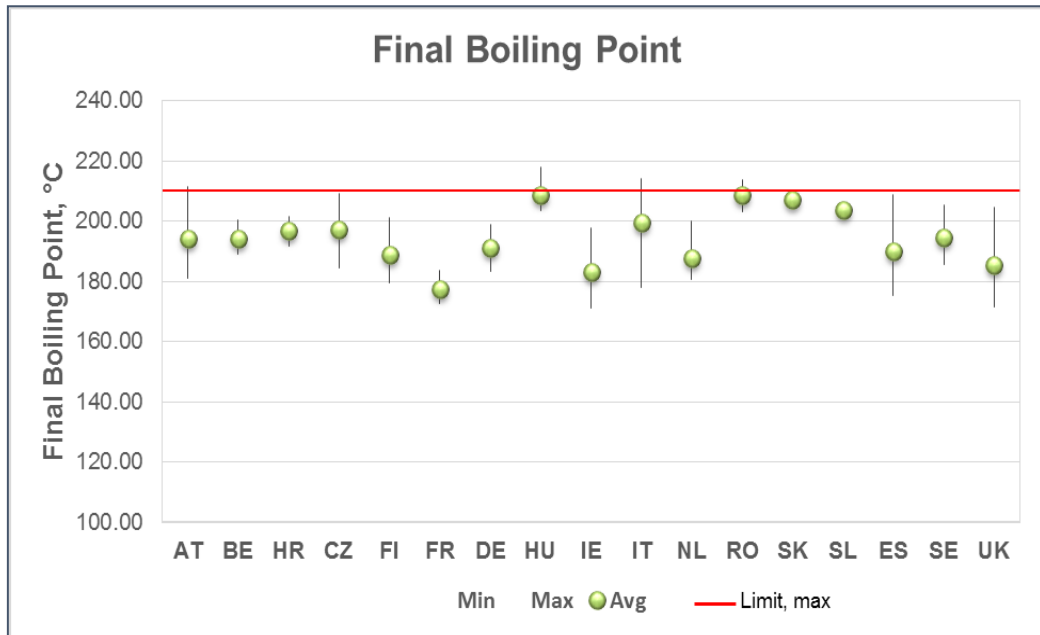


Figure 10. Petrol FBP in 2015



4.5. VAPOUR PRESSURE

Vapour pressure is set on a country by country basis and depends on vapour classes which have been agreed upon by each country. Not surprisingly northern European countries show higher vapour pressure than those of southern European countries for these which were summer grade fuels in **Figures 11** and **12**.

Figure 11. Petrol DVPE

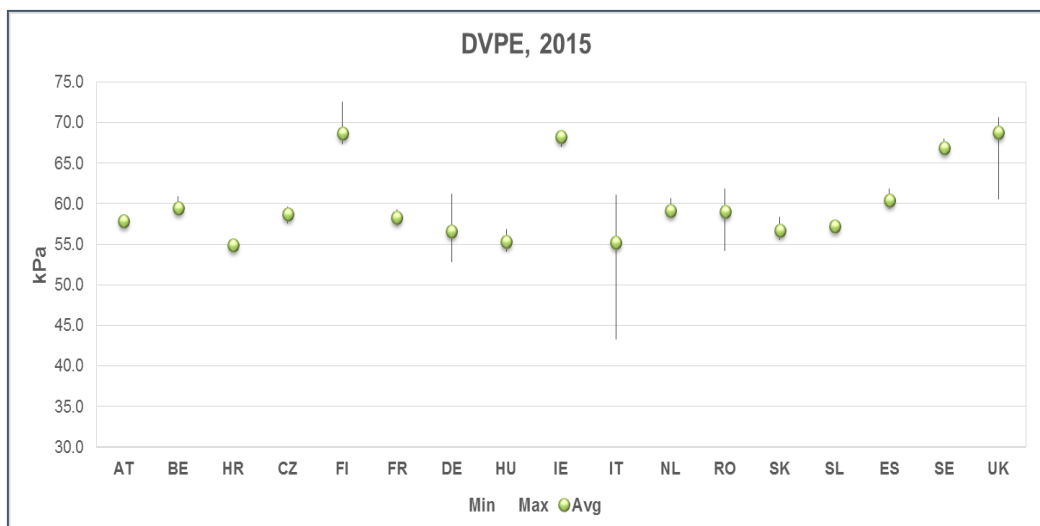
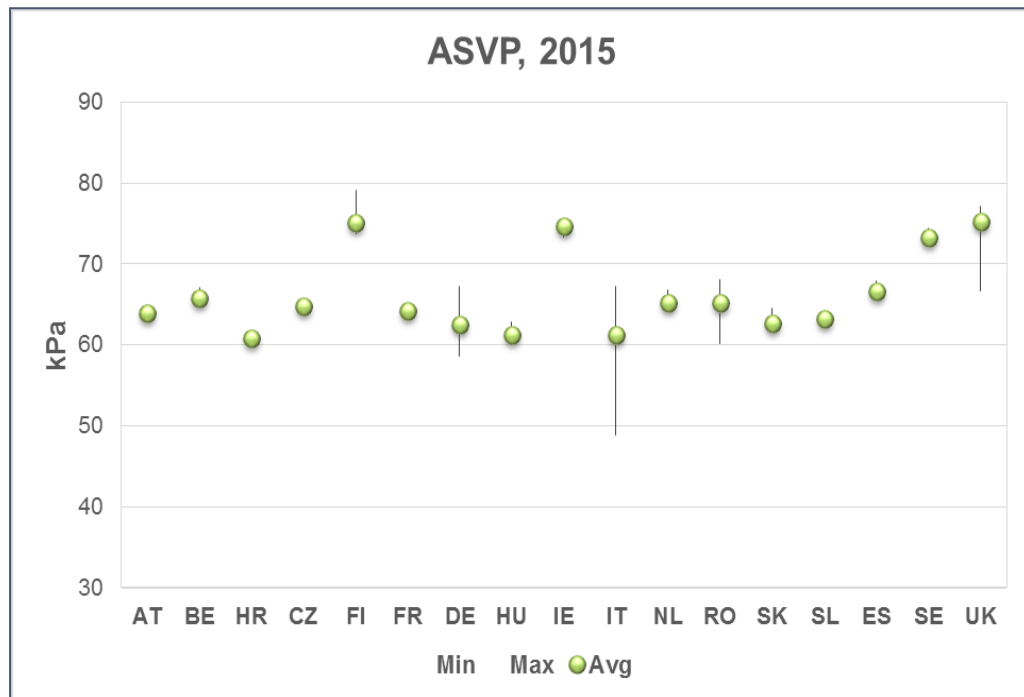


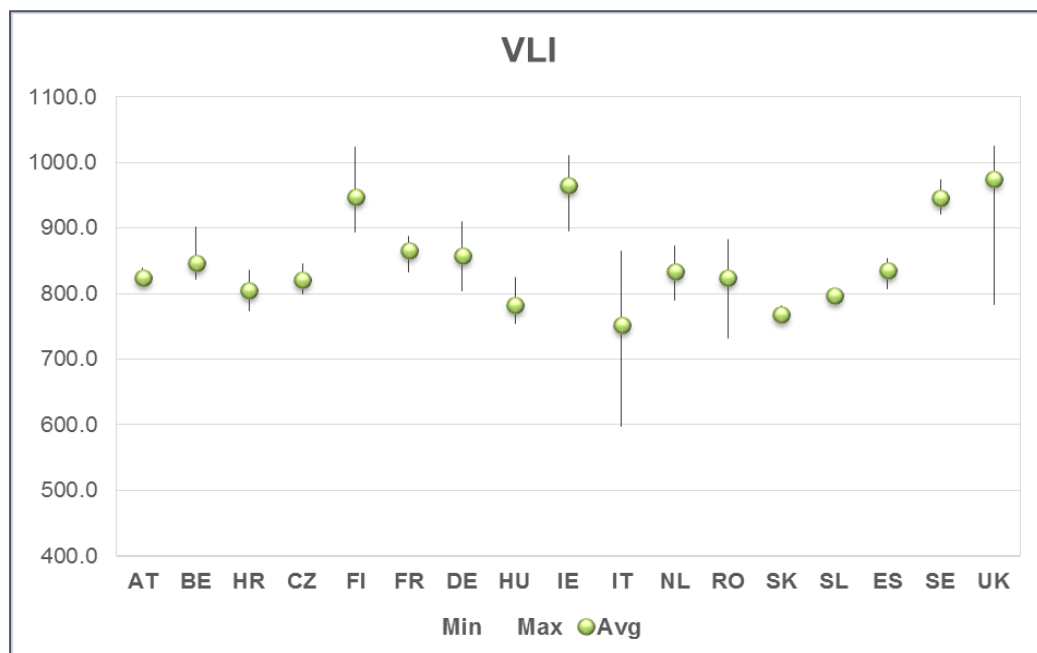
Figure 12. Petrol ASVP



4.6 VAPOUR LOCK INDEX

Vapour lock indices are shown in **Figure 13** and follow the vapour pressure results. Only in the transition periods on either side of summer are there any requirements on VLI so no conclusions can be made on these results.

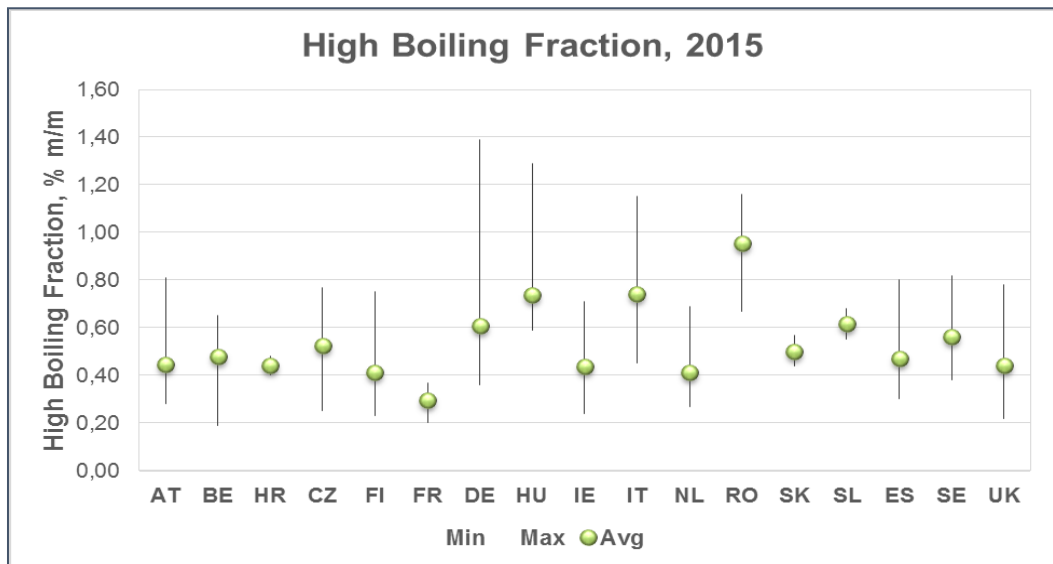
Figure 13. Vapour Lock Index



4.7 HIGH BOILING FRACTIONS

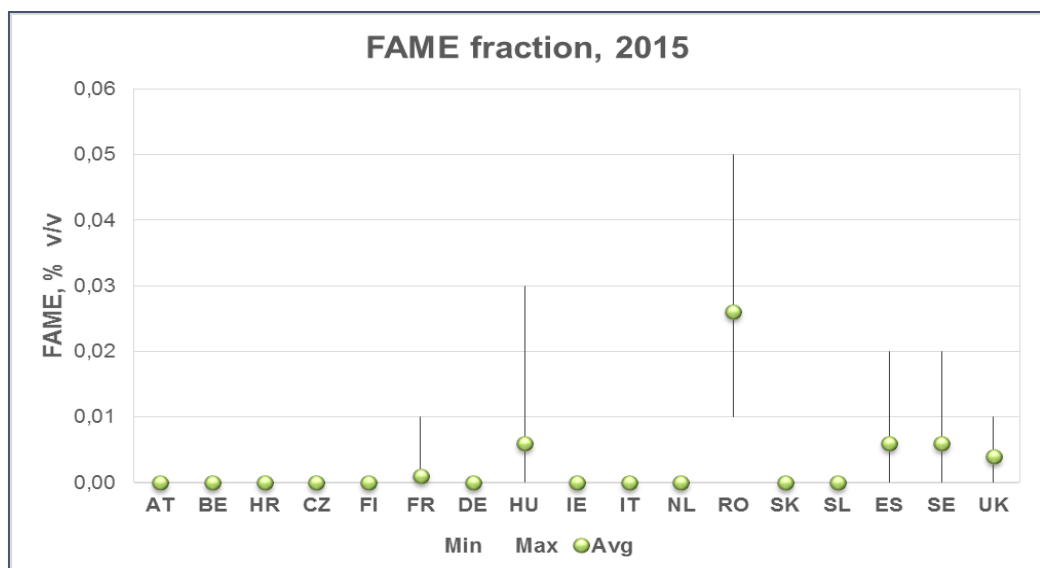
High boiling fractions give an indication of the heavier components in the fuel which can cause issues with gum formation. These results are shown in **Figure 14** and on average were below 1% m/m.

Figure 14. Petrol high boiling fraction in 2015



To investigate potential for FAME contamination in petrol, the FAME content was measured and the results are shown in **Figure 15**. The results were generally low with the highest levels observed in Hungary (average <0,01% v/v) and Romania (average <0,03% v/v).

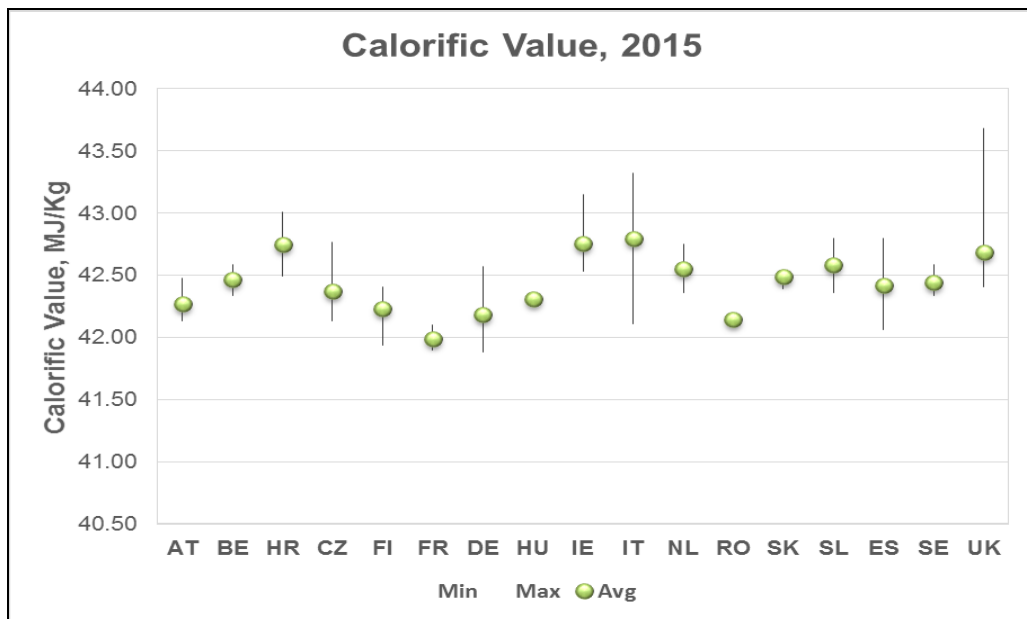
Figure 15. FAME content in Petrol in 2015



4.8 CALORIFIC VALUE

Although there is no specification for calorific value it was interesting to see that there is not very much variability in the results obtained from the different countries. Even the countries which are known to contain fuels with higher levels of alcohols only showed slightly lower calorific values compared to the others (**Figure 16**)

Figure 16. Calorific value of Petrol



4.9 UNWASHED GUM

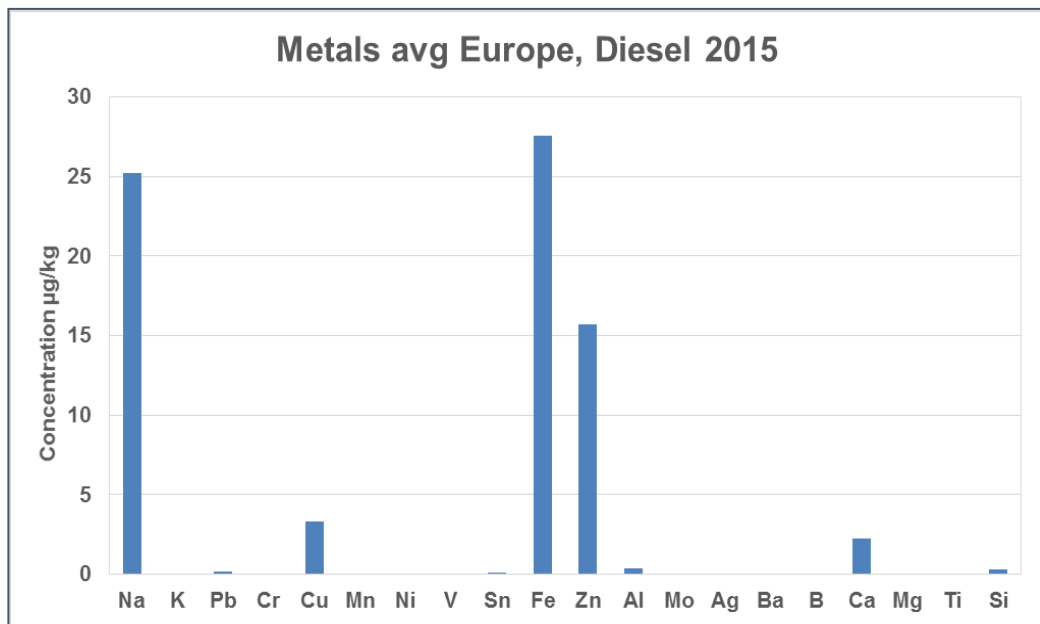
In all petrol samples unwashed gum content was negligible or absent so a chart has not been provided.

5. RESULTS AND DISCUSSION - DIESEL SURVEY

5.1 ELEMENTAL ANALYSIS

In **Figure 17** the average metals analyses in diesel for 2015 is shown.

Figure 17. Average metals content in 2015



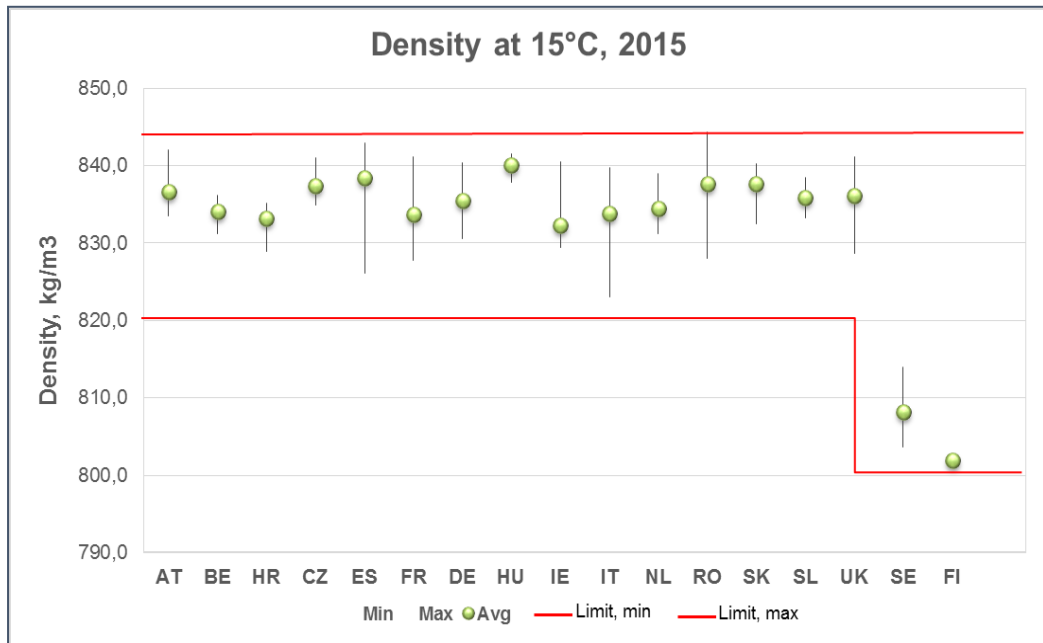
The elements K, Cr, Mn, Ni, V, Mo, Ag, Ba, B and Ti were not detected or negligible. The concentrations for Pb, Sn, Al, and Ca are uncertain by a factor of 3. This means a value of 1 ppb is in the range of 0.33- 3 ppb.

The presence of metals generally derives from different sources for example additive packages, processing of crude, catalysts used in processing of biofuels and in materials used in the distribution system. The levels of sodium, iron and zinc observed in the samples are considered very low.

5.2 DENSITY

The density content of diesel is well controlled in the refineries so it was not surprising that all the samples measured met the density limits as shown in **Figure 18**. The Swedish and Finnish fuels had much lower densities reflecting the class of winter grade fuels needed for Arctic conditions.

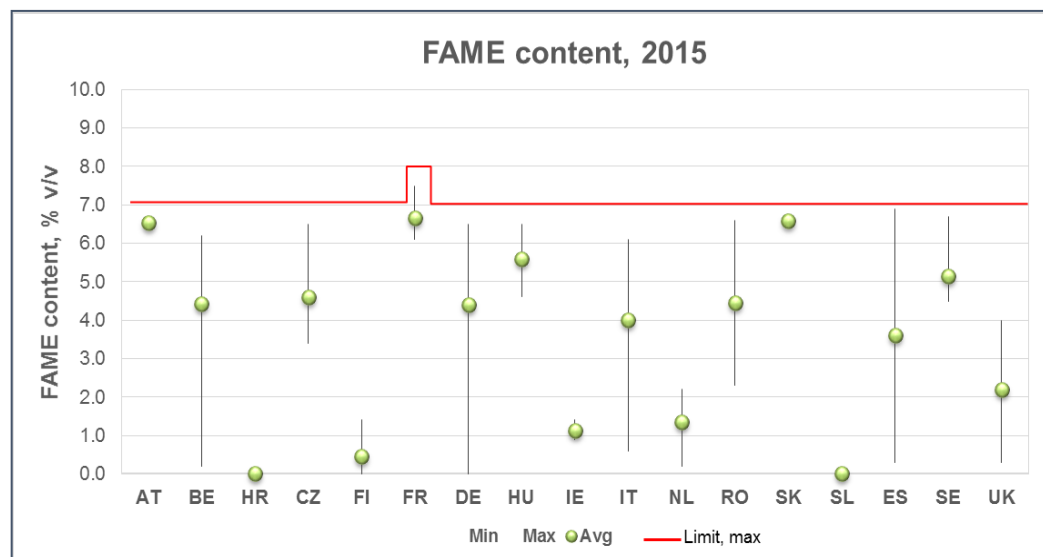
Figure 18. Density of diesel sample in 2015



5.3 FAME CONTENT

In **Figure 19**, FAME content is reported, it can be seen that the 7% specification limit was met in all cases; France has some values above 7% because the national limit for FAME content is 8%. The average FAME content for the samples tested was 3.7%.

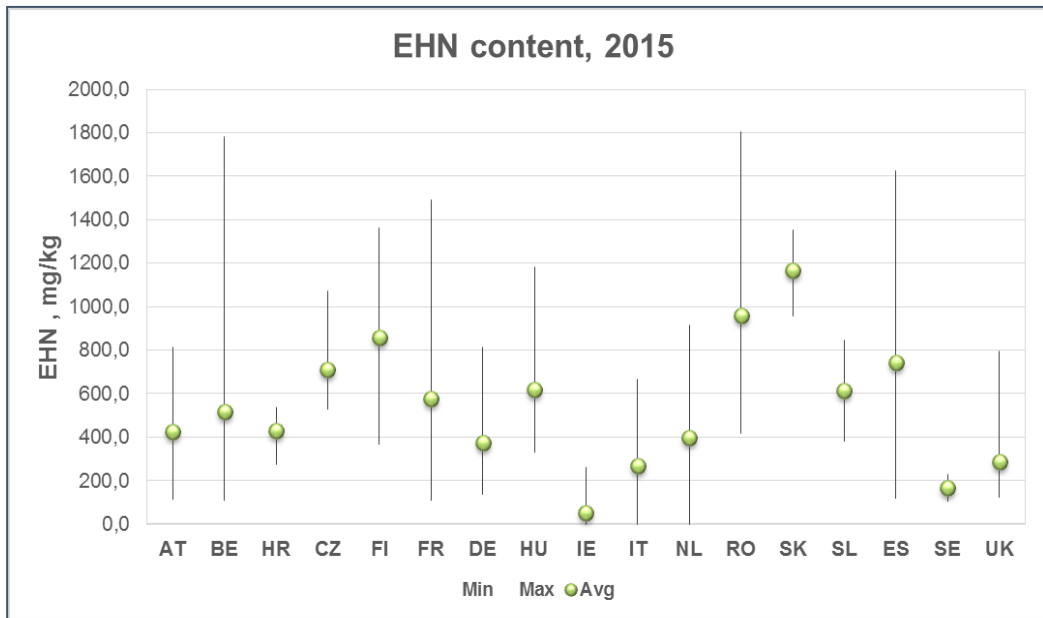
Figure 19. FAME content in diesel in 2015



5.4 EHN CONTENT

Cetane improver (Ethyl hexyl nitrate) content was tested and the results can be seen in **Figure 20**. Cetane improver content ranged from zero to 1800mg/kg with the average at 557mg/kg.

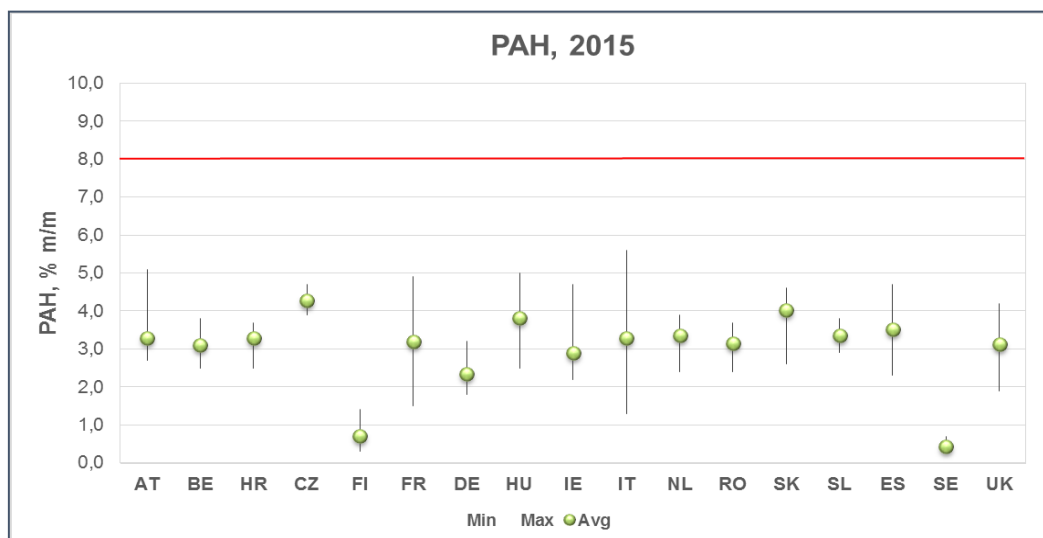
Figure 20. EHN Content in diesel in 2015



5.5 AROMATIC HYDROCARBONS COMPOSITION

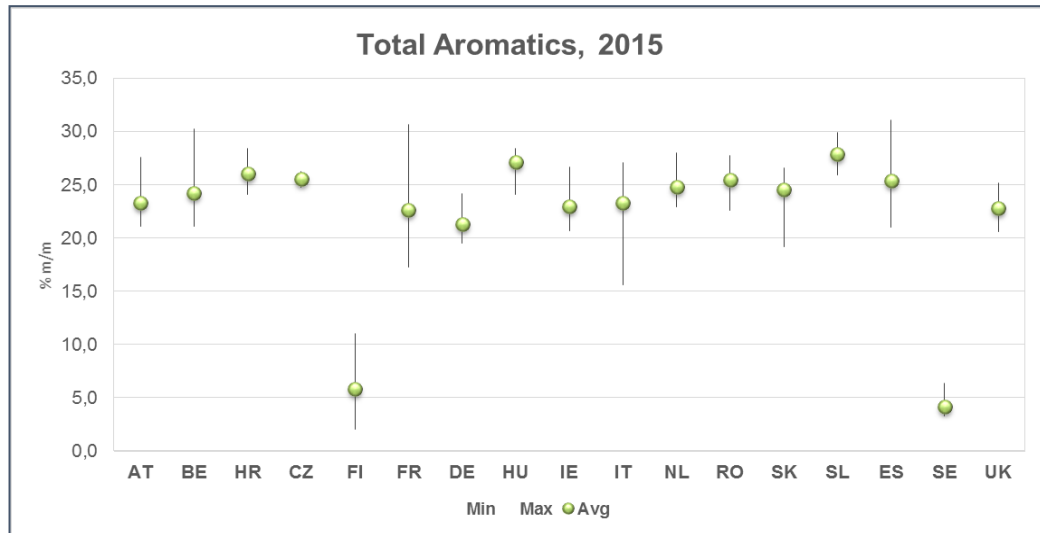
The hydrocarbon composition of samples has been tested showing that the polycyclic aromatic hydrocarbons content results were well below the specification limit (8 % (m/m)) with an average result of 3%. The PAH and total aromatic content is shown in **Figures 21 and 22**.

Figure 21. PAH content



The total aromatics content although not a diesel specification was below 30% in the majority of fuels tested. Finland and Sweden showed lower aromatics, both at around 5% again reflecting the lower density fuels used in the winter in these countries.

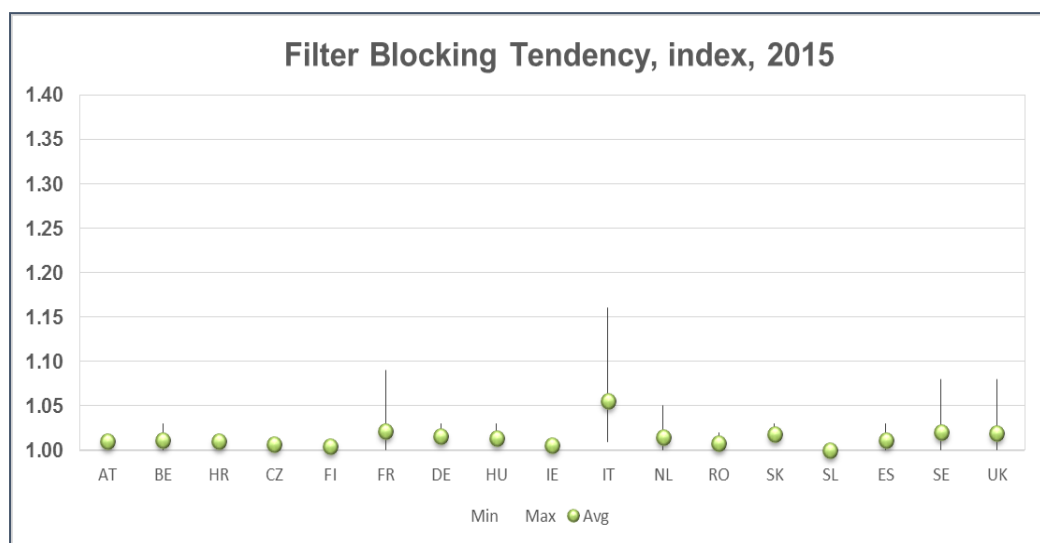
Figure 22. Total aromatics content



5.6 TOTAL CONTAMINATION

In most of the samples the level of contamination detected using EN 12662 was negligible and in all cases the reported values were well below the specification limit (24 mg/kg) so the chart has not been included here. The filter blocking tendency of diesel has recently been included in the national annex of the UK standard (BS EN 590) with a maximum limit of 2.52 for winter diesel fuels. All the samples tested were well below this limit. (Figure 23).

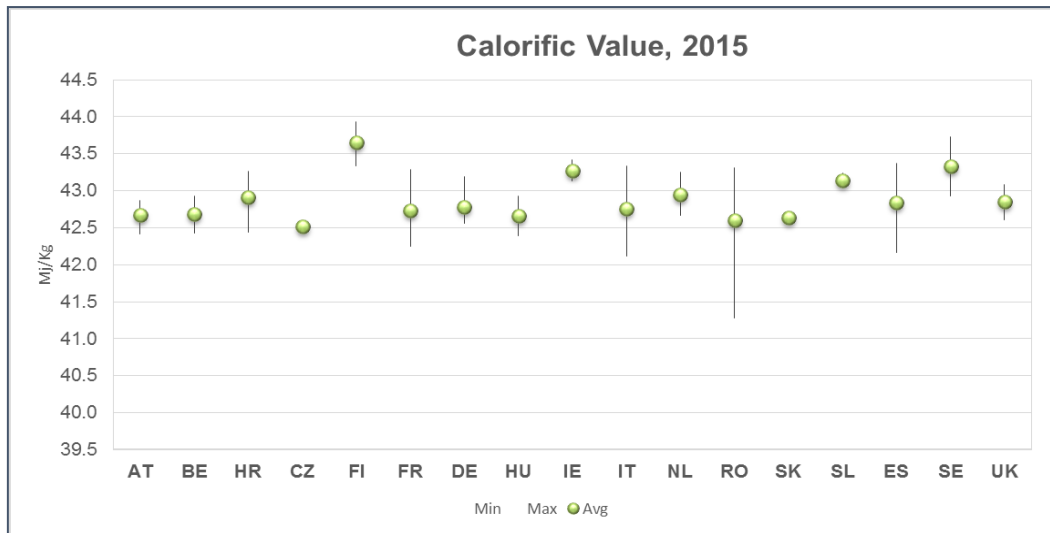
Figure 23. Filter Blocking Tendency (FBT)



5.7 CALORIFIC VALUE

As with petrol there was little variation in calorific value of the diesel samples with only Romania showing more variation than the other countries. This variation does not appear to correlate with any of the other properties observed so the reason is unknown.

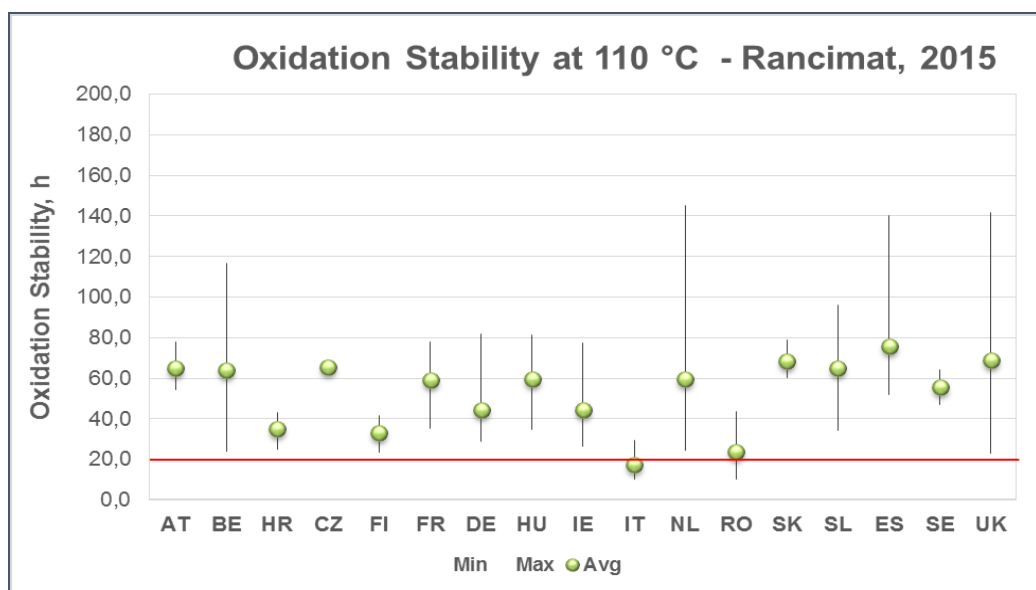
Figure 24. Calorific Value of Diesel



5.8 OXIDATION STABILITY

The current specification test in the EN 590 is the Rancimat test run at 110 °C. The minimum Rancimat specification is 20 hours although there are samples from some countries for which this is not relevant as all fuels from these countries contained less than 2% FAME – these were Croatia, Finland, Ireland and Slovakia. For Italy and Romania the averages appear to be lower and are closer to the specification limits.

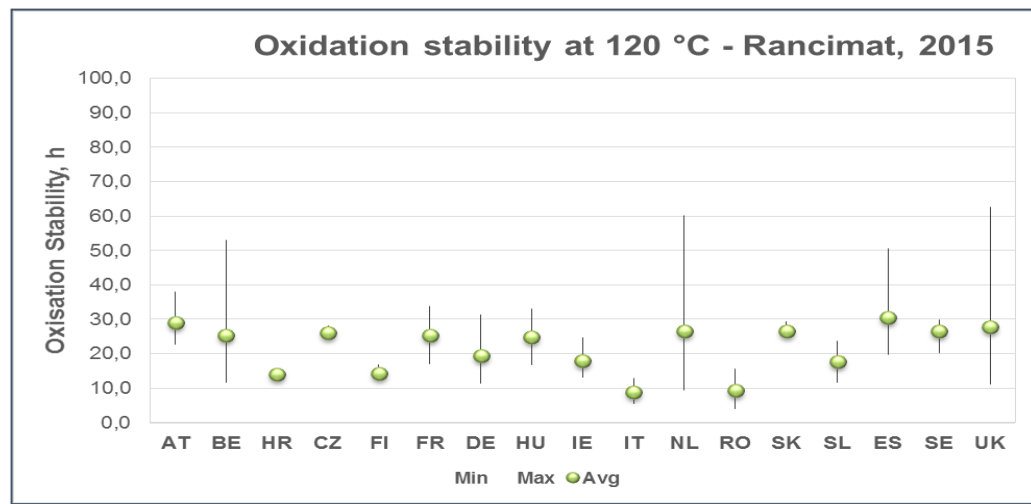
Figure 25. Rancimat results at 110°C in diesel in 2015



5.9 ALTERNATIVE OXIDATION STABILITY TEST METHODS

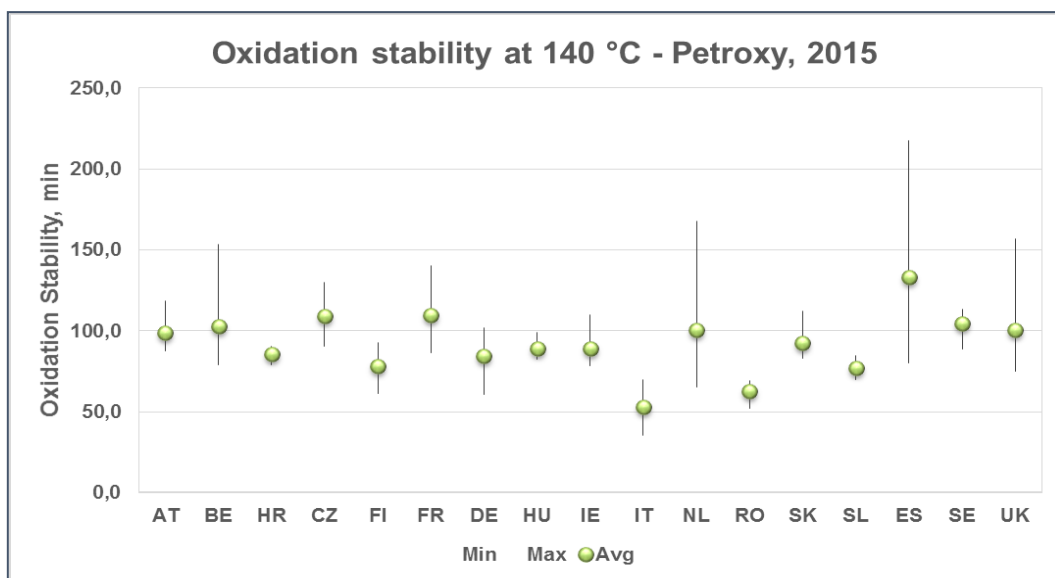
There are ongoing discussions within CEN and Concaawe on oxidation stability and various methods have been evaluated and correlated with the 110 °C Rancimat test. This section gives the results of some of them along with some correlations with the 110 °C Rancimat test. The Rancimat test run at 120°C is an attempt to speed up the test from 20 hours to around 10 hours. It was published by CEN in 2014 as EN 16568 although this has not been incorporated into EN 590. The results from the 2015 survey are shown in **Figure 26**.

Figure 26. Rancimat results run at 120°C in diesel in 2015



Another test method which has been developed which has the advantage of being quicker than the Rancimat test is the PetroOxy test. The standard test is run at 140°C and although it is not included in the EN 590 specification it has been included in the 2015 survey and the results are shown in **Figure 27**.

Figure 27. PetroOxy run at 140°C in diesel in 2015



6 CONCLUSIONS

The main conclusion from this 2015 survey is that fuels in Europe appear to be meeting the fuel standards for the specification tests conducted and quality appears to be on the whole consistently good. Specific observations were made as follows:

Petrol

- Metals content were at low levels and averages were generally less than 100ppb although there were some individual results which were higher
- ETBE and ethanol were the most commonly used oxygenates followed by smaller amounts of MTBE and TAME in the samples tested
- Average ETBE content was 1.7%v/v ranging from 0 to around 15%v/v
- Average Ethanol content was 4.3%v/v ranging from 0 to around 10%v/v
- High boiling fractions were on average below 1% and E150 was above the minimum limit of 75% in all cases
- FAME contamination was not generally present in these samples

Diesel

- Metals content was measured at very low levels and averages were generally less than 30ppb although there were some individual results which were higher
- PAH content is much lower than the 8%*m/m* specification value at 3%*m/m* on average and ranged from 0.3%*m/m* to 5.6%*m/m*
- Average FAME content was 3.7%v/v but ranged from 0 to 7.5%v/v
- Average EHN content was 557 mg/kg and ranged from 0 to around 1800mg/kg
- The oxidation stability requirement of the EN 590 standard was met in the vast majority of cases and there were no indications of filter blocking tendency in any of the samples tested

Compared to previous Concaawe surveys from 2008, 2010 and 2012, recently reported in reference [10] there were no significant changes in the trends observed for either petrol or diesel.

7 GLOSSARY

AES	Atomic emission spectrometry
ASVP	Air saturated vapour pressure
B7	Fuel containing 7% fatty acid methyl esters
B10	Fuel containing 10% fatty acid methyl esters
B100	Fuel consisting of 100% fatty acid methyl esters
CEN	Comité Européen de Normalisation
DGMK	Deutsche Wissenschaftliche Gesellschaft für Erdöl, Erdgas und Kohle e.V.
DIN	Deutsches Institut für Normung eV
DVPE	Dry vapour pressure equivalent
E70	Amount (%) which is evaporated at 70°C
E100	Amount (%) which is evaporated at 100°C
E150	Amount (%) which is evaporated at 150°C
EHN	Ethyl hexyl nitrate
EN	European Standard
ETBE	Ethyl tertiary butyl ether
FAME	Fatty acid methyl ester
FBP	Final Boiling Point
GC	Gas Chromatography
ICP	Inductively coupled plasma
ICP- MS	Inductively coupled plasma-mass spectrometry
ISO	International Standards Organization
MTBE	Methyl tertiary butyl ether
ppb	Parts per billion (µg/kg)
ppm	Parts per million (mg/kg)
TAME	Tertiary amyl methyl ether
VLI	Vapour lock index

8 ACKNOWLEDGMENTS

Concaawe and FE/STF-24 would like to acknowledge the contribution of ASG Analytik Service GmbH, (Germany) in carrying out testing for the survey described in this report.

9 REFERENCES

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APPENDIX: SURVEY DATA PER COUNTRY

CONCAWE Petrol survey 2015
 Country: Austria
 Measured properties: elemental analysis

Austria	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	131,0	175	148,4	0
Potassium (K)	5	0,0	0	0	5
Lead (Pb)	5	0,0	0	0	5
Chromium (Cr)	5	0,0	0	0	5
Copper (Cu)	5	0,0	19	6	3
Manganese (Mn)	5	0,0	15	7,2	2
Nickel (Ni)	5	0,0	0	0	5
Vanadium (V)	5	0,0	0	0	5
Tin (Sn)	5	0,0	0	0	5
Iron (Fe)	5	15,0	27	19	0
Zinc (Zn)	5	12,0	45	24,6	0
Aluminium (Al)	5	0,0	0	0	5
Molybdenum (Mo)	5	0,0	0	0	5
Silver (Ag)	5	0,0	0	0	5
Barium (Ba)	5	0,0	0	0	5
Boron (B)	5	0,0	65	20,8	1
Calcium (Ca)	5	0,0	0	0	5
Magnesium (Mg)	5	0,0	77	49	1
Titanium (Ti)	5	0,0	0	0	5
Silicon (Si)	5	0,0	0	0	5

CONCAWE Petrol survey 2015

Country: Austria

Measured properties: Distillation characteristics, oxygenates and high boiling components

Austria	2015							
Property	Method	Unit	Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	EN ISO 3405	°C		5	5,0	40,8	32,5	0
Evaporated at 70°C (E70)	EN ISO 3405	% (V/V)	22-50	5	34,5	36,1	35,2	0
Evaporated at 100°C (E100)	EN ISO 3405	% (V/V)	46-71	5	50,0	53,6	52,3	0
Evaporated at 150°C (E150)	EN ISO 3405	% (V/V)	Min 75	5	77,9	91,2	85,9	0
Final boiling point (FBP)	EN ISO 3405	°C	Max 210	5	181,0	211,4	193,98	0
Distillation residue	EN ISO 3405	% (V/V)	Max 2	5	0,8	1	0,88	0
Vapour pressure DVPE	EN 13016-1	kPa		5	57,5	58,7	57,84	0
Vapour pressure ASVP	EN 13016-1	kPa		5	63,5	64,7	63,86	0
Vapour lock index				5	816.5	839.7	824.52	0
Unwashed gum	EN ISO 6246	mg/100 ml		5	0	0	0	5
2-Butanol	EN ISO 22854	% (v/v)	Max 15	5	0,0	0,0	0,0	5
ETBE	EN ISO 22854	% (v/v)	Max 5	5	0,5	1,98	0,888	0
Ethanol	EN ISO 22854	% (v/v)	Max 3	5	4,6	4,86	4,728	0
Methanol	EN ISO 22854	% (v/v)		5	0,0	0	0	5
Iso-Propanol	EN ISO 22854	% (v/v)	Max 15	5	0,0	0	0	5
MTBE	EN ISO 22854	% (v/v)	Max 15	5	0,2	3,82	1,76	0
TAME	EN ISO 22854	% (v/v)		5	0,0	0,09	0,064	1
TAAE	EN ISO 22854	% (v/v)		5	0,0	1,25	0,25	3
High boiling components	EN 16270	% (m/m)		5	0,3	0,81	0,444	0
FAME fraction	EN 16270	% (m/m)		5	0	0	0	5
Calorific value, lower	EN ISO 22854	MJ/kg		5	42.1	42.48	42.27	0

CONCAWE Diesel survey 2015
 Country: Austria
 Measured properties: elemental analysis

Austria	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	0,0	0,0	0,0	5
Potassium (K)	5	0,0	0,0	0,0	5
Lead (Pb)	5	0,0	0,0	0,0	5
Chromium (Cr)	5	0,0	0,0	0,0	5
Copper (Cu)	5	0,0	0,0	0,0	5
Manganese (Mn)	5	0,0	0,0	0,0	5
Nickel (Ni)	5	0,0	0,0	0,0	5
Vanadium (V)	5	0,0	0,0	0,0	5
Tin (Sn)	5	0,0	0,0	0,0	5
Iron (Fe)	5	0,0	23,0	6,6	3
Zinc (Zn)	5	0,0	57,0	15,4	3
Aluminium (Al)	5	0,0	0,0	0,0	5
Molybdenum (Mo)	5	0,0	0,0	0,0	5
Silber (Ag)	5	0,0	0,0	0,0	5
Barium (Ba)	5	0,0	0,0	0,0	5
Boron (B)	5	0,0	0,0	0,0	5
Calcium (Ca)	5	0,0	79,0	15,8	4
Magnesium (Mg)	5	0,0	0,0	0,0	5
Titanium (Ti)	5	0,0	0,0	0,0	5
Silicon (Si)	5	0,0	0,0	0,0	5

CONCAWE Diesel survey 2015

Country: Austria

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Austria	2015							
Property	unit	Spec.	Method	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	kg/m ³	820-845	EN ISO 12185	5	833,5	842,0	836,6	0
FAME content	% (V/V)	7	EN 14078	5	6,4	6,6	6,5	0
Oxidation stability at 110°C (Rancimat)	h	Min 20	EN 15751	5	54,3	77,7	64,8	0
Oxidation stability at 120°C (Rancimat)	h			5	22,7	38,0	29,0	0
Oxidation stability at 140°C (Petrooxy)	min		EN 16091	5	87,7	118,5	98,5	0
Monoaromatics	% (m/m)		EN 12916	5	18,3	22,5	20,0	0
Diaromatics	% (m/m)			5	2,4	4,3	2,9	0
Triaromatics	% (m/m)			5	0,2	0,8	0,4	0
PAH content	% (m/m)	Max 8		5	2,7	5,1	3,3	0
Total aromatics	% (m/m)			5	21,1	27,6	23,3	0
Total contamination	EN 12662	mg/kg		5	0.0	0.0	0.0	5
Filter Blocking Tendency	-		IP 387 (ambient)	5	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		5	42.4	42.9	42.7	0
EHN-content	mg/kg		DIN 51449	5	116,0	813,0	423,6	0

CONCAWE Petrol survey 2015
Country: Belgium
Measured properties: elemental analysis

Belgium	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	150,0	280	197,2	0
Potassium (K)	5	0,0	88	17,6	4
Lead (Pb)	5	0,0	0	0	5
Chromium (Cr)	5	0,0	26	15,6	2
Copper (Cu)	5	0,0	315	63	4
Manganese (Mn)	5	0,0	0	0	5
Nickel (Ni)	5	0,0	0	0	5
Vanadium (V)	5	0,0	0	0	5
Tin (Sn)	5	0,0	0	0	5
Iron (Fe)	5	21,0	33	24,8	0
Zinc (Zn)	5	15,0	50	31,8	0
Aluminium (Al)	5	0,0	0	0	5
Molybdenum (Mo)	5	0,0	0	0	5
Silver (Ag)	5	0,0	0	0	5
Barium (Ba)	5	0,0	0	0	5
Boron (B)	5	0,0	0	0	5
Calcium (Ca)	5	0,0	56	11,2	0
Magnesium (Mg)	5	0,0	0	0	5
Titanium (Ti)	5	0,0	0	0	5
Silicon (Si)	5	0,0	0	0	5

CONCAWE Petrol survey 2015

Country: Belgium

Measured properties: Distillation characteristics, oxygenates and high boiling components

Belgium	2015							
Property	Method	Unit	Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	EN ISO 3405	°C		5	24,7	37,2	32,14	0
Evaporated at 70°C (E70)	EN ISO 3405	% (V/V)	22-50	5	33,2	41,9	36	0
Evaporated at 100°C (E100)	EN ISO 3405	% (V/V)	46-71	5	48,7	59	54,72	0
Evaporated at 150°C (E150)	EN ISO 3405	% (V/V)	Min 75	5	80,0	88,7	86,52	0
Final boiling point (FBP)	EN ISO 3405	°C	Max 210	5	188,9	200,3	194,16	0
Distillation residue	EN ISO 3405	% (V/V)	Max 2	5	0,6	0,9	0,72	0
Vapour pressure DVPE	EN 13016-1	kPa		5	58,6	60,9	59,48	0
Vapour pressure ASVP	EN 13016-1	kPa		5	65,1	67,1	65,74	0
Vapour lock index				5	821.2	902.3	846.8	0
Unwashed gum	EN ISO 6246	mg/100 ml		5	0	0	0	5
2-Butanol	EN ISO 22854	% (V/V)		5	0,0	0	0	5
ETBE	EN ISO 22854	% (V/V)	Max 15	5	0,0	0,04	0,008	4
Ethanol	EN ISO 22854	% (V/V)	Max 5	5	4,5	5,43	4,864	0
Methanol	EN ISO 22854	% (V/V)	Max 3	5	0,0	0	0	5
iso-Propanol	EN ISO 22854	% (V/V)		5	0,0	0	0	5
MTBE	EN ISO 22854	% (V/V)	Max 15	5	0,1	2,79	1,24	0
TAME	EN ISO 22854	% (V/V)	Max 15	5	0,0	0	0	5
TAAE	EN ISO 22854	% (V/V)		5	0,0	0	0	5
High boiling components	EN 16270	% (m/m)		5	0,2	0,65	0,478	0
FAME fraction	EN 16270	% (m/m)		5	0.0	0	0	5
Calorific value, lower	EN ISO 22854	MJ/kg		5	42.3	42.59	42.462	0

CONCAWE Diesel survey 2015
Country: Belgium
Measured properties: elemental analysis

Belgium	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	11	0,0	85,0	19,7	8
Potassium (K)	11	0,0	0,0	0,0	11
Lead (Pb)	11	0,0	0,0	0,0	11
Chromium (Cr)	11	0,0	0,0	0,0	11
Copper (Cu)	11	0,0	12,0	1,1	10
Manganese (Mn)	11	0,0	0,0	0,0	11
Nickel (Ni)	11	0,0	0,0	0,0	11
Vanadium (V)	11	0,0	0,0	0,0	11
Tin (Sn)	11	0,0	0,0	0,0	11
Iron (Fe)	11	0,0	73,0	27,8	3
Zinc (Zn)	11	10,0	73,0	34,1	0
Aluminium (Al)	11	0,0	0,0	0,0	11
Molybdenum (Mo)	11	0,0	0,0	0,0	11
Silber (Ag)	11	0,0	0,0	0,0	11
Barium (Ba)	11	0,0	0,0	0,0	11
Boron (B)	11	0,0	11,0	1,9	9
Calcium (Ca)	11	0,0	0,0	0,0	11
Magnesium (Mg)	11	0,0	0,0	0,0	11
Titanium (Ti)	11	0,0	0,0	0,0	11
Silicon (Si)	11	0,0	1,1	0,4	6

CONCAWE Diesel survey 2015

Country: Belgium

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Belgium	2015							
Property	Method	Unit	Spec.	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	11	831,2	836,2	834,1	0
FAME content	EN 14078	% (V/V)	7	11	0,2	6,2	4,4	0
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	11	24,1	116,6	64,1	0
Oxidation stability at 120°C (Rancimat)		h		11	11,6	52,9	25,3	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		11	79,0	153,4	102,7	0
Oxidation stability at 120°C (Petrooxy)		min		11	388,9	857,7	568,9	0
Monoaromatics	EN 12916	% (m/m)		11	18,2	27,3	21,1	0
Diaromatics		% (m/m)		11	2,4	3,2	2,8	0
Triaromatics		% (m/m)		11	0,1	0,6	0,4	0
PAH content		% (m/m)	Max 8	11	2,5	3,8	3,1	0
Total aromatics		% (m/m)		11	21,1	30,3	24,2	0
Total contamination	EN 12662	mg/kg		11	0.0	0.0	0.0	11
Filter Blocking Tendency	IP 387 (ambient)	-		11	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		11	42.4	42.9	42.7	0
EHN-content	DIN 51449	mg/kg		11	108,0	1783,0	516,6	0

CONCAWE Petrol survey 2015
Country: Croatia
Measured properties: elemental analysis

Croatia	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	2	111,0	134,0	122,5	0
Potassium (K)	2	0,0	0,0	0	2
Lead (Pb)	2	0,0	0,0	0	2
Chromium (Cr)	2	0,0	0,0	0	2
Copper (Cu)	2	0,0	0,0	0	2
Manganese (Mn)	2	0,0	0,0	0	2
Nickel (Ni)	2	0,0	0,0	0	2
Vanadium (V)	2	0,0	0,0	0	2
Tin (Sn)	2	0,0	0,0	0	2
Iron (Fe)	2	14,0	15,0	14,5	0
Zinc (Zn)	2	0,0	25,0	12,5	0
Aluminium (Al)	2	0,0	0,0	0	2
Molybdenum (Mo)	2	0,0	0,0	0	2
Silver (Ag)	2	0,0	0,0	0	2
Barium (Ba)	2	0,0	0,0	0	2
Boron (B)	2	0,0	0,0	0	2
Calcium (Ca)	2	0,0	64,0	32	0
Magnesium (Mg)	2	64,0	122,0	93	0
Titanium (Ti)	2	0,0	0,0	0	2
Silicon (Si)	2	0,0	0,0	0	2

CONCAWE Petrol survey 2015

Country: Croatia

Measured properties: Distillation characteristics, oxygenates and high boiling components

Croatia	2015							No. under limit of detection	
	Property	Method	Units	Spec.	n	Min	Max		Avg
Initial boiling point (IBP)	DIN EN ISO 3405	°C			2	37,1	37,5	37,3	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50		2	32,5	40,5	36,5	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71		2	52,4	63,7	58,05	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75		2	81,4	88,8	85,1	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210		2	191,8	201,5	196,65	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2		2	0,9	1,0	0,95	0
Vapour pressure DVPE	DIN EN 13016-1	kPa			2	54,6	55,3	54,95	0
Vapour pressure ASVP	DIN EN 13016-1	kPa			2	60,5	61,2	60,85	0
Vapour lock index					2	773.5	836.5	805	0
Unwashed gum	EN ISO 6246	mg/100 ml			2	0	0	0	2
2-Butanol	EN ISO 22854	% (V/V)			2	0,0	0,0	0	2
ETBE	EN ISO 22854	% (V/V)	Max 15		2	0,0	1,6	0,81	1
Ethanol	EN ISO 22854	% (V/V)	Max 5		2	0,0	0,1	0,03	1
Methanol	EN ISO 22854	% (V/V)	Max 3		2	0,0	0,0	0	2
iso-Propanol	EN ISO 22854	% (V/V)			2	0,0	0,0	0	2
MTBE	EN ISO 22854	% (V/V)	Max 15		2	1,6	10,7	6,15	0
TAME	EN ISO 22854	% (V/V)	Max 15		2	0,0	0,0	0	2
TAE	EN ISO 22854	% (V/V)			2	0,0	0,0	0	2
High boiling components	EN 16270	% (m/m)			2	0,4	0,5	0,44	0
FAME fraction	EN 16270	% (m/m)			2	0	0	0	2
Calorific value, lower	EN ISO 22854	MJ/kg			2	42.5	43.0	42.75	0

CONCAWE Diesel survey 2015
Country: Croatia
Measured properties: elemental analysis

Croatia	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	4	0,0	0,0	0,0	4
Potassium (K)	4	0,0	0,0	0,0	4
Lead (Pb)	4	0,0	0,0	0,0	4
Chromium (Cr)	4	0,0	0,0	0,0	4
Copper (Cu)	4	0,0	0,0	0,0	4
Manganese (Mn)	4	0,0	0,0	0,0	4
Nickel (Ni)	4	0,0	0,0	0,0	4
Vanadium (V)	4	0,0	0,0	0,0	4
Tin (Sn)	4	0,0	0,0	0,0	4
Iron (Fe)	4	0,0	11,0	2,8	3
Zinc (Zn)	4	0,0	36,0	12,3	2
Aluminium (Al)	4	0,0	0,0	0,0	4
Molybdenum (Mo)	4	0,0	0,0	0,0	4
Silber (Ag)	4	0,0	0,0	0,0	4
Barium (Ba)	4	0,0	0,0	0,0	4
Boron (B)	4	0,0	0,0	0,0	4
Calcium (Ca)	4	0,0	0,0	0,0	4
Magnesium (Mg)	4	0,0	0,0	0,0	4
Titanium (Ti)	4	0,0	0,0	0,0	4
Silicon (Si)	4	0,0	0,0	0,0	4

CONCAWE Diesel survey 2015

Country: Croatia

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Croatia		2015						
Property	Method	Units	Spec.	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	°C	820-845	4	828,9	835,2	833,2	0
FAME content	EN 14078	% (V/V)	7	4	0,0	0,0	0,0	4
Oxidation stability at 110°C (Rancimat)	EN 15751	% (V/V)	Min 20	4	25,1	42,9	35,2	0
Oxidation stability at 120°C (Rancimat)		% (V/V)		4	13,5	14,5	14,1	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	°C		4	78,9	90,3	85,4	0
Oxidation stability at 120°C (Petrooxy)		% (V/V)		4	379,3	499,1	445,7	0
Monoaromatics	EN 12916	kPa		4	21,1	24,7	22,8	0
Diaromatics		kPa		4	2,2	3,4	2,9	0
Triaromatics		% (V/V)		4	0,3	0,5	0,4	0
PAH content		% (V/V)	Max 8	4	2,5	3,7	3,3	0
Total aromatics		% (V/V)		4	24,1	28,4	26,0	0
Total contamination	EN 12662	mg/kg		4	0.0	0.0	0.0	4
Filter Blocking Tendency	IP 387 (ambient)	% (V/V)		4	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		4	42.4	43.3	42.9	0
EHN-content	DIN 51449	% (V/V)		4	273,0	539,0	429,3	0

CONCAWE Petrol survey 2015
Country: Czech Republic
Measured properties: elemental analysis

Czech Republic	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	3	153,0	161,0	157,7	0
Potassium (K)	3	0,0	0,0	0,0	3
Lead (Pb)	3	0,0	0,0	0,0	3
Chromium (Cr)	3	0,0	0,0	0,0	3
Copper (Cu)	3	36,0	82,0	53,3	0
Manganese (Mn)	3	0,0	17,0	9,3	1
Nickel (Ni)	3	0,0	0,0	0,0	3
Vanadium (V)	3	0,0	0,0	0,0	3
Tin (Sn)	3	0,0	0,0	0,0	3
Iron (Fe)	3	17,0	22,0	19,7	0
Zinc (Zn)	3	12,0	83,0	39,3	0
Aluminium (Al)	3	0,0	0,0	0,0	3
Molybdenum (Mo)	3	0,0	0,0	0,0	3
Silver (Ag)	3	0,0	0,0	0,0	3
Barium (Ba)	3	0,0	0,0	0,0	3
Boron (B)	3	0,0	21,0	7,0	2
Calcium (Ca)	3	0,0	74,0	24,7	2
Magnesium (Mg)	3	51,0	70,0	58,0	0
Titanium (Ti)	3	0,0	0,0	0,0	3
Silicon (Si)	3	0,0	0,0	0,0	3

CONCAWE Petrol survey 2015

Country: Czech Republic

Measured properties: Distillation characteristics, oxygenates and high boiling components

Czech Republic	2015							
Property	Method	Unit	Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	EN ISO 3405	°C		3	37,0	38,9	38,1	0
Evaporated at 70°C (E70)	EN ISO 3405	% (V/V)	22-50	3	29,8	35,8	33,4	0
Evaporated at 100°C (E100)	EN ISO 3405	% (V/V)	46-71	3	47,9	52,9	50,7	0
Evaporated at 150°C (E150)	EN ISO 3405	% (V/V)	Min 75	3	78,6	89,9	83,5	0
Final boiling point (FBP)	EN ISO 3405	°C	Max 210	3	184,4	209,0	197,2	0
Distillation residue	EN ISO 3405	% (V/V)	Max 2	3	0,9	1,0	0,9	0
Vapour pressure DVPE	EN 13016-1	kPa		3	57,6	59,6	58,7	0
Vapour pressure ASVP	EN 13016-1	kPa		3	63,6	65,7	64,8	0
Vapour lock index				3	798.6	846.6	821.1	0
Unwashed gum	EN ISO 6246	mg/100 ml		3	4.4	4.4	4.4	0
2-Butanol	EN ISO 22854	% (V/V)		3	0,0	0,0	0,0	3
ETBE	EN ISO 22854	% (V/V)	Max 15	3	0,1	2,3	0,8	0
Ethanol	EN ISO 22854	% (V/V)	Max 5	3	3,0	4,8	4,2	0
Methanol	EN ISO 22854	% (V/V)	Max 3	3	0,0	0,0	0,0	3
iso-Propanol	EN ISO 22854	% (V/V)		3	0,0	0,0	0,0	3
MTBE	EN ISO 22854	% (V/V)	Max 15	3	0,8	4,7	2,2	0
TAME	EN ISO 22854	% (V/V)	Max 15	3	0,0	0,0	0,0	3
TAAE	EN ISO 22854	% (V/V)		3	0,0	0,0	0,0	3
High boiling components	EN 16270	% (m/m)		3	0,3	0,8	0,5	0
FAME fraction	EN 16270	% (m/m)		3	0.0	0.0	0.0	3
Calorific value, lower	EN ISO 22854	MJ/kg		3	42.1	42.8	42.4	0

CONCAWE Diesel survey 2015 Country: Czech Republic
 Measured properties: elemental analysis

Czech Republic	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	3	0,0	0,0	0,0	3
Potassium (K)	3	0,0	0,0	0,0	3
Lead (Pb)	3	0,0	0,0	0,0	3
Chromium (Cr)	3	0,0	0,0	0,0	3
Copper (Cu)	3	0,0	0,0	0,0	3
Manganese (Mn)	3	0,0	0,0	0,0	3
Nickel (Ni)	3	0,0	0,0	0,0	3
Vanadium (V)	3	0,0	0,0	0,0	3
Tin (Sn)	3	0,0	0,0	0,0	3
Iron (Fe)	3	14,0	23,0	17,0	0
Zinc (Zn)	3	27,0	27,0	27,0	0
Aluminium (Al)	3	0,0	0,0	0,0	3
Molybdenum (Mo)	3	0,0	0,0	0,0	3
Silber (Ag)	3	0,0	0,0	0,0	3
Barium (Ba)	3	0,0	0,0	0,0	3
Boron (B)	3	0,0	0,0	0,0	3
Calcium (Ca)	3	0,0	0,0	0,0	3
Magnesium (Mg)	3	0,0	0,0	0,0	3
Titanium (Ti)	3	0,0	0,0	0,0	3
Silicon (Si)	3	0,0	0,8	0,3	3

CONCAWE Diesel survey 2015

Country: Czech Republic

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Czech Republic	2015							No. under limit of detection
	Property	Method	Unit	Spec.	n	Min	Max	
Density (15°C)	EN ISO 12185	kg/m ³	820-845	3	834,9	841,0	837,4	0
FAME content	EN 14078	% (V/V)	7	3	3,4	6,5	4,6	0
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	3	63,0	67,4	65,5	0
Oxidation stability at 120°C (Rancimat)		h		3	24,1	28,2	25,9	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		3	90,6	130,1	109,1	0
Monoaromatics	EN 12916	% (m/m)		3	20,9	21,6	21,3	0
Diaromatics		% (m/m)		3	3,4	4,2	3,7	0
Triaromatics		% (m/m)		3	0,5	0,6	0,5	0
PAH content		% (m/m)	Max 8	3	3,9	4,7	4,3	0
Total aromatics		% (m/m)		3	24,8	26,3	25,6	0
Total contamination	EN 12662	mg/kg		3	0.0	0.0	0.0	3
Filter Blocking Tendency	IP 387 (ambient)	-		3	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		3	42.5	42.6	42.5	0
EHN	DIN 51449	mg/kg		3	529,0	1071,0	712,3	0

CONCAWE Petrol survey 2015
Country: Finland
Measured properties: elemental analysis

Finland	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	4	131	190	159	0
Potassium (K)	4	0	0	0	3
Lead (Pb)	4	0	0	0	3
Chromium (Cr)	4	0	0	0	3
Copper (Cu)	4	0	0	0	3
Manganese (Mn)	4	0	0	0	3
Nickel (Ni)	4	0	0	0	3
Vanadium (V)	4	0	0	0	3
Tin (Sn)	4	0	0	0	3
Iron (Fe)	4	21	33	28,4	0
Zinc (Zn)	4	17	90	41,6	0
Aluminium (Al)	4	0	0	0	3
Molybdenum (Mo)	4	0	0	0	3
Silver (Ag)	4	0	0	0	3
Barium (Ba)	4	0	0	0	3
Boron (B)	4	0	0	0	3
Calcium (Ca)	4	0	0	0	3
Magnesium (Mg)	4	0	0	0	3
Titanium (Ti)	4	0	0	0	3
Silicon (Si)	4	0	0	0	3

CONCAWE Petrol survey 2015

Country: Finland

Measured properties: Distillation characteristics, oxygenates and high boiling components

Finland	2015							
Property	Method	Unit	Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	EN ISO 3405	°C		5	31,2	35,5	33,12	0
Evaporated at 70°C (E70)	EN ISO 3405	% (V/V)	22-50	5	30,9	42,5	37,2	0
Evaporated at 100°C (E100)	EN ISO 3405	% (V/V)	46-71	5	49,2	68,8	59,94	0
Evaporated at 150°C (E150)	EN ISO 3405	% (V/V)	Min 75	5	84,5	93,2	90,02	0
Final boiling point (FBP)	EN ISO 3405	°C	Max 210	5	179,6	201,3	188,66	0
Distillation residue	EN ISO 3405	% (V/V)	Max 2	5	0,1	0,9	0,66	0
Vapour pressure DVPE	EN 13016-1	kPa		5	67,4	72,6	68,68	0
Vapour pressure ASVP	EN 13016-1	kPa		5	73,7	79,1	75,02	0
Vapour lock index				5	894.3	1023.5	947.2	0
Unwashed gum	EN ISO 6246	mg/100 ml		5	0	0	0	5
2-Butanol	EN ISO 22854	% (V/V)		5	0	0,15	0,054	2
ETBE	EN ISO 22854	% (V/V)	Max 15	5	0	4,41	0,978	1
Ethanol	EN ISO 22854	% (V/V)	Max 5	5	0	7,61	3,162	1
Methanol	EN ISO 22854	% (V/V)	Max 3	5	0	0,66	0,256	2
iso-Propanol	EN ISO 22854	% (V/V)		5	0	0	0	5
MTBE	EN ISO 22854	% (V/V)	Max 15	5	1,132	7,61	4,2044	0
TAME	EN ISO 22854	% (V/V)	Max 15	5	0	7,33	4,374	1
TAAE	EN ISO 22854	% (V/V)		5	0	0,08	0,032	2
High boiling components	EN 16270	% (m/m)		5	0,23	0,75	0,412	0
FAME fraction	EN 16270	% (m/m)		5	0	0	0	5
Calorific value, lower	EN ISO 22854	MJ/kg		5	41.94	42.41	42.232	0

CONCAWE Diesel survey 2015
Country: Finland
Measured properties: Elemental analysis

Finland	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	0,0	0,0	0,0	5
Potassium (K)	5	0,0	0,0	0,0	5
Lead (Pb)	5	0,0	0,0	0,0	5
Chromium (Cr)	5	0,0	0,0	0,0	5
Copper (Cu)	5	0,0	11,0	2,2	4
Manganese (Mn)	5	0,0	0,0	0,0	5
Nickel (Ni)	5	0,0	0,0	0,0	5
Vanadium (V)	5	0,0	0,0	0,0	5
Tin (Sn)	5	0,0	0,0	0,0	5
Iron (Fe)	5	0,0	0,0	0,0	5
Zinc (Zn)	5	0,0	20,0	7,2	3
Aluminium (Al)	5	0,0	0,0	0,0	5
Molybdenum (Mo)	5	0,0	0,0	0,0	5
Silber (Ag)	5	0,0	0,0	0,0	5
Barium (Ba)	5	0,0	0,0	0,0	5
Boron (B)	5	0,0	0,0	0,0	5
Calcium (Ca)	5	0,0	0,0	0,0	5
Magnesium (Mg)	5	0,0	0,0	0,0	5
Titanium (Ti)	5	0,0	0,0	0,0	5
Silicon (Si)	5	0,0	0,5	0,3	2

CONCAWE Diesel survey 2015

Country: Finland

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Finland	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	5	801,3	802,7	801,9	0
FAME content	EN 14078	% (V/V)	7	5	0.0	1.4	0.5	3
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	5	23,6	41,5	33,0	0
Oxidation stability at 120°C (Rancimat)		h		5	12,2	16,8	14,2	0
Oxidation stability at 140°C (PetroOxy)	EN 16091	min		5	61,5	92,7	78,3	0
Monoaromatics	EN 12916	% (m/m)		5	1,7	9,6	5,1	0
Diaromatics		% (m/m)		5	0,0	1,3	0,6	1
Triaromatics		% (m/m)		5	0,0	0,1	0,0	3
PAH content		% (m/m)	Max 8	5	0,3	1,4	0,7	0
Total aromatics		% (m/m)		5	2,0	11,0	5,8	0
Total contamination	EN 12662	mg/kg		5	0.0	0.0	0.0	5
Filter Blocking Tendency	IP 387 (ambient)	-		5	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		5	43.3	43.9	43.7	0
EHN-content	DIN 51449	mg/kg		5	367,0	1364,0	859,4	0

CONCAWE Petrol survey 2015
Country: France
Measured properties: elemental analysis

France	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS	µg/kg	µg/kg	µg/kg	µg/kg	
Sodium (Na)	10	98,0	117,0	108,5	0
Potassium (K)	10	0,0	0,0	0,0	10
Lead (Pb)	10	0,0	25,0	2,5	9
Chromium (Cr)	10	0,0	0,0	0,0	10
Copper (Cu)	10	0,0	36,0	3,6	9
Manganese (Mn)	10	0,0	0,0	0,0	10
Nickel (Ni)	10	0,0	0,0	0,0	10
Vanadium (V)	10	0,0	0,0	0,0	10
Tin (Sn)	10	0,0	0,0	0,0	10
Iron (Fe)	10	11,0	25,0	15,0	0
Zinc (Zn)	10	0,0	35,0	18,0	2
Aluminium (Al)	10	0,0	0,0	0,0	10
Molybdenum (Mo)	10	0,0	0,0	0,0	10
Silver (Ag)	10	0,0	0,0	0,0	10
Barium (Ba)	10	0,0	0,0	0,0	10
Boron (B)	10	0,0	150,0	50,2	1
Calcium (Ca)	10	0,0	52,0	15,4	7
Magnesium (Mg)	10	72,0	85,0	79,0	0
Titanium (Ti)	10	0,0	0,0	0,0	10
Silicon (Si)	10	0,0	0,0	0,0	10

CONCAWE Petrol survey 2015

Country: France

Measured properties: Distillation characteristics, oxygenates and high boiling components

France	2015							
Property	Method	Unit	Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	EN ISO 3405	°C		10	38,6	40,6	39,9	0
Evaporated at 70°C (E70)	EN ISO 3405	% (V/V)	22-50	10	36,9	42,4	40,4	0
Evaporated at 100°C (E100)	EN ISO 3405	% (V/V)	46-71	10	51,4	61,0	58,2	0
Evaporated at 150°C (E150)	EN ISO 3405	% (V/V)	Min 75	10	89,0	95,3	93,3	0
Final boiling point (FBP)	EN ISO 3405	°C	Max 210	10	172,4	183,5	177,4	0
Distillation residue	EN ISO 3405	% (V/V)	Max 2	10	0,9	1,1	1,0	0
Vapour pressure DVPE	EN 13016-1	kPa		10	57,3	59,3	58,3	0
Vapour pressure ASVP	EN 13016-1	kPa		10	63,4	65,1	64,3	0
Vapour lock index				10	833.3	887.8	866.0	0
Unwashed gum	EN ISO 6246	mg/100 ml		10	0	0	0	10
2-Butanol	EN ISO 22854	% (V/V)		10	0,0	0,0	0,0	10
ETBE	EN ISO 22854	% (V/V)	Max 15	10	4,4	6,8	5,5	0
Ethanol	EN ISO 22854	% (V/V)	Max 5	10	5,5	7,9	7,2	0
Methanol	EN ISO 22854	% (V/V)	Max 3	10	0,0	0,0	0,0	10
iso-Propanol	EN ISO 22854	% (V/V)		10	0,0	0,1	0,1	2
MTBE	EN ISO 22854	% (V/V)	Max 15	10	0,0	0,05	0,02	5
TAME	EN ISO 22854	% (V/V)	Max 15	10	0,0	0,0	0,0	10
TAE	EN ISO 22854	% (V/V)		10	0,0	0,0	0,0	10
High boiling components	EN 16270	% (m/m)		10	0,2	0,4	0,3	0
FAME fraction	EN 16270	% (m/m)		10	0	0	0	10
Calorific value, lower	EN ISO 22854	MJ/kg		10	41.9	42.1	42.0	0

CONCAWE Diesel survey 2015
Country: France
Measured properties: elemental analysis

France	2015				
Appearance	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	20	0,0	290,0	103,9	2
Potassium (K)	20	0,0	0,0	0,0	20
Lead (Pb)	20	0,0	0,0	0,0	20
Chromium (Cr)	20	0,0	0,0	0,0	20
Copper (Cu)	20	0,0	38,0	7,1	13
Manganese (Mn)	20	0,0	0,0	0,0	20
Nickel (Ni)	20	0,0	0,0	0,0	20
Vanadium (V)	20	0,0	0,0	0,0	20
Tin (Sn)	20	0,0	0,0	0,0	20
Iron (Fe)	20	13,0	223,0	64,8	0
Zinc (Zn)	20	0,0	56,0	19,4	4
Aluminium (Al)	20	0,0	0,0	0,0	20
Molybdenum (Mo)	20	0,0	0,0	0,0	20
Silber (Ag)	20	0,0	0,0	0,0	20
Barium (Ba)	20	0,0	0,0	0,0	20
Boron (B)	20	0,0	0,0	0,0	20
Calcium (Ca)	20	0,0	112,0	11,4	17
Magnesium (Mg)	20	0,0	0,0	0,0	20
Titanium (Ti)	20	0,0	0,0	0,0	20
Silicon (Si)	20	0,0	1,0	0,4	11

CONCAWE Diesel survey 2015

Country: France

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

France	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	20	827,8	841,1	833,7	0
FAME content	EN 14078	% (V/V)	7	20	6,1	7,5	6,7	0
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	20	35,5	77,9	58,8	0
Oxidation stability at 120°C (Rancimat)		h		20	17,1	33,8	25,4	0
Oxidation stability at 140°C (PetroOxy)	EN 16091	min		20	86,2	140,2	109,6	0
Monoaromatics	EN 12916	% (m/m)		20	15,8	25,8	19,5	0
Diaromatics		% (m/m)		20	1,4	4,4	2,9	0
Triaromatics		% (m/m)		20	0,1	0,6	0,3	0
PAH content		% (m/m)	Max 8	20	1,5	4,9	3,2	0
Total aromatics		% (m/m)		20	17,3	30,7	22,7	0
Total contamination	EN 12662	mg/kg		20	0.0	13.0	0.7	19
Filter Blocking Tendency	IP 387 (ambient)	-		20	1,0	1,1	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		20	42.2	43.3	42.7	0
EHN-content	DIN 51449	mg/kg		20	111,0	1491,0	575,8	0

CONCAWE Petrol survey 2015
 Country: Germany
 Measured properties: elemental analysis

Germany	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	10	226	250	240	0
Potassium (K)	10	0	0	0	10
Lead (Pb)	10	0	0	0	10
Chromium (Cr)	10	0	0	0	10
Copper (Cu)	10	0	0	0	10
Manganese (Mn)	10	0	0	0	10
Nickel (Ni)	10	0	0	0	10
Vanadium (V)	10	0	0	0	10
Tin (Sn)	10	0	0	0	10
Iron (Fe)	10	0	21	2,1	9
Zinc (Zn)	10	13	61	24,3	0
Aluminium (Al)	10	0	0	0	10
Molybdenum (Mo)	10	0	0	0	10
Silver (Ag)	10	0	0	0	10
Barium (Ba)	10	0	0	0	10
Boron (B)	10	0	0	0	10
Calcium (Ca)	10	0	73	42,56	3
Magnesium (Mg)	10	94	170	122,5	0
Titanium (Ti)	10	0	0	0	10
Silicon (Si)	10	0	0	0	10

CONCAWE Petrol survey 2015

Country: Germany

Measured properties: Distillation characteristics, oxygenates and high boiling components

Germany	2015							
Property	Method		Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	EN ISO 3405	°C		10	28,3	41,6	36,23	0
Evaporated at 70°C (E70)	EN ISO 3405	% (V/V)	22-50	10	34,6	48,2	41,82	0
Evaporated at 100°C (E100)	EN ISO 3405	% (V/V)	46-71	10	50,2	60,3	55,53	0
Evaporated at 150°C (E150)	EN ISO 3405	% (V/V)	Min 75	10	81,6	91,6	86,82	0
Final boiling point (FBP)	EN ISO 3405	°C	Max 210	10	183,3	199	190,91	0
Distillation residue	EN ISO 3405	% (V/V)	Max 2	10	0,8	1,5	1,04	0
Vapour pressure DVPE	EN 13016-1	kPa		10	52,8	61,2	56,55	0
Vapour pressure ASVP	EN 13016-1	kPa		10	58,6	67,3	62,51	0
Vapour lock index				10	804.2	910.4	858.24	0
Unwashed gum	EN ISO 6246	mg/100 ml		10	0	0	0	10
2-Butanol	EN ISO 22854	% (V/V)		10	0	0	0	10
ETBE	EN ISO 22854	% (V/V)	Max 15	10	0,01	0,87	0,32	0
Ethanol	EN ISO 22854	% (V/V)	Max 5	10	4,85	9,9	7,159	0
Methanol	EN ISO 22854	% (V/V)	Max 3	10	0	0	0	10
iso-Propanol	EN ISO 22854	% (V/V)		10	0	0	0	10
MTBE	EN ISO 22854	% (V/V)	Max 15	10	0	3,55	1,261	0
TAME	EN ISO 22854	% (V/V)	Max 15	10	0	0,48	0,121	0
TAAE	EN ISO 22854	% (V/V)		10	0	0	0	10
High boiling components	EN 16270	% (m/m)		10	0,36	1,39	0,608	0
FAME fraction	EN 16270	% (m/m)		10	0	0	0	10
Calorific value, lower	EN ISO 22854	MJ/kg		10	41.88	42.57	42.181	0

CONCAWE Diesel survey 2015
 Country: Germany
 Measured properties: elemental analysis

Germany	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	20	0.0	102.0	27.9	8
Potassium (K)	20	0.0	0.0	0.0	20
Lead (Pb)	20	0.0	0.0	0.0	20
Chromium (Cr)	20	0.0	0.0	0.0	20
Copper (Cu)	20	0.0	33.0	6.6	10
Manganese (Mn)	20	0,0	0,0	0,0	20
Nickel (Ni)	20	0,0	0,0	0,0	20
Vanadium (V)	20	0,0	0,0	0,0	20
Tin (Sn)	20	0.0	14.0	1.0	13
Iron (Fe)	20	0.0	95.0	36.6	4
Zinc (Zn)	20	0.0	28.0	8.1	7
Aluminium (Al)	20	0,0	0,0	0,0	20
Molybdenum (Mo)	20	0,0	0,0	0,0	20
Silber (Ag)	20	0,0	0,0	0,0	20
Barium (Ba)	20	0,0	0,0	0,0	20
Boron (B)	20	0,0	0,0	0,0	20
Calcium (Ca)	20	0.0	0.0	0.0	20
Magnesium (Mg)	20	0,0	0,0	0,0	20
Titanium (Ti)	20	0,0	0,0	0,0	20
Silicon (Si)	20	0.0	0.8	0.4	6

CONCAWE Diesel survey 2015

Country: Germany

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Germany Property	2015							No. under limit of detection
	Method	Unit	Spec	n	Min	Max	Avg	
Density (15°C)	EN ISO 12185	kg/m ³	820-845	20	830,6	840,4	835,5	0
FAME content	EN 14078	% (V/V)	7	20	0,0	6,5	4,4	3
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	20	29,1	82,0	44,3	0
Oxidation stability at 120°C (Rancimat)		h		20	11,4	31,3	19,5	0
Oxidation stability at 140°C (PetroOxy)	EN 16091	min		20	60,5	101,8	84,4	0
Monoaromatics	EN 12916	% (m/m)		20	17,3	22,2	19,0	0
Diaromatics		% (m/m)		20	1,7	2,8	2,1	0
Triaromatics		% (m/m)		20	0,1	0,4	0,2	0
PAH content		% (m/m)	Max 8	20	1,8	3,2	2,3	0
Total aromatics		% (m/m)		20	19,5	24,2	21,3	0
Total contamination		EN 12662	mg/kg		20	0.0	0.0	0.0
Filter Blocking Tendency	IP 387 (ambient)	-		20	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		20	42.6	43.2	42.8	0
EHN-content	DIN 51449	mg/kg		20	138,0	814,0	373,9	0

CONCAWE Petrol survey 2015
 Country: Hungary
 Measured properties: elemental analysis

Hungary	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	139,0	170,0	156,4	0
Potassium (K)	5	0,0	0,0	0,0	5
Lead (Pb)	5	0,0	0,0	0,0	5
Chromium (Cr)	5	0,0	0,0	0,0	5
Copper (Cu)	5	0,0	0,0	0,0	5
Manganese (Mn)	5	0,0	10,0	4,0	3
Nickel (Ni)	5	0,0	0,0	0,0	5
Vanadium (V)	5	0,0	0,0	0,0	5
Tin (Sn)	5	0,0	0,0	0,0	5
Iron (Fe)	5	16,0	37,0	25,2	0
Zinc (Zn)	5	13,0	46,0	33,4	0
Aluminium (Al)	5	0,0	0,0	0,0	5
Molybdenum (Mo)	5	0,0	0,0	0,0	5
Silver (Ag)	5	0,0	0,0	0,0	5
Barium (Ba)	5	0,0	0,0	0,0	5
Boron (B)	5	0,0	15,0	3,0	4
Calcium (Ca)	5	0,0	56,0	21,8	3
Magnesium (Mg)	5	57,0	114,0	73,4	0
Titanium (Ti)	5	0,0	0,0	0,0	5
Silicon (Si)	5	0,0	0,0	0,0	5

CONCAWE Petrol survey 2015

Country: Hungary

Measured properties: Distillation characteristics, oxygenates and high boiling components

Hungary	2015							
Property	Method	Units	Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	DIN EN ISO 3405	°C		5	37,4	41,1	39,3	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	5	30,4	36,6	32,8	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	5	46,2	53,0	49,0	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	5	78,6	81,0	79,8	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	5	203,5	218,1	208,5	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	5	0,8	1,1	1,0	0
Vapour pressure DVPE	DIN EN 13016-1	kPa		5	54,1	56,9	55,4	0
Vapour pressure ASVP	DIN EN 13016-1	kPa		5	60,0	62,8	61,3	0
Vapour lock index				5	753.8	825.2	783.1	0
Unwashed gum	EN ISO 6246	mg/100 ml		5	0	0	0	5
2-Butanol	EN ISO 22854	% (V/V)		5	0,0	0,0	0,0	5
ETBE	EN ISO 22854	% (V/V)	Max 15	5	0,1	2,2	1,4	0
Ethanol	EN ISO 22854	% (V/V)	Max 5	5	4,8	5,2	4,9	0
Methanol	EN ISO 22854	% (V/V)	Max 3	5	0,0	0,0	0,0	5
iso-Propanol	EN ISO 22854	% (V/V)		5	0,0	0,1	0,0	4
MTBE	EN ISO 22854	% (V/V)	Max 15	5	0,6	3,5	1,4	0
TAME	EN ISO 22854	% (V/V)	Max 15	5	0,0	0,9	0,2	4
TAAE	EN ISO 22854	% (V/V)		5	0,0	0,0	0,0	5
High boiling components	EN 16270	% (m/m)		5	0,6	1,3	0,7	0
FAME fraction	EN 16270	% (m/m)		5	0	0	0	5
Calorific value, lower	EN ISO 22854	MJ/kg		5	42.3	42.4	42.3	0

CONCAWE Diesel survey 2015
Country: Hungary
Measured properties: elemental analysis

Hungary	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	0,0	58,0	23,0	3
Potassium (K)	5	0,0	58,0	22,2	3
Lead (Pb)	5	0,0	0,0	0,0	5
Chromium (Cr)	5	0,0	0,0	0,0	5
Copper (Cu)	5	0,0	19,0	6,2	3
Manganese (Mn)	5	0,0	0,0	0,0	5
Nickel (Ni)	5	0,0	0,0	0,0	5
Vanadium (V)	5	0,0	0,0	0,0	5
Tin (Sn)	5	0,0	0,0	0,0	5
Iron (Fe)	5	26,0	57,0	44,6	0
Zinc (Zn)	5	0,0	95,0	28,4	1
Aluminium (Al)	5	0,0	0,0	0,0	5
Molybdenum (Mo)	5	0,0	0,0	0,0	5
Silber (Ag)	5	0,0	0,0	0,0	5
Barium (Ba)	5	0,0	0,0	0,0	5
Boron (B)	5	0,0	0,0	0,0	5
Calcium (Ca)	5	0,0	90,0	63,0	1
Magnesium (Mg)	5	0,0	0,0	0,0	5
Titanium (Ti)	5	0,0	0,0	0,0	5
Silicon (Si)	5	0,0	0,8	0,2	4

CONCAWE Diesel survey 2015

Country: Hungary

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Hungary	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	5	837,8	841,6	840,1	0
FAME content	EN 14078	% (V/V)	7	5	4,6	6,5	5,6	0
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	5	34,8	81,6	59,6	0
Oxidation stability at 120°C (Rancimat)		h		5	16,7	33,1	24,7	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		5	82,6	99,0	89,2	0
Monoaromatics	EN 12916	% (m/m)		5	20,3	25,0	23,3	0
Diaromatics		% (m/m)		5	3,2	4,3	3,5	0
Triaromatics		% (m/m)		5	0,3	0,7	0,5	0
PAH content		% (m/m)	Max 8	5	2,5	5,0	3,8	0
Total aromatics		% (m/m)		5	24,1	28,4	27,1	0
Total contamination		EN 12662	mg/kg		5	0.0	0.0	0.0
Filter Blocking Tendency	IP 387 (ambient)	-		5	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		5	42.4	42.9	42.7	0
EHN-content	DIN 51449	mg/kg		5	329,0	1182,0	620,2	0

CONCAWE Petrol survey 2015
Country: Ireland
Measured properties: elemental analysis

Ireland	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	97,0	136,0	108,0	0
Potassium (K)	5	0,0	0,0	0,0	5
Lead (Pb)	5	0,0	0,0	0,0	5
Chromium (Cr)	5	0,0	0,0	0,0	5
Copper (Cu)	5	0,0	0,0	0,0	5
Manganese (Mn)	5	0,0	0,0	0,0	5
Nickel (Ni)	5	0,0	0,0	0,0	5
Vanadium (V)	5	0,0	0,0	0,0	5
Tin (Sn)	5	13,0	32,0	19,8	0
Iron (Fe)	5	23,0	37,0	27,2	0
Zinc (Zn)	5	17,0	73,0	32,6	0
Aluminium (Al)	5	0,0	0,0	0,0	5
Molybdenum (Mo)	5	0,0	0,0	0,0	5
Silver (Ag)	5	0,0	0,0	0,0	5
Barium (Ba)	5	0,0	0,0	0,0	5
Boron (B)	5	0,0	60,0	14,4	3
Calcium (Ca)	5	0,0	66,0	38,0	2
Magnesium (Mg)	5	71,0	100,0	84,4	0
Titanium (Ti)	5	0,0	0,0	0,0	5
Silicon (Si)	5	0,0	0,0	0,0	5

CONCAWE Petrol survey 2015

Country: Ireland

Measured properties: Distillation characteristics, oxygenates and high boiling components

Ireland	2015							
Property	Method	Units	Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	DIN EN ISO 3405	°C		5	35,6	36,6	36,1	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	5	32,2	46,0	40,4	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	5	53,5	63,2	58,9	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	5	89,2	95,8	92,8	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	5	171,1	197,6	183,0	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	5	0,5	1,1	0,9	0
Vapour pressure DVPE	DIN EN 13016-1	kPa		5	67,0	69,0	68,3	0
Vapour pressure ASVP	DIN EN 13016-1	kPa		5	73,3	75,4	74,7	0
Vapour lock index				5	895.4	1011.3	965.9	0
Unwashed gum	EN ISO 6246	mg/100 ml		5	0	0	0	5
2-Butanol	EN ISO 22854	% (V/V)		5	0,0	0,0	0,0	5
ETBE	EN ISO 22854	% (V/V)	Max 15	5	0,0	0,0	0,0	5
Ethanol	EN ISO 22854	% (V/V)	Max 5	5	3,7	5,2	4,8	0
Methanol	EN ISO 22854	% (V/V)	Max 3	5	0,0	0,0	0,0	5
iso-Propanol	EN ISO 22854	% (V/V)		5	0,0	0,0	0,0	5
MTBE	EN ISO 22854	% (V/V)	Max 15	5	0,0	0,0	0,0	5
TAME	EN ISO 22854	% (V/V)	Max 15	5	0,0	0,0	0,0	5
TAAE	EN ISO 22854	% (V/V)		5	0,0	0,0	0,0	5
High boiling components	EN 16270	% (m/m)		5	0,2	0,7	0,4	0
FAME fraction	EN 16270	% (m/m)		5	0	0	0	5
Calorific value, lower	EN ISO 22854	MJ/kg		5	42.5	43.2	42.8	0

CONCAWE Diesel survey 2015
 Country: Ireland
 Measured properties: elemental analysis

Ireland	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	0,0	0,0	0,0	5
Potassium (K)	5	0,0	0,0	0,0	5
Lead (Pb)	5	0,0	0,0	0,0	5
Chromium (Cr)	5	0,0	0,0	0,0	5
Copper (Cu)	5	0,0	0,0	0,0	5
Manganese (Mn)	5	0,0	0,0	0,0	5
Nickel (Ni)	5	0,0	0,0	0,0	5
Vanadium (V)	5	0,0	0,0	0,0	5
Tin (Sn)	5	0,0	0,0	0,0	5
Iron (Fe)	5	0,0	20,0	4,0	4
Zinc (Zn)	5	0,0	11,0	2,2	4
Aluminium (Al)	5	0,0	0,0	0,0	5
Molybdenum (Mo)	5	0,0	0,0	0,0	5
Silber (Ag)	5	0,0	0,0	0,0	5
Barium (Ba)	5	0,0	0,0	0,0	5
Boron (B)	5	0,0	0,0	0,0	5
Calcium (Ca)	5	0,0	0,0	0,0	5
Magnesium (Mg)	5	0,0	0,0	0,0	5
Titanium (Ti)	5	0,0	0,0	0,0	5
Silicon (Si)	5	0,0	0,0	0,0	5

CONCAWE Diesel survey 2015

Country: Ireland

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Ireland	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	5	829,4	840,5	832,2	0
FAME content	EN 14078	% (V/V)	7	5	0,9	1,4	1,1	0
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	5	26,6	77,6	44,2	0
Oxidation stability at 120°C (Rancimat)		h		5	13,1	24,8	18,0	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		5	78,5	109,8	88,7	0
Monoaromatics	EN 12916	% (m/m)		5	18,5	22,0	20,0	0
Diaromatics		% (m/m)		5	2,0	4,2	2,6	0
Triaromatics		% (m/m)		5	0,2	0,5	0,3	0
PAH content		% (m/m)	Max 8	5	2,2	4,7	2,9	0
Total aromatics		% (m/m)		5	20,7	26,7	22,9	0
Total contamination	EN 12662	mg/kg		5	0.0	0.0	0.0	5
Filter Blocking Tendency	IP 387 (ambient)	-		5	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		5	43.1	43.4	43.3	0
EHN-content	DIN 51449	mg/kg		5	0,0	261,0	52,2	0

CONCAWE Petrol survey 2015
Country: Italy
Measured properties: elemental analysis

Italy	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS	µg/kg	µg/kg	µg/kg	µg/kg	
Sodium (Na)	10	142	214	168,5	0
Potassium (K)	10	0	0	0	10
Lead (Pb)	10	0	0	0	10
Chromium (Cr)	10	0	0	0	10
Copper (Cu)	10	0	950	101,5	7
Manganese (Mn)	10	0	0	0	10
Nickel (Ni)	10	0	0	0	10
Vanadium (V)	10	0	0	0	10
Tin (Sn)	10	0	0	0	10
Iron (Fe)	10	0	24	7,1	6
Zinc (Zn)	10	0	26	13,2	3
Aluminium (Al)	10	0	0	0	10
Molybdenum (Mo)	10	0	0	0	10
Silver (Ag)	10	0	0	0	10
Barium (Ba)	10	0	0	0	10
Boron (B)	10	0	33	3,3	9
Calcium (Ca)	10	0	80	52,3	2
Magnesium (Mg)	10	0	229	137	1
Titanium (Ti)	10	0	0	0	10
Silicon (Si)	10	0	0	0	10

CONCAWE Petrol survey 2015

Country: Italy

Measured properties: Distillation characteristics, oxygenates and high boiling components

Italy	2015							
Property	Method	Units	Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	DIN EN ISO 3405	°C		10	25,7	41,5	35,25	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	10	22,1	38	28,56	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	10	47,2	60	52,59	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	10	80,4	95,2	85,79	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	10	178	214	199,59	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	10	0,8	1,2	0,93	0
Vapour pressure DVPE	DIN EN 13016-1	kPa		10	43,3	61,1	55,26	0
Vapour pressure ASVP	DIN EN 13016-1	kPa		10	48,8	67,3	61,18	0
Vapour lock index				10	596.8	865	752.52	0
Unwashed gum	EN ISO 6246	mg/100 ml		10	0	0	0	10
2-Butanol	EN ISO 22854	% (V/V)		10	0	0	0	10
ETBE	EN ISO 22854	% (V/V)	Max 15	10	0	0,51	0,087	5
Ethanol	EN ISO 22854	% (V/V)	Max 5	10	0	2,24	0,302	7
Methanol	EN ISO 22854	% (V/V)	Max 3	10	0	0,22	0,022	9
iso-Propanol	EN ISO 22854	% (V/V)		10	0	0	0	10
MTBE	EN ISO 22854	% (V/V)	Max 15	10	0,25	14,23	4,837	0
TAME	EN ISO 22854	% (V/V)	Max 15	10	0	2,33	0,475	7
TAE	EN ISO 22854	% (V/V)		10	0	0	0	10
High boiling components	EN 16270	% (m/m)		10	0,45	1,15	0,741	0
FAME fraction	EN 16270	% (m/m)		10	0	0	0	10
Calorific value, lower	EN ISO 22854	MJ/kg		10	42.11	43.32	42.797	0

CONCAWE Diesel survey 2015
Country: Italy
Measured properties: elemental analysis

Italy	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	15	0,0	69,0	4,6	14
Potassium (K)	15	0,0	0,0	0,0	15
Lead (Pb)	15	0,0	13,0	0,9	14
Chromium (Cr)	15	0,0	0,0	0,0	15
Copper (Cu)	15	0,0	78,0	7,7	13
Manganese (Mn)	15	0,0	0,0	0,0	15
Nickel (Ni)	15	0,0	0,0	0,0	15
Vanadium (V)	15	0,0	0,0	0,0	15
Tin (Sn)	15	0,0	0,0	0,0	15
Iron (Fe)	15	0,0	122,0	33,3	2
Zinc (Zn)	15	0,0	103,0	14,0	11
Aluminium (Al)	15	0,0	0,0	0,0	15
Molybdenum (Mo)	15	0,0	0,0	0,0	15
Silber (Ag)	15	0,0	0,0	0,0	15
Barium (Ba)	15	0,0	0,0	0,0	15
Boron (B)	15	0,0	0,0	0,0	15
Calcium (Ca)	15	0,0	0,0	0,0	15
Magnesium (Mg)	15	0,0	0,0	0,0	15
Titanium (Ti)	15	0,0	0,0	0,0	15
Silicon (Si)	15	0,0	0,7	0,1	13

CONCAWE Diesel survey 2015

Country: Italy

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Italy	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	15	823,0	839,7	833,8	0
FAME content	EN 14078	% (V/V)	7	15	0,0	6,1	3,7	1
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	15	10,0	29,3	17,4	0
Oxidation stability at 120°C (Rancimat)		h		15	5,6	12,9	8,8	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		15	35,2	70,0	52,8	0
Monoaromatics	EN 12916	% (m/m)		15	14,3	23,3	20,0	0
Diaromatics		% (m/m)		15	1,2	5,1	3,0	0
Triaromatics		% (m/m)		15	0,0	0,6	0,3	1
PAH content		% (m/m)	Max 8	15	1,3	5,6	3,3	0
Total aromatics		% (m/m)		15	15,6	27,1	23,3	0
Total contamination	EN 12662	mg/kg		15	0.0	0.0	0.0	15
Filter Blocking Tendency	IP 387 (ambient)	-		15	1,0	1,2	1,1	0
Calorific Value (lower)	51900-2	MJ/kg		15	42.1	43.3	42.8	0
EHN-content	DIN 51449	mg/kg		15	0,0	667,0	270,5	4

CONCAWE Petrol survey 2015
 Country: Netherlands
 Measured properties: elemental analysis

Netherlands	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	150	200	174,4	0
Potassium (K)	5	0	0	0	5
Lead (Pb)	5	0	0	0	5
Chromium (Cr)	5	0	0	0	5
Copper (Cu)	5	0	315	75	3
Manganese (Mn)	5	0	0	0	5
Nickel (Ni)	5	0	0	0	5
Vanadium (V)	5	0	0	0	5
Tin (Sn)	5	0	0	0	5
Iron (Fe)	5	21	55	29,8	0
Zinc (Zn)	5	14	83	30,8	0
Aluminium (Al)	5	0	0	0	5
Molybdenum (Mo)	5	0	0	0	5
Silver (Ag)	5	0	0	0	5
Barium (Ba)	5	0	0	0	5
Boron (B)	5	0	0	0	5
Calcium (Ca)	5	0	0	0	5
Magnesium (Mg)	5	0	0	0	5
Titanium (Ti)	5	0	0	0	5
Silicon (Si)	5	0	0	0	5

CONCAWE Petrol survey 2015

Country: Netherlands

Measured properties: Distillation characteristics, oxygenates and high boiling components

Netherlands		2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection	
Initial boiling point (IBP)	DIN EN ISO 3405	°C		5	35,4	39,4	38,24	0	
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	5	29,4	38,1	34,56	0	
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	5	53	60,6	56,84	0	
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	5	88,8	95,1	91,7	0	
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	5	180,7	200	187,5	0	
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	5	0,5	0,6	0,52	0	
Vapour pressure DVPE	DIN EN 13016-1	kPa		5	58,2	60,7	59,16	0	
Vapour pressure ASVP	DIN EN 13016-1	kPa		5	64,2	66,8	65,22	0	
Vapour lock index				5	789,8	873,7	833,52	0	
Unwashed gum	EN ISO 6246	mg/100 ml		5	0	0	0	5	
2-Butanol	EN ISO 22854	% (V/V)		5	0	0	0	5	
ETBE	EN ISO 22854	% (V/V)	Max 15	5	0	0,04	0,012	3	
Ethanol	EN ISO 22854	% (V/V)	Max 5	5	0	4,87	3,83	1	
Methanol	EN ISO 22854	% (V/V)	Max 3	5	0	0	0	5	
iso-Propanol	EN ISO 22854	% (V/V)		5	0	0,07	0,014	4	
MTBE	EN ISO 22854	% (V/V)	Max 15	5	0,77	8,75	3,4	0	
TAME	EN ISO 22854	% (V/V)	Max 15	5	0	0,05	0,01	4	
TAAE	EN ISO 22854	% (V/V)		5	0	0	0	5	
High boiling components	EN 16270	% (m/m)		5	0,27	0,69	0,412	0	
FAME fraction	EN 16270	% (m/m)		5	0	0	0	5	
Calorific value, lower	EN ISO 22854	MJ/kg		5	42,36	42,75	42,554	5	

CONCAWE Diesel survey 2015
 Country: Netherlands
 Measured properties: elemental analysis

Netherlands	2015				
Appearance	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	6	0,0	0,0	0,0	6
Potassium (K)	6	0,0	0,0	0,0	6
Lead (Pb)	6	0,0	0,0	0,0	6
Chromium (Cr)	6	0,0	0,0	0,0	6
Copper (Cu)	6	0,0	185,0	44,7	3
Manganese (Mn)	6	0,0	0,0	0,0	6
Nickel (Ni)	6	0,0	0,0	0,0	6
Vanadium (V)	6	0,0	0,0	0,0	6
Tin (Sn)	6	0,0	0,0	0,0	6
Iron (Fe)	6	0,0	70,0	19,7	3
Zinc (Zn)	6	0,0	32,0	10,5	2
Aluminium (Al)	6	0,0	0,0	0,0	6
Molybdenum (Mo)	6	0,0	0,0	0,0	6
Silber (Ag)	6	0,0	0,0	0,0	6
Barium (Ba)	6	0,0	0,0	0,0	6
Boron (B)	6	0,0	48,0	8,0	5
Calcium (Ca)	6	0,0	0,0	0,0	6
Magnesium (Mg)	6	0,0	0,0	0,0	6
Titanium (Ti)	6	0,0	0,0	0,0	6
Silicon (Si)	6	0,0	0,9	0,6	2

CONCAWE Diesel survey 2015

Country: Netherlands

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Netherlands	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	6	831,2	839,0	834,5	0
FAME content	EN 14078	% (V/V)	7	6	0,0	2,2	0,9	2
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	6	24,5	145,3	59,5	0
Oxidation stability at 120°C (Rancimat)		h		6	9,5	60,2	26,5	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		6	65,1	167,9	100,3	0
Monoaromatics	EN 12916	% (m/m)		6	19,8	24,5	21,5	0
Diaromatics		% (m/m)		6	2,2	3,6	3,0	0
Triaromatics		% (m/m)		6	0,2	0,6	0,4	0
PAH content		% (m/m)	Max 8	6	2,4	3,9	3,4	0
Total aromatics		% (m/m)		6	22,9	28,0	24,8	0
Total contamination	EN 12662	mg/kg		6	0.0	0.0	0.0	6
Filter Blocking Tendency	IP 387 (ambient)	-		6	1,0	1,1	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		6	42.7	43.3	43.0	0
EHN-content	DIN 51449	mg/kg		6	0,0	914,0	396,7	2

CONCAWE Petrol survey 2015
Country: Romania
Measured properties: elemental analysis

Romania	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	125,0	151,0	142,0	0
Potassium (K)	5	0,0	0,0	0,0	5
Lead (Pb)	5	0,0	0,0	0,0	5
Chromium (Cr)	5	0,0	0,0	0,0	5
Copper (Cu)	5	0,0	0,0	0,0	5
Manganese (Mn)	5	0,0	17,0	5,4	3
Nickel (Ni)	5	0,0	0,0	0,0	5
Vanadium (V)	5	0,0	0,0	0,0	5
Tin (Sn)	5	0,0	0,0	0,0	5
Iron (Fe)	5	16,0	45,0	29,2	0
Zinc (Zn)	5	10,0	36,0	18,2	0
Aluminium (Al)	5	0,0	0,0	0,0	5
Molybdenum (Mo)	5	0,0	0,0	0,0	5
Silver (Ag)	5	0,0	0,0	0,0	5
Barium (Ba)	5	0,0	0,0	0,0	5
Boron (B)	5	0,0	120,0	45,0	3
Calcium (Ca)	5	0,0	0,0	0,0	5
Magnesium (Mg)	5	61,0	71,0	67,8	0
Titanium (Ti)	5	0,0	0,0	0,0	5

CONCAWE Petrol survey 2015

Country: Romania

Measured properties:

Distillation characteristics, oxygenates and high boiling components

Romania	2015							
Property	Method	Units	Spec.	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	DIN EN ISO 3405	°C		5	34,5	37,9	36,1	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	5	27,1	37,8	33,5	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	5	48,9	52,6	50,9	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	5	82,7	85,4	84,0	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	5	203,0	213,9	208,5	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	5	0,4	1,1	0,9	0
Vapour pressure DVPE	DIN EN 13016-1	kPa		5	54,2	61,9	59,1	0
Vapour pressure ASVP	DIN EN 13016-1	kPa		5	60,1	68,1	65,1	0
Vapour lock index				5	731.7	882.9	825.0	0
Unwashed gum	EN ISO 6246	mg/100 ml		5	0	0	0	5
2-Butanol	EN ISO 22854	% (V/V)		5	0,0	0,0	0,0	5
ETBE	EN ISO 22854	% (V/V)	Max 15	5	0,1	3,8	1,5	0
Ethanol	EN ISO 22854	% (V/V)	Max 5	5	3,4	5,4	4,6	0
Methanol	EN ISO 22854	% (V/V)	Max 3	5	0,0	0,0	0,0	5
iso-Propanol	EN ISO 22854	% (V/V)		5	0,0	0,0	0,0	5
MTBE	EN ISO 22854	% (V/V)	Max 15	5	0,1	3,6	2,0	0
TAME	EN ISO 22854	% (V/V)	Max 15	5	0,0	3,6	1,4	1
TAAE	EN ISO 22854	% (V/V)		5	0,0	0,0	0,0	5
High boiling components	EN 16270	% (m/m)		5	0,7	1,2	1,0	0
FAME fraction	EN 16270	% (m/m)		5	0.01	0.05	0.03	0
Calorific value, lower	EN ISO 22854	MJ/kg		5	42,1	42,2	42,1	0

CONCAWE Diesel survey 2015
Country: Romania
Measured properties: elemental analysis

Romania	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS	5	µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	0,0	0,0	0,0	5
Potassium (K)	5	0,0	0,0	0,0	5
Lead (Pb)	5	0,0	13,0	2,6	4
Chromium (Cr)	5	0,0	0,0	0,0	5
Copper (Cu)	5	0,0	0,0	0,0	5
Manganese (Mn)	5	0,0	0,0	0,0	5
Nickel (Ni)	5	0,0	0,0	0,0	5
Vanadium (V)	5	0,0	0,0	0,0	5
Tin (Sn)	5	0,0	0,0	0,0	5
Iron (Fe)	5	0,0	88,0	22,6	2
Zinc (Zn)	5	0,0	73,0	35,4	2
Aluminium (Al)	5	0,0	0,0	0,0	5
Molybdenum (Mo)	5	0,0	0,0	0,0	5
Silber (Ag)	5	0,0	0,0	0,0	5
Barium (Ba)	5	0,0	0,0	0,0	5
Boron (B)	5	0,0	0,0	0,0	5
Calcium (Ca)	5	0,0	0,0	0,0	5
Magnesium (Mg)	5	0,0	0,0	0,0	5
Titanium (Ti)	5	0,0	0,0	0,0	5
Silicon (Si)	5	0,0	0,0	0,0	5

CONCAWE Diesel survey 2015

Country: Romania

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Romania	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	5	828,0	844,4	837,7	0
FAME content	EN 14078	% (V/V)	7	5	0,0	6,6	1,8	
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	5	10,0	43,7	23,7	0
Oxidation stability at 120°C (Rancimat)		h		5	3,9	15,7	9,4	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		5	52,2	69,2	62,4	0
Monoaromatics	EN 12916	% (m/m)		5	20,2	24,1	22,3	0
Diaromatics		% (m/m)		5	2,1	3,3	2,8	0
Triaromatics		% (m/m)		5	0,3	0,4	0,3	0
PAH content		% (m/m)	Max 8	5	2,4	3,7	3,1	0
Total aromatics		% (m/m)		5	22,6	27,8	25,5	0
Total contamination	EN 12662	mg/kg		5	0.0	0.0	0.0	5
Filter Blocking Tendency	IP 387 (ambient)	-		5	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		5	41.3	43.3	42.6	0
EHN-content	DIN 51449	mg/kg		5	417,0	1802,0	958,2	0

CONCAWE Petrol survey 2015
Country: Slovakia
Measured properties: elemental analysis

Slovakia	2015				No. under limit of detection
Elements	n	Min	Max	Avg	
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	3	145,0	166,0	153,0	0
Potassium (K)	3	0,0	0,0	0,0	3
Lead (Pb)	3	0,0	0,0	0,0	3
Chromium (Cr)	3	0,0	0,0	0,0	3
Copper (Cu)	3	0,0	0,0	0,0	3
Manganese (Mn)	3	0,0	11,0	3,7	2
Nickel (Ni)	3	0,0	0,0	0,0	3
Vanadium (V)	3	0,0	0,0	0,0	3
Tin (Sn)	3	0,0	0,0	0,0	3
Iron (Fe)	3	23,0	34,0	28,3	0
Zinc (Zn)	3	35,0	68,0	49,0	0
Aluminium (Al)	3	0,0	0,0	0,0	3
Molybdenum (Mo)	3	0,0	0,0	0,0	3
Silver (Ag)	3	0,0	0,0	0,0	3
Barium (Ba)	3	0,0	0,0	0,0	3
Boron (B)	3	0,0	0,0	0,0	3
Calcium (Ca)	3	0,0	51,0	17,0	2
Magnesium (Mg)	3	52,0	61,0	56,0	0
Titanium (Ti)	3	0,0	0,0	0,0	3
Silicon (Si)	3	0,0	0,0	0,0	3

CONCAWE Petrol survey 2015

Country: Slovakia

Measured properties: Distillation characteristics, oxygenates and high boiling components

Slovakia	2015							No. under limit of detection
	Property	Method	Unit	Spec	n	Min	Max	
Initial boiling point (IBP)	DIN EN ISO 3405	°C		3	38,7	51,4	43,0	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	3	28,2	29,0	28,7	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	3	49,0	52,8	50,4	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	3	77,2	83,1	79,3	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	3	206,0	207,9	206,9	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	3	0,1	1,0	0,7	0
Vapour pressure DVPE	DIN EN 13016-1	kPa		3	55,6	58,4	56,7	0
Vapour pressure ASVP	DIN EN 13016-1	kPa		3	61,6	64,5	62,7	0
Vapour lock index				3	757.6	781.4	767.7	0
Unwashed gum	EN ISO 6246	mg/100 ml		3	0	0	0	3
2-Butanol	EN ISO 22854	% (V/V)		3	0,0	0,0	0,0	3
ETBE	EN ISO 22854	% (V/V)	Max 15	3	3,7	7,2	4,9	0
Ethanol	EN ISO 22854	% (V/V)	Max 5	3	1,7	3,0	2,6	0
Methanol	EN ISO 22854	% (V/V)	Max 3	3	0,0	0,0	0,0	3
iso-Propanol	EN ISO 22854	% (V/V)		3	0,0	0,1	0,0	2
MTBE	EN ISO 22854	% (V/V)	Max 15	3	0,0	1,19	0,4	2
TAME	EN ISO 22854	% (V/V)	Max 15	3	0,0	0,1	0,1	1
TAAE	EN ISO 22854	% (V/V)		3	0,0	0,0	0,0	3
High boiling components	EN 16270	% (m/m)		3	0,4	0,6	0,5	0
FAME fraction	EN 16270	% (m/m)		3	0.0	0.0	0.0	3
Calorific value, lower	EN ISO 22854	MJ/kg		3	42,4	42,5	42,5	0

CONCAWE Diesel survey 2015
Country: Slovakia
Measured properties: elemental analysis

Slovakia	2015				
Appearance	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	4	0,0	0,0	0,0	4
Potassium (K)	4	0,0	87,0	38,5	2
Lead (Pb)	4	0,0	0,0	0,0	4
Chromium (Cr)	4	0,0	0,0	0,0	4
Copper (Cu)	4	0,0	49,0	14,8	2
Manganese (Mn)	4	0,0	0,0	0,0	4
Nickel (Ni)	4	0,0	0,0	0,0	4
Vanadium (V)	4	0,0	0,0	0,0	4
Tin (Sn)	4	0,0	0,0	0,0	4
Iron (Fe)	4	0,0	0,0	0,0	4
Zinc (Zn)	4	0,0	94,0	60,3	1
Aluminium (Al)	4	0,0	0,0	0,0	4
Molybdenum (Mo)	4	0,0	0,0	0,0	4
Silber (Ag)	4	0,0	0,0	0,0	4
Barium (Ba)	4	0,0	0,0	0,0	4
Boron (B)	4	0,0	0,0	0,0	4
Calcium (Ca)	4	0,0	72,0	34,0	2
Magnesium (Mg)	4	0,0	0,0	0,0	4
Titanium (Ti)	4	0,0	0,0	0,0	4
Silicon (Si)	4	0,0	0,0	0,0	4

CONCAWE Diesel survey 2015

Country: Slovakia

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Slovakia	2015							
Appearance	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	4	832,5	840,3	837,7	0
FAME content	EN 14078	% (V/V)	7	4	6,5	6,6	6,6	0
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	4	60,3	79,1	68,3	0
Oxidation stability at 120°C (Rancimat)		h		4	24,9	29,3	26,5	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		4	83,1	112,0	92,6	0
Monoaromatics	EN 12916	% (m/m)		4	16,6	22,1	20,6	0
Diaromatics		% (m/m)		4	2,2	3,9	3,4	0
Triaromatics		% (m/m)		4	0,4	0,7	0,6	0
PAH content		% (m/m)	Max 8	4	2,6	4,6	4,0	0
Total aromatics		% (m/m)		4	19,2	26,6	24,6	0
Total contamination	EN 12662	mg/kg		4	0.0	0.0	0.0	4
Filter Blocking Tendency	IP 387 (ambient)	-		4	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		4	42.6	42.7	42.6	0
EHN-content	DIN 51449	mg/kg		4	956,0	1354,0	1165,7	0

CONCAWE Petrol survey 2015
Country: Slovenia
Measured properties: elemental analysis

Slovenia	2015				No. under limit of detection
Elements	n	Min	Max	Avg	
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	2	110,0	142,0	126,0	0
Potassium (K)	2	0,0	0,0	0,0	2
Lead (Pb)	2	0,0	0,0	0,0	2
Chromium (Cr)	2	0,0	0,0	0,0	2
Copper (Cu)	2	0,0	0,0	0,0	2
Manganese (Mn)	2	0,0	0,0	0,0	2
Nickel (Ni)	2	0,0	0,0	0,0	2
Vanadium (V)	2	0,0	0,0	0,0	2
Tin (Sn)	2	0,0	0,0	0,0	2
Iron (Fe)	2	18,0	19,0	18,5	0
Zinc (Zn)	2	24,0	54,0	39,0	0
Aluminium (Al)	2	0,0	0,0	0,0	2
Molybdenum (Mo)	2	0,0	0,0	0,0	2
Silver (Ag)	2	0,0	0,0	0,0	2
Barium (Ba)	2	0,0	0,0	0,0	2
Boron (B)	2	0,0	0,0	0,0	2
Calcium (Ca)	2	0,0	50,0	25,0	1
Magnesium (Mg)	2	69,0	77,0	73,0	0
Titanium (Ti)	2	0,0	0,0	0,0	2
Silicon (Si)	2	0,0	0,0	0,0	2

CONCAWE Petrol survey 2015

Country: Slovenia

Measured properties: Distillation characteristics, oxygenates and high boiling components

Slovenia	2015							
Property	Method	Units	Spec	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	DIN EN ISO 3405	°C		2	34,8	40,3	37,6	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	2	31,6	32,7	32,2	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	2	47,4	54,8	51,1	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	2	78,5	86,7	82,6	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	2	201,8	205,4	203,6	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	2	0,9	1,0	1,0	0
Vapour pressure DVPE	DIN EN 13016-1	kPa		2	57,1	57,3	57,2	0
Vapour pressure ASVP	DIN EN 13016-1	kPa		2	63,1	63,3	63,2	0
Vapour lock index				2	794.2	799.9	797.1	0
Unwashed gum	EN ISO 6246	mg/100 ml		2	0	0	0	2
2-Butanol	EN ISO 22854	% (V/V)		2	0,0	0,0	0,0	2
ETBE	EN ISO 22854	% (V/V)	Max 15	2	0,0	0,7	0,3	1
Ethanol	EN ISO 22854	% (V/V)	Max 5	2	0,0	4,8	2,4	1
Methanol	EN ISO 22854	% (V/V)	Max 3	2	0,0	0,0	0,0	2
iso-Propanol	EN ISO 22854	% (V/V)		2	0,0	0,0	0,0	2
MTBE	EN ISO 22854	% (V/V)	Max 15	2	2,4	6,1	4,2	0
TAME	EN ISO 22854	% (V/V)	Max 15	2	0,0	0,1	0,0	1
TAAE	EN ISO 22854	% (V/V)		2	0,0	0,0	0,0	2
High boiling components	EN 16270	% (m/m)		2	0,6	0,7	0,6	0
FAME fraction	EN 16270	% (m/m)		2	0.0	0.0	0.0	2
Calorific value, lower	EN ISO 22854	MJ/kg		2	42,4	42,8	42,6	0

CONCAWE Diesel survey 2015
Country: Slovenia
Measured properties: elemental analysis

Slovenia	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	2	0,0	0,0	0,0	2
Potassium (K)	2	0,0	0,0	0,0	2
Lead (Pb)	2	0,0	0,0	0,0	2
Chromium (Cr)	2	0,0	0,0	0,0	2
Copper (Cu)	2	0,0	0,0	0,0	2
Manganese (Mn)	2	0,0	0,0	0,0	2
Nickel (Ni)	2	0,0	0,0	0,0	2
Vanadium (V)	2	0,0	0,0	0,0	2
Tin (Sn)	2	0,0	0,0	0,0	2
Iron (Fe)	2	0,0	23,0	11,5	1
Zinc (Zn)	2	0,0	110,0	55,0	1
Aluminium (Al)	2	0,0	0,0	0,0	2
Molybdenum (Mo)	2	0,0	0,0	0,0	2
Silber (Ag)	2	0,0	0,0	0,0	2
Barium (Ba)	2	0,0	0,0	0,0	2
Boron (B)	2	0,0	0,0	0,0	2
Calcium (Ca)	2	0,0	0,0	0,0	2
Magnesium (Mg)	2	0,0	0,0	0,0	2
Titanium (Ti)	2	0,0	0,0	0,0	2
Silicon (Si)	2	0,0	0,6	0,3	1

CONCAWE Diesel survey 2015

Country: Slovenia

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Slovenia	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	2	833,2	838,5	835,9	0
FAME content	EN 14078	% (V/V)	7	2	0,0	0,0	0,0	2
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	2	34,1	96,0	65,1	0
Oxidation stability at 120°C (Rancimat)		h		2	11,6	23,8	17,7	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		2	69,6	84,8	77,2	0
Monoaromatics	EN 12916	% (m/m)		2	23,0	26,1	24,6	0
Diaromatics		% (m/m)		2	2,5	3,4	3,0	0
Triaromatics		% (m/m)		2	0,4	0,4	0,4	0
PAH content		% (m/m)	Max 8	2	2,9	3,8	3,4	0
Total aromatics		% (m/m)		2	25,9	29,9	27,9	0
Total contamination	EN 12662	mg/kg		2	0,0	0,0	0,0	2
Filter Blocking Tendency	IP 387 (ambient)	-		2	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		2	43,0	43,2	43,1	0
EHN-content	DIN 51449	mg/kg		2	380,0	847,0	613,5	0

CONCAWE Petrol survey 2015
Country: Spain
Measured properties: elemental analysis

Spain	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	84	115	92,6	0
Potassium (K)	5	0	0	0	5
Lead (Pb)	5	0	0	0	5
Chromium (Cr)	5	0	0	0	5
Copper (Cu)	5	0	14	2,8	4
Manganese (Mn)	5	0	18	3,6	4
Nickel (Ni)	5	0	11	2,2	4
Vanadium (V)	5	0	0	0	5
Tin (Sn)	5	0	0	0	5
Iron (Fe)	5	11	16	13,8	0
Zinc (Zn)	5	0	26	10	2
Aluminium (Al)	5	0	0	0	5
Molybdenum (Mo)	5	0	0	0	5
Silver (Ag)	5	0	0	0	5
Barium (Ba)	5	0	0	0	5
Boron (B)	5	0	50	13	3
Calcium (Ca)	5	0	62	45,6	1
Magnesium (Mg)	5	85	105	91,8	0
Titanium (Ti)	5	0	0	0	5
Silicon (Si)	5	0	0	0	5

CONCAWE Petrol survey 2015

Country: Spain

Measured properties: Distillation characteristics, oxygenates and high boiling components

Spain		2015						No. under limit of detection
Property	Method	Units	Spec	n	Min	Max	Avg	
Initial boiling point (IBP)	DIN EN ISO 3405	°C		5	35,5	37,5	36,9	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	5	29,1	36,2	32,86	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	5	58,2	65,8	62,08	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	5	85,3	94,5	90,18	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	5	175,3	208,6	189,92	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	5	0,9	1	0,94	0
Vapour pressure DVPE	DIN EN 13016-1	kPa		5	59,4	61,8	60,46	0
Vapour pressure ASVP	DIN EN 13016-1	kPa		5	65,5	67,9	66,54	0
Vapour lock index				5	807.7	853.4	834.62	0
Unwashed gum	EN ISO 6246	mg/100 ml		5	0	0	0	5
2-Butanol	EN ISO 22854	% (V/V)		5	0	0	0	5
ETBE	EN ISO 22854	% (V/V)	Max 15	5	10,81	14,07	12,74	0
Ethanol	EN ISO 22854	% (V/V)	Max 5	5	0,66	2,97	1,696	0
Methanol	EN ISO 22854	% (V/V)	Max 3	5	0	0	0	5
iso-Propanol	EN ISO 22854	% (V/V)		5	0	0,45	0,19	1
MTBE	EN ISO 22854	% (V/V)	Max 15	5	0	0,06	0,034	1
TAME	EN ISO 22854	% (V/V)	Max 15	5	0	0	0	5
TAAE	EN ISO 22854	% (V/V)		5	0	0	0	5
High boiling components	EN 16270	% (m/m)		5	0,3	0,8	0,472	0
FAME fraction	EN 16270	% (m/m)		5	0	0,02	0,01	3
Calorific value, lower	EN ISO 22854	MJ/kg		5	42.06	42.8	42.416	0

CONCAWE Diesel survey 2015
Country: Spain
Measured properties: elemental analysis

Spain	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	20	0,0	154,0	20,7	17
Potassium (K)	20	0,0	0,0	0,0	20
Lead (Pb)	20	0,0	0,0	0,0	20
Chromium (Cr)	20	0,0	0,0	0,0	20
Copper (Cu)	20	0,0	21,0	4,3	15
Manganese (Mn)	20	0,0	0,0	0,0	20
Nickel (Ni)	20	0,0	0,0	0,0	20
Vanadium (V)	20	0,0	0,0	0,0	20
Tin (Sn)	20	0,0	0,0	0,0	20
Iron (Fe)	20	0,0	82,0	23,2	4
Zinc (Zn)	20	0,0	39,0	6,0	13
Aluminium (Al)	20	0,0	52,0	2,6	19
Molybdenum (Mo)	20	0,0	0,0	0,0	20
Silber (Ag)	20	0,0	0,0	0,0	20
Barium (Ba)	20	0,0	0,0	0,0	20
Boron (B)	20	0,0	0,0	0,0	20
Calcium (Ca)	20	0,0	0,0	0,0	20
Magnesium (Mg)	20	0,0	0,0	0,0	20
Titanium (Ti)	20	0,0	0,0	0,0	20
Silicon (Si)	20	0,0	0,7	0,2	13

CONCAWE Diesel survey 2015

Country: Spain

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Spain	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	20	826,1	842,9	838,5	0
FAME content	EN 14078	% (V/V)	7	20	0,3	6,9	3,6	0
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	20	52,1	140,0	75,9	0
Oxidation stability at 120°C (Rancimat)		h		20	19,8	50,5	30,4	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		20	80,0	217,6	133,2	0
Monoaromatics	EN 12916	% (m/m)		20	17,8	27,3	21,9	0
Diaromatics		% (m/m)		20	2,2	4,2	3,2	0
Triaromatics		% (m/m)		20	0,1	0,6	0,4	0
PAH content		% (m/m)	Max 8	20	2,3	4,7	3,5	0
Total aromatics		% (m/m)		20	21,0	31,1	25,4	0
Total contamination		EN 12662	mg/kg		20	0.0	14.0	1.3
Filter Blocking Tendency	IP 387 (ambient)	-		20	1,0	1,0	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		20	42.9	43.7	43.3	0
EHN-content	DIN 51449	mg/kg		20	117,0	1623,0	741,9	0

CONCAWE Petrol survey 2015
 Country: Sweden
 Measured properties: elemental analysis

Sweden	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS	5	µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	170	220	188	0
Potassium (K)	5	0	51	10,2	4
Lead (Pb)	5	0	0	0	5
Chromium (Cr)	5	0	26	18,6	1
Copper (Cu)	5	0	0	0	5
Manganese (Mn)	5	0	0	0	5
Nickel (Ni)	5	0	0	0	5
Vanadium (V)	5	0	0	0	5
Tin (Sn)	5	0	18	3,6	4
Iron (Fe)	5	22	40	28,4	0
Zinc (Zn)	5	0	45	17	3
Aluminium (Al)	5	0	0	0	5
Molybdenum (Mo)	5	0	0	0	5
Silver (Ag)	5	0	0	0	5
Barium (Ba)	5	0	0	0	5
Boron (B)	5	0	16	3,2	4
Calcium (Ca)	5	0	0	0	5
Magnesium (Mg)	5	0	0	0	5
Titanium (Ti)	5	0	0	0	5
Silicon (Si)	5	0	0	0	5

CONCAWE Petrol survey 2015

Country: Sweden

Measured properties: Distillation characteristics, oxygenates and high boiling components

Sweden	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	DIN EN ISO 3405	°C		5	35,2	37,4	36,5	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	5	34,4	43,1	39,48	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	5	46,9	63,6	56,2	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	5	84,3	91,9	89,12	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	5	185,7	205,2	194,32	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	5	0,7	1	0,86	0
Vapour pressure DVPE	DIN EN 13016-1	kPa		5	66,2	68	66,92	0
Vapour pressure ASVP	DIN EN 13016-1	kPa		5	72,5	74,4	73,24	0
Vapour lock index				5	920.8	974.2	945.56	0
Unwashed gum	EN ISO 6246	mg/100 ml		5	0	0	0	5
2-Butanol	EN ISO 22854	% (V/V)		5	0	0	0	5
ETBE	EN ISO 22854	% (V/V)	Max 15	5	0	0	0	5
Ethanol	EN ISO 22854	% (V/V)	Max 5	5	4,8	5,18	5,012	0
Methanol	EN ISO 22854	% (V/V)	Max 3	5	0	0	0	5
iso-Propanol	EN ISO 22854	% (V/V)		5	0	0	0	5
MTBE	EN ISO 22854	% (V/V)	Max 15	5	0	0,62	0,364	1
TAME	EN ISO 22854	% (V/V)	Max 15	5	0	0,78	0,156	4
TAAE	EN ISO 22854	% (V/V)		5	0	0	0	5
High boiling components	EN 16270	% (m/m)		5	0,38	0,82	0,564	0
FAME fraction	EN 16270	% (m/m)		5	0	0.02	0.01	3
Calorific value, lower	EN ISO 22854	MJ/kg		5	42,34	42,59	42,446	0

CONCAWE Diesel survey 2015
Country: Sweden
Measured properties: elemental analysis

Sweden	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	5	0,0	104,0	20,8	4
Potassium (K)	5	0,0	0,0	0,0	5
Lead (Pb)	5	0,0	0,0	0,0	5
Chromium (Cr)	5	0,0	0,0	0,0	5
Copper (Cu)	5	0,0	0,0	0,0	5
Manganese (Mn)	5	0,0	0,0	0,0	5
Nickel (Ni)	5	0,0	0,0	0,0	5
Vanadium (V)	5	0,0	0,0	0,0	5
Tin (Sn)	5	0,0	0,0	0,0	5
Iron (Fe)	5	0,0	16,0	5,6	3
Zinc (Zn)	5	0,0	23,0	8,6	3
Aluminium (Al)	5	0,0	0,0	0,0	5
Molybdenum (Mo)	5	0,0	0,0	0,0	5
Silber (Ag)	5	0,0	0,0	0,0	5
Barium (Ba)	5	0,0	0,0	0,0	5
Boron (B)	5	0,0	0,0	0,0	5
Calcium (Ca)	5	0,0	0,0	0,0	5
Magnesium (Mg)	5	0,0	0,0	0,0	5
Titanium (Ti)	5	0,0	0,0	0,0	5
Silicon (Si)	5	0,0	0,0	0,0	5

CONCAWE Diesel survey 2015

Country: Sweden

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

Sweden	2016							No. under limit of detection
	Method	Unit	Spec	n	Min	Max	Avg	
Density (15°C)	EN ISO 12185	kg/m ³	820-845	5	803,7	814,0	808,2	0
FAME content	EN 14078	% (V/V)	7	5	4,5	6,7	5,1	0
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	5	46,8	64,2	55,4	0
Oxidation stability at 120°C (Rancimat)		h		5	20,3	29,9	26,5	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		5	88,7	113,2	104,3	0
Monoaromatics	EN 12916	% (m/m)		5	3,0	5,7	3,7	0
Diaromatics		% (m/m)		5	0,2	0,5	0,3	0
Triaromatics		% (m/m)		5	0,0	0,2	0,1	1
PAH content		% (m/m)	Max 8	5	0,3	0,7	0,4	0
Total aromatics		% (m/m)		5	3,3	6,4	4,2	0
Total contamination	EN 12662	mg/kg		5	0.0	0.0	0.0	5
Filter Blocking Tendency	IP 387 (ambient)	-		5	1,0	1,1	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		5	42.9	43.7	43.3	0
EHN-content	DIN 51449	mg/kg		5	106,0	230,0	168,0	0

CONCAWE Petrol survey 2015
 Country: UK
 Measured properties: elemental analysis

UK	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	15	92,0	218,0	139,7	0
Potassium (K)	15	0,0	0,0	0,0	15
Lead (Pb)	15	0,0	0,0	0,0	15
Chromium (Cr)	15	0,0	0,0	0,0	15
Copper (Cu)	15	0,0	0,0	0,0	15
Manganese (Mn)	15	0,0	15,0	4,0	11
Nickel (Ni)	15	0,0	0,0	0,0	15
Vanadium (V)	15	0,0	0,0	0,0	15
Tin (Sn)	15	0,0	0,0	0,0	15
Iron (Fe)	15	0,0	24,0	13,3	2
Zinc (Zn)	15	67,0	245,0	135,8	0
Aluminium (Al)	15	0,0	0,0	0,0	15
Molybdenum (Mo)	15	0,0	0,0	0,0	15
Silver (Ag)	15	0,0	0,0	0,0	15
Barium (Ba)	15	0,0	0,0	0,0	15
Boron (B)	15	0,0	58,0	7,7	10
Calcium (Ca)	15	0,0	68,0	32,4	7
Magnesium (Mg)	15	51,0	89,0	73,9	0
Titanium (Ti)	15	0,0	0,0	0,0	15
Silicon (Si)	15	0,0	0,0	0,0	15

CONCAWE Petrol survey 2015

Country: UK

Measured properties: Distillation characteristics, oxygenates and high boiling components

UK	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Initial boiling point (IBP)	DIN EN ISO 3405	°C		15	33,4	39,9	36,1	0
Evaporated at 70°C (E70)	DIN EN ISO 3405	% (V/V)	22-50	15	25,4	46,2	41,1	0
Evaporated at 100°C (E100)	DIN EN ISO 3405	% (V/V)	46-71	15	50,3	67,9	58,6	0
Evaporated at 150°C (E150)	DIN EN ISO 3405	% (V/V)	Min 75	15	84,8	96,0	90,9	0
Final boiling point (FBP)	DIN EN ISO 3405	°C	Max 210	15	171,3	204,5	185,4	0
Distillation residue	DIN EN ISO 3405	% (V/V)	Max 2	15	0,6	1,0	0,8	0
Vapour pressure DVPE	DIN EN 13016-1	kPa		15	60,6	70,7	68,8	0
Vapour pressure ASVP	DIN EN 13016-1	kPa		15	66,7	77,2	75,2	0
Vapour lock index				15	783.8	1024.6	975.5	0
Unwashed gum	EN ISO 6246	mg/100 ml		15	0	0	0	15
2-Butanol	EN ISO 22854	% (V/V)		15	0,0	0,0	0,0	15
ETBE	EN ISO 22854	% (V/V)	Max 15	15	0,0	0,6	0,1	10
Ethanol	EN ISO 22854	% (V/V)	Max 5	15	0,0	5,5	4,7	1
Methanol	EN ISO 22854	% (V/V)	Max 3	15	0,0	0,7	0,1	13
iso-Propanol	EN ISO 22854	% (V/V)		15	0,0	3,5	0,2	14
MTBE	EN ISO 22854	% (V/V)	Max 15	15	0,0	0,3	0,049	9
TAME	EN ISO 22854	% (V/V)	Max 15	15	0,0	0,0	0,0	15
TAAE	EN ISO 22854	% (V/V)		15	0,0	0,0	0,0	15
High boiling components	EN 16270	% (m/m)		15	0,2	0,8	0,4	0
FAME fraction	EN 16270	% (m/m)		15	0.00	0.01	0.00	9
Calorific value, lower	EN ISO 22854	MJ/kg		15	42,4	43,7	42,7	0

CONCAWE Diesel survey 2015
 Country: UK
 Measured properties: elemental analysis

UK	2015				
Elements	n	Min	Max	Avg	No. under limit of detection
ICP-MS		µg/kg	µg/kg	µg/kg	
Sodium (Na)	15	0,0	116,0	29,9	9
Potassium (K)	15	0,0	0,0	0,0	15
Lead (Pb)	15	0,0	0,0	0,0	15
Chromium (Cr)	15	0,0	0,0	0,0	15
Copper (Cu)	15	0,0	0,0	0,0	15
Manganese (Mn)	15	0,0	0,0	0,0	15
Nickel (Ni)	15	0,0	0,0	0,0	15
Vanadium (V)	15	0,0	0,0	0,0	15
Tin (Sn)	15	0,0	0,0	0,0	15
Iron (Fe)	15	0,0	99,0	30,6	4
Zinc (Zn)	15	0,0	150,0	34,8	1
Aluminium (Al)	15	0,0	0,0	0,0	15
Molybdenum (Mo)	15	0,0	0,0	0,0	15
Silber (Ag)	15	0,0	0,0	0,0	15
Barium (Ba)	15	0,0	0,0	0,0	15
Boron (B)	15	0,0	0,0	0,0	15
Calcium (Ca)	15	0,0	0,0	0,0	15
Magnesium (Mg)	15	0,0	0,0	0,0	15
Titanium (Ti)	15	0,0	0,0	0,0	15
Silicon (Si)	15	0,0	1,0	0,3	10

CONCAWE Diesel survey 2015

Country: UK

Measured properties: Density, FAME content, FBT, oxidation stability, aromatic composition, and EHN content

UK	2015							
Property	Method	Unit	Spec	n	Min	Max	Avg	No. under limit of detection
Density (15°C)	EN ISO 12185	kg/m ³	820-845	15	828,7	841,2	836,1	0
FAME content	EN 14078	% (V/V)	7	15	0,0	4,0	1,0	8
Oxidation stability at 110°C (Rancimat)	EN 15751	h	Min 20	15	22,9	141,5	69,0	0
Oxidation stability at 120°C (Rancimat)		h		15	11,1	62,6	27,8	0
Oxidation stability at 140°C (Petrooxy)	EN 16091	min		15	74,8	156,8	100,2	0
Monoaromatics	EN 12916	% (m/m)		15	17,5	21,3	19,7	0
Diaromatics		% (m/m)		15	1,7	3,7	2,8	0
Triaromatics		% (m/m)		15	0,2	0,5	0,4	0
PAH content		% (m/m)	Max 8	15	1,9	4,2	3,1	0
Total aromatics		% (m/m)		15	20,6	25,2	22,8	0
Total contamination	EN 12662	mg/kg	24 mg/kg	15	0.0	0.0	0.0	15
Filter Blocking Tendency	IP 387 (ambient)	-		15	1,0	1,1	1,0	0
Calorific Value (lower)	51900-2	MJ/kg		15	42.6	43.1	42.8	0
EHN-content	DIN 51449	mg/kg		15	122,0	797,0	288,6	0

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