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ENVIRONMENTAL SCIENCE FOR THE EUROPEAN REFINING INDUSTRY

report

report no. 5/17

Compilation of Concawe market fuel surveys: 2008-2012

ISBN 978-2-87567-071-7

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April 2017

ABSTRACT

Concawe conducted a number of market fuel surveys on petrol and diesel qualities in eighteen European countries. In total 547 samples (151 petrol and 396 diesel) were sampled from 18 EU countries in the years 2008, 2010 and 2012. This report summarises the data by country and illustrates the data in charts for comparison purposes.

KEYWORDS

Petrol, diesel, market survey

INTERNET

This report is available as an Adobe pdf file on the Concawe website (www.concawe.org).

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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. 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 after-treatment systems which are becoming increasingly common for both gasoline and diesel. Concawe has conducted three market surveys in the years 2008, 2010 and 2012; each survey had a different focus reflecting the quality events or issues that were being observed at the time. In 2008, the focus was on metals analysis for both gasoline and diesel, in addition gasoline oxygenates were measured in 2010 whilst in both 2010 and 2012, diesel oxygenates and stability was a focus. Samples were taken from 18 EU countries. This report serves as a compilation of these results.

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 published in 2009 and have since been updated in the form of the Indirect Land Use Change (ILUC) Directive 2015/1513 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 biofuel components which will aid fuel suppliers in meeting 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 the European Committee for Standardization (CEN) and are the EN 228 [5] which covers motor gasoline containing ethanol up to 5% and 10%, and CEN technical standard TS15293 for E85. EN 590 [6] covers automotive diesel with fatty acid methyl ester (FAME) levels up to 7%. In addition there are standards for 100% ethanol (EN 15376) [7], 100% fatty acid methyl ester (EN 14214) [8], automotive diesel with fatty acid methyl ester levels up to 10% (EN 16734), automotive diesel with Fatty acid methyl ester levels up to 20% and 30% (EN 16709) and paraffinic diesel fuels (EN 15940) [9].

Concawe has a history of carrying out market surveys at regular intervals. The surveys reported here are from 2008, 2010 and 2012 and had different focuses reflecting the fuel quality events or issues that were being observed at the time.

In 2008, the focus for both gasoline and diesel was on elemental analysis and tests were carried out on 70 petrol samples and 100 diesel samples from 9 countries. The samples were tested for 26 elements. The samples were collected in the March-April timeframe.

In 2010, elemental analysis was carried out again for gasoline and diesel as well as additional properties for a wider range of countries – 13 countries in all, 5 of which had been included in the 2008 survey and 8 which were new countries. In 2010 86 petrol samples were tested and 128 diesel samples. For petrol the tests carried out were distillation, oxygen content, high boiling fraction and FAME fraction (to detect potential low-level contamination by diesel in the supply chain). In addition, the samples were tested for the full range of gasoline range oxygenates. Elemental analysis was also carried out on the diesel samples as well as some additional properties – density, oxidation stability methods under evaluation at the time – Rancimat, PetroOxy, Delta total acid number (TAN), peroxide value as well as FAME content and ethyl hexyl nitrate (EHN) content, both of which were thought to influence oxidation stability. The 2010 survey reflected the increased use of bio-derived components in both gasoline and diesel as well as elements which could come from production of these components as well as those which could be introduced from

normal fossil fuel processing. The 2010 samples were collected during the winter of 2010-2011.

In 2012, it was decided to only survey diesel samples and 163 samples were taken from 18 countries. In this survey the additional diesel properties tested in 2010 were tested again with an additional test temperature for the Rancimat test (120^{o}C in addition to the standard 110^{o}C temperature). As the focus was on stability the 2012 samples were taken in summer to ensure that the most severe samples would be collected.

The majority of testing over the three campaigns was carried out by ASG Analytik Service GmbH in Germany for all three surveys apart from metals testing in 2008 which was carried out by TNO in the Netherlands.

2. EXPERIMENTAL PROCEDURES

2.1. SAMPLING LOCATIONS

The fuel samples evaluated in this study were taken 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

		2008		2010		2012
Country	**Country code**	**Petrol**	**Diesel**	**Petrol**	**Diesel**	**Diesel**
Austria	AT			5	5	5
Belgium	BE			10	10	10
Croatia	HR			2	4	5
Czech Republic	CZ			3	3	5
Finland	FI	5	5		5	5
France	FR	10	20	10	20	15
Germany	DE	10	20	11	20	30
Hungary	HU			5	5	5
Ireland	IE					5
Italy	IT	10	15	10	15	15
Netherlands	NL	5	5	5	5	5
Poland	PL	5	5		5	5
Romania	RO			5	5	5
Slovakia	SK			3	4	5
Slovenia	SI			2	2	5
Spain	ES	5	20	5	20	15
Sweden	SE	5	5		4	8
United Kingdom	GB	15	15	10	10	15
Total		**70**	**110**	**86**	**142**	**163**

2.3. TEST METHODS

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

2.3.1. Elemental analysis

Inductively coupled plasma-atomic emission spectrometry (ICP-AES) and inductively coupled plasma-mass spectrometry (ICP-MS).

Inductively coupled plasma (ICP) analytical techniques provide 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-AES is suitable for the trace analysis of metal elements in the ppb ranges and a limited number of non-metallic elements (e.g. S, P). The AES instrument can measure the relative amounts of up to 60 elements per single sample run.

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

In the 2008 survey ICP-MS was used for gasoline and diesel whilst in 2010 ICP-AES was used for gasoline and ICP-MS was used for diesel. Although the test methods were the same for diesel in 2008 and 2010, two different instruments were used with different limits of detection so it is difficult to compare the results. In addition, in 2008 for both gasoline and diesel, the samples were divided into four and each of the subsamples tested and the results averaged.

2.3.2. Determination of oxygenates (EN 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. It should be noted that DIPE was not included although at least in 2012 it appears that some suppliers are also offering this component [11].

2.3.3. 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 gasolines, automotive engine gasolines with up to 10% (V/V) ethanol and aviation gasolines. Middle distillates are aviation turbine fuels, kerosenes, diesel, diesel with up to 20% (V/V) FAME, burner fuels and marine fuels that have no appreciable quantities of residua.

2.3.4. High boiling fraction in petrol – simulated distillation (EN 16270)

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.

2.3.5. FAME fraction in petrol

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

2.3.6. Density (EN ISO 12185)

This gives a method for the determination, using an oscillation U-tube densitometer, of the density of crude petroleum and related products within the range 600 kg/m^3 to 1 100 kg/m^3 which can be handled as single-phase liquids at the test temperature and pressure.

2.3.7. FAME content in diesel (EN 14078)

This test method involves determination of FAME content in middle distillates using the technique of infrared spectrometry.

2.3.8. EHN content (EN ISO 13759)

This method specifies a procedure for the determination of alkyl nitrate in diesel fuel in the concentration range 0.03% (V/V) to 0.30% (V/V). The presence of nitrate esters, inorganic nitrate ions and nitrogen oxides will interfere with this determination.

2.3.9. Rancimat Stability at 110 °C (EN 15751)

This test method (EN 15751) can be applied to B100 biodiesel and to biodiesel 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 110ºC. The induction period before the onset of rapid oxidation is taken as a measure of stability. The range of the method has a maximum of 48 h (indicated in section 1 of EN 15751, for higher induction periods).

2.3.10. Rancimat Stability at 120 °C (EN 16568)

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

2.3.11. PetroOxy Test (EN16091)

The PetroOxy test 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 is typically performed at 140 °C.

2.3.12. Peroxide value (ISO 3960)

ISO 3960 specifies a method for the iodometric determination of the peroxide value of animal and vegetable fats and oils with a visual endpoint detection and can also be used for fuels. The peroxide value is a measure of the amount of oxygen chemically bound to an oil or fat as peroxides, particularly hydroperoxides.The peroxide value evolves quickly with time and the final value is very dependent on the aging of the sample.

2.3.13. Delta TAN (based on EN 14104)

The Delta TAN method is a measurement of change in TAN as measured by EN 14104. This European Standard specifies one titrimetric method for the determination of acid value in blends of FAME. It allows the determination of acid value within a range of 0.10 mg KOH/g to 1.00 mg KOH/g.

3. RESULTS AND DISCUSSION

3.1. PETROL SURVEYS

3.1.1. Elemental Analysis

The elemental analysis determined on 70 petrol samples collected in nine European countries in 2008 has been determined by ICP-MS in µg/kg. The results along with the diesel samples have been published previously in a paper by TNO [10]. Averages are shown in **Figure 1**. The elements Ag, Al, Au, Pt, Se, Sn, Ti and V for all sampled countries are measured below 1 µg/kg (ppb). Ti for all sampled countries is measured below the detection limit.

The Finnish petrol and diesel samples were delivered in metal containers. The petrol samples appear to be contaminated by the containers as can be seen from the extremely high Zn contents. It is difficult to conclude for every element if it is affected by the storage containers. For discussion all data including the Zn values are included here.

The elemental analysis determined on 86 petrol samples collected in thirteen European countries in 2010 has been determined by ICP-AES in mg/kg. The averages are shown in **Figure 2**.The elements Ag, Al, Ba, Ca, Cd, Cr, Cu, K, Mg, Mo, Na, Ni, Pb, Sn, Ti and V for all sampled countries were measured below 0.5 mg/kg. The remainder of the metals gave averages which measured above 0.5mg/kg.

The detailed results from individual countries averaged in **Figures 1** and **2** are given in the appendix. There were only six countries where samples were tested in both 2008 and 2010 – France, Germany, Italy, Netherlands, Spain, UK although two different test methods were used. The limit of detection for the ICP-AES in 2010 (0.5 mg/kg or 500 µg/kg (ppb)) was much higher than the ICP-MS used in 2008 when the limit of detection was different for each isotope ranged from 0.05 ppb to around 6 ppb.

Figure 1. Metals in Petrol in 2008

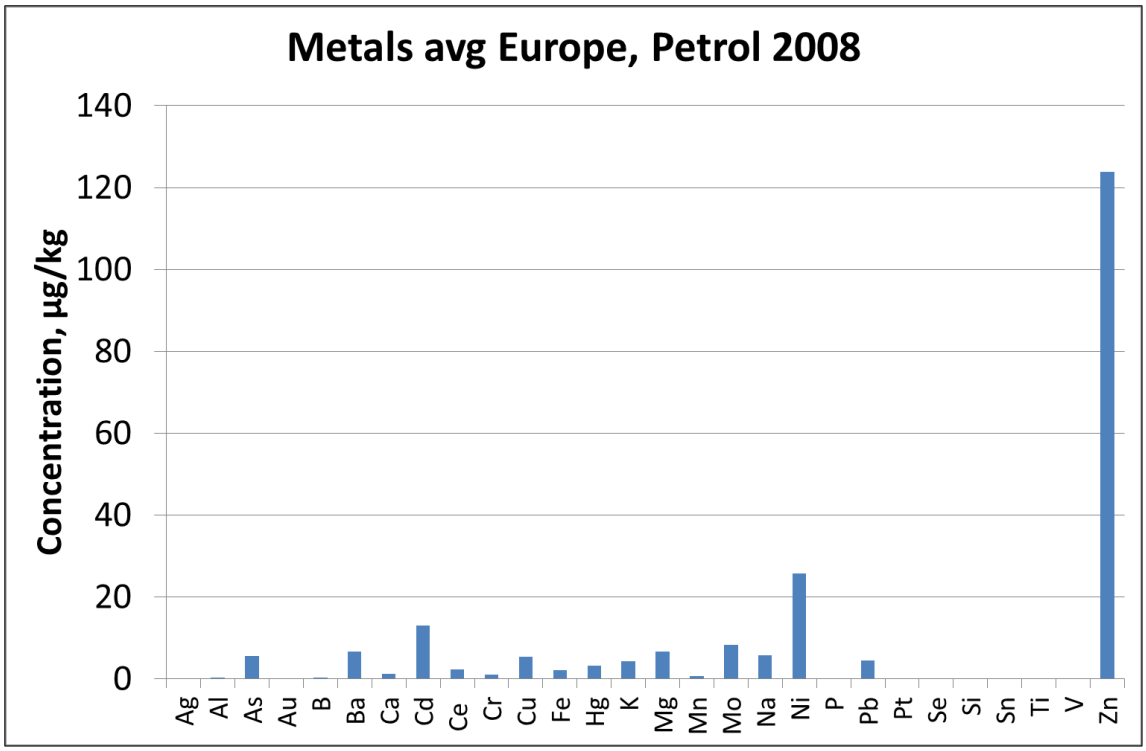
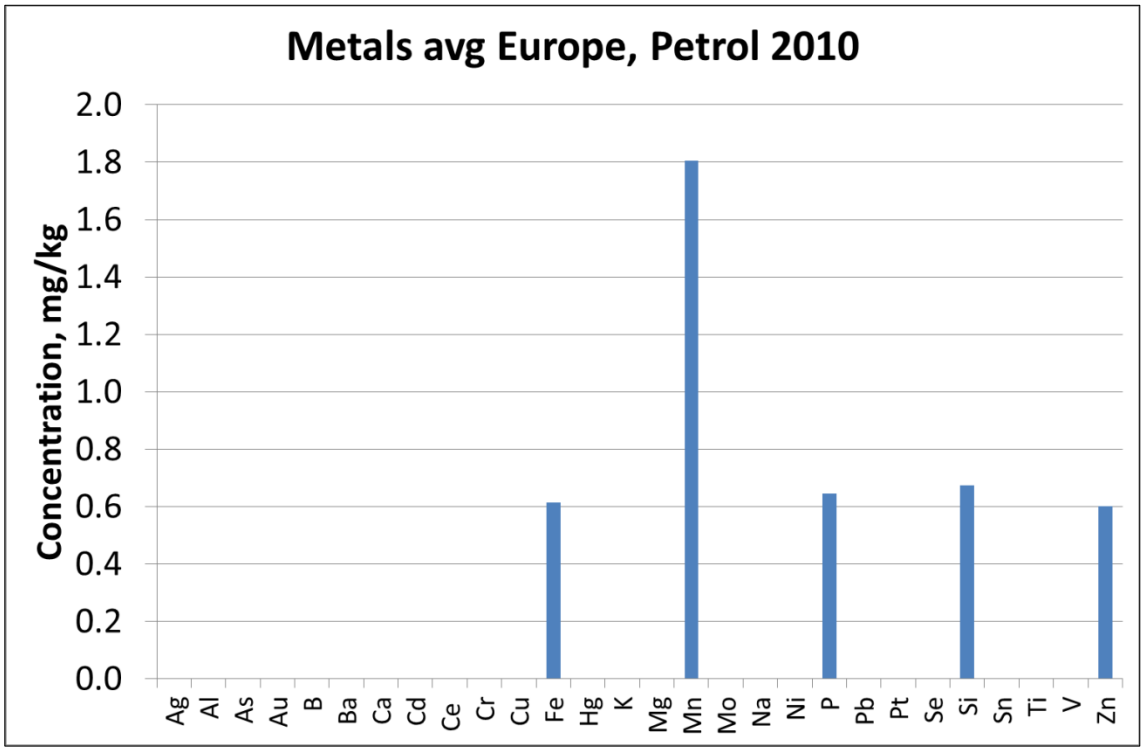


Figure 2. Metals in Petrol in 2010



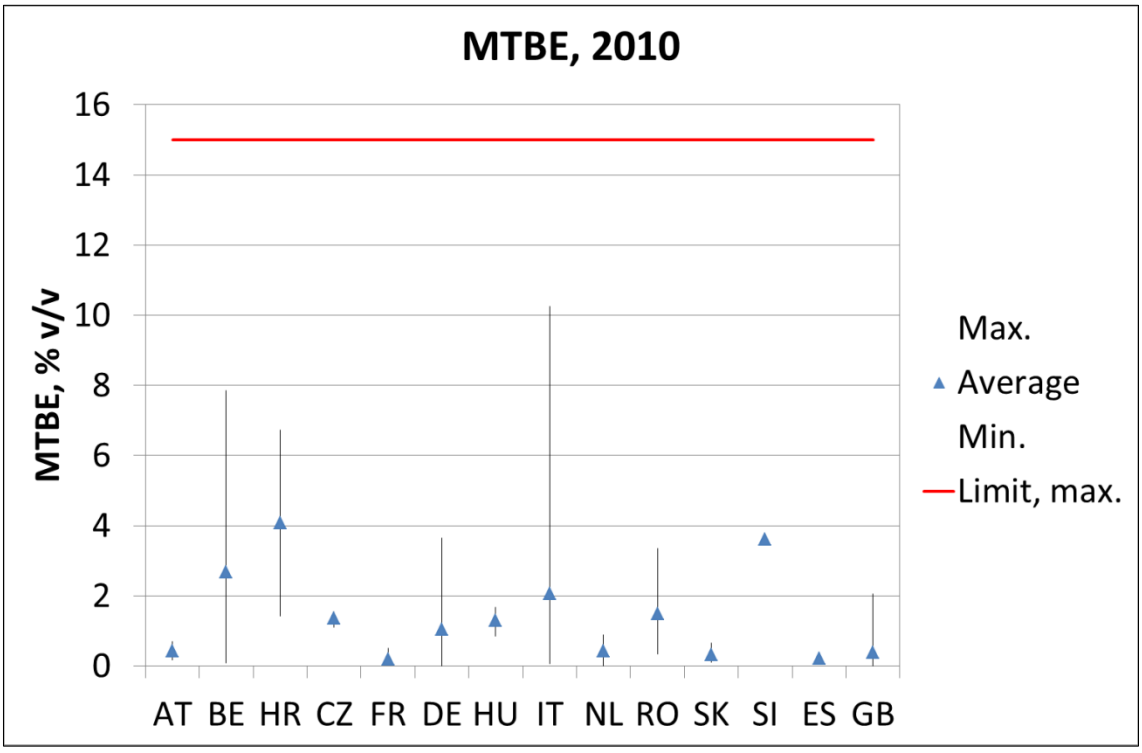
3.1.2. Oxygenates in general

On the petrol samples collected in 2010 additional properties have been determined such as oxygenate content, oxygen content, distillation characteristics and high boiling fraction. The triangles in the figures represent the country average value, the bars indicate the range of minimum and maximum values observed. Where there is a definite pan-European limit it is indicate by the red line on the chart.

It has been determined that tert-butanol and tert-amyl alcohol were detected in few of the samples tested at very low levels so there are no charts for these oxygenates. Readers who are interested in oxygenates may also be interested in Concawe report 4/12 [11].

3.1.3. Ethers

Figure 3. MTBE content in 2010



All samples tested gave total oxygenates on or under the 15% (V/V) limit. For MTBE the averages were all under 4% (V/V) as shown in **Figure 3.** The overall average MTBE content was 1.1% (V/V). ETBE levels were more variable than MTBE and the overall average was higher at 3.3% (V/V) as shown in **Figure 4**. **Figure 5** shows the TAME content which is much lower than either MTBE or ETBE content.

Figure 4. ETBE Content in 2010

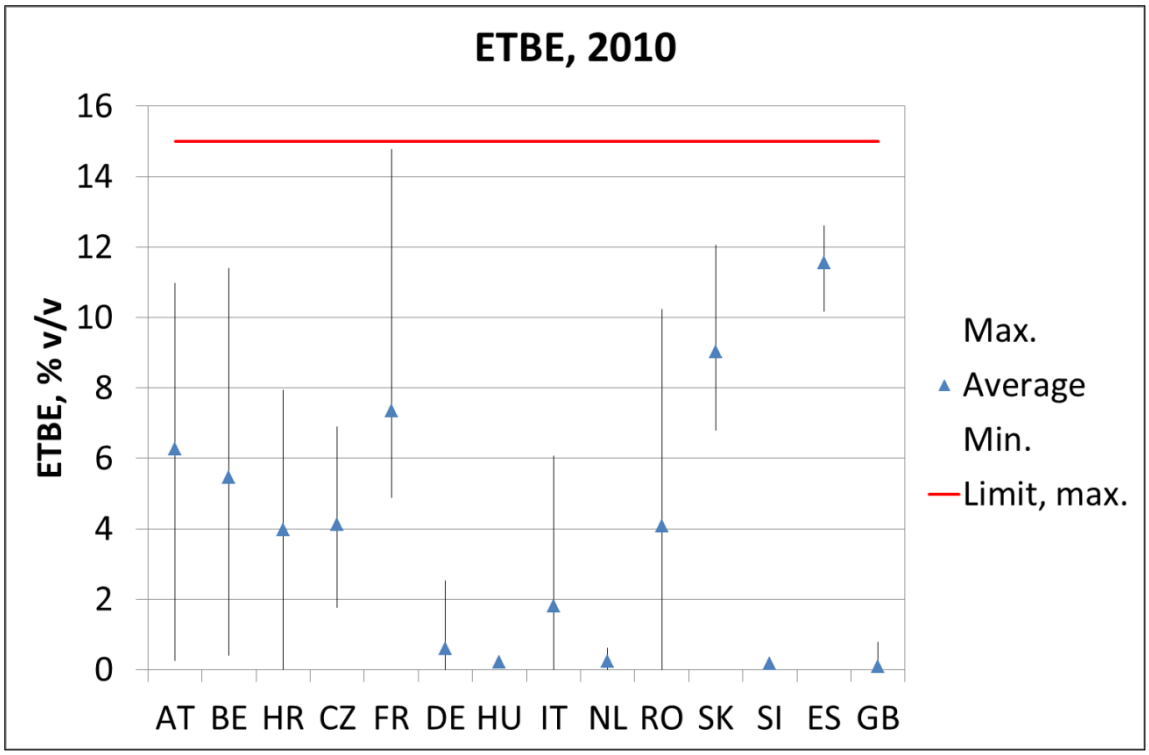
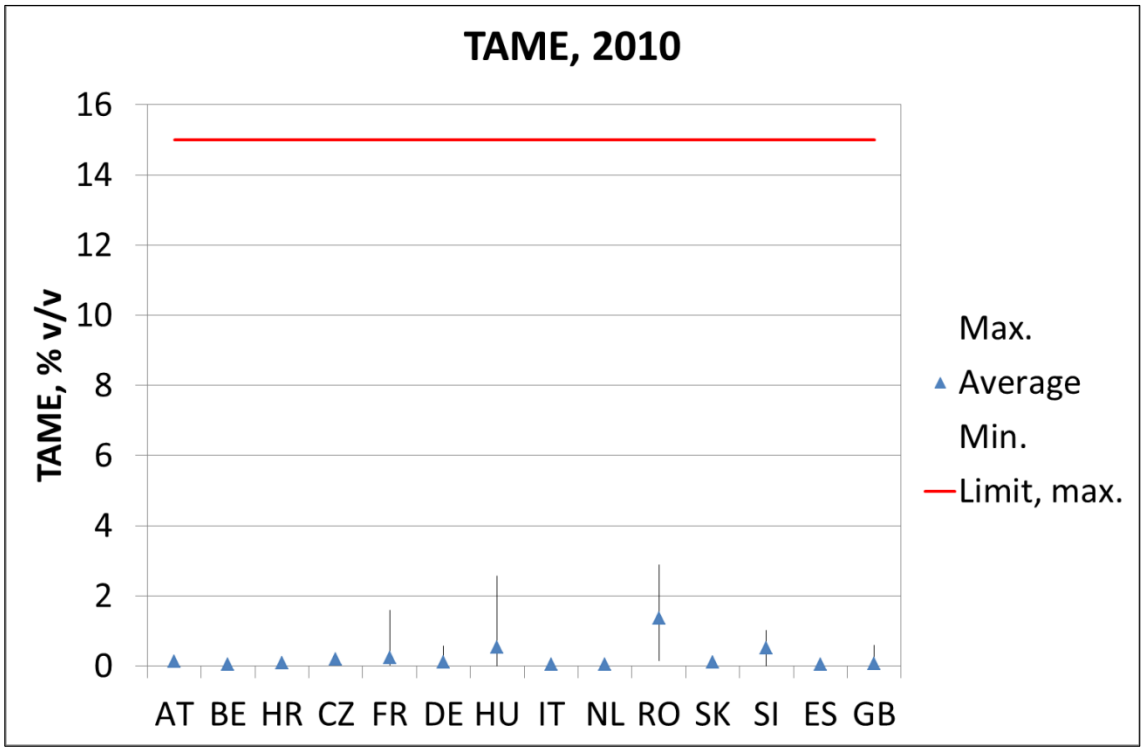


Figure 5. TAME Content in 2010



3.1.4. Alcohols

Figure 6 shows the methanol content in 2010 which was only observed to a small degree in Romania and Slovakia. There were higher levels of ethanol content as shown in **Figure 7**. The overall average content for ethanol was 3.2% (V/V). In 2010 E10 had already been launched in France which would explain the excusions above the 5% for that particular country.

Figure 6. Methanol Content in 2010

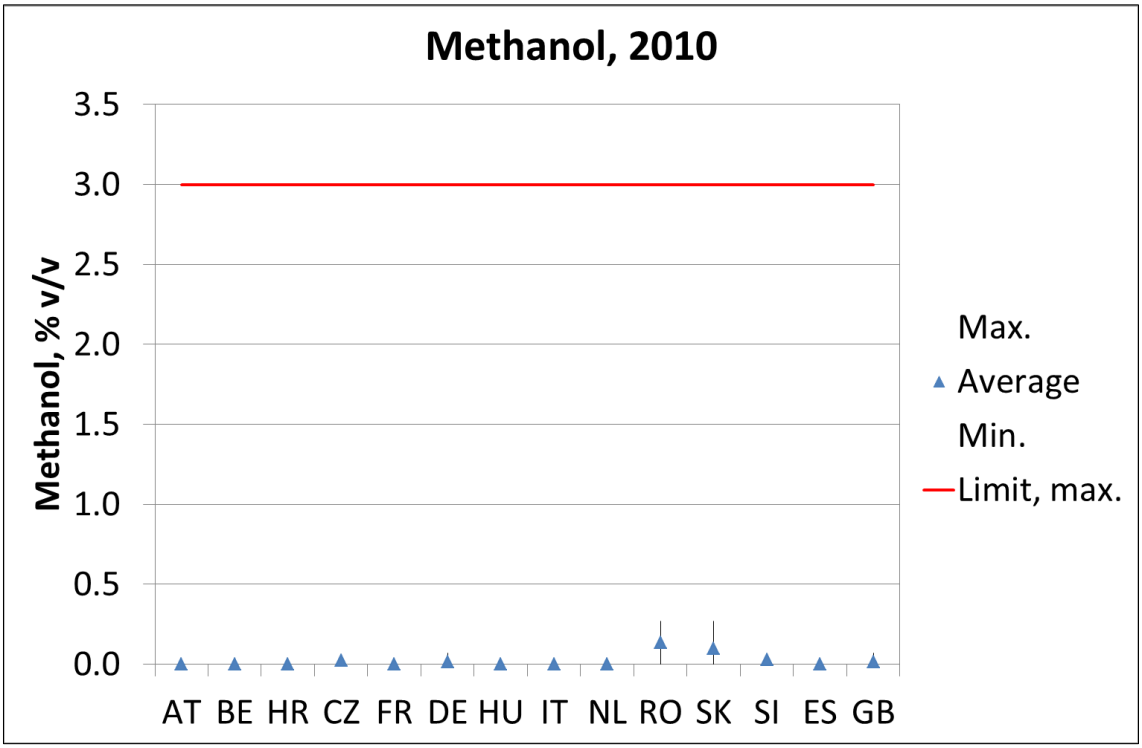
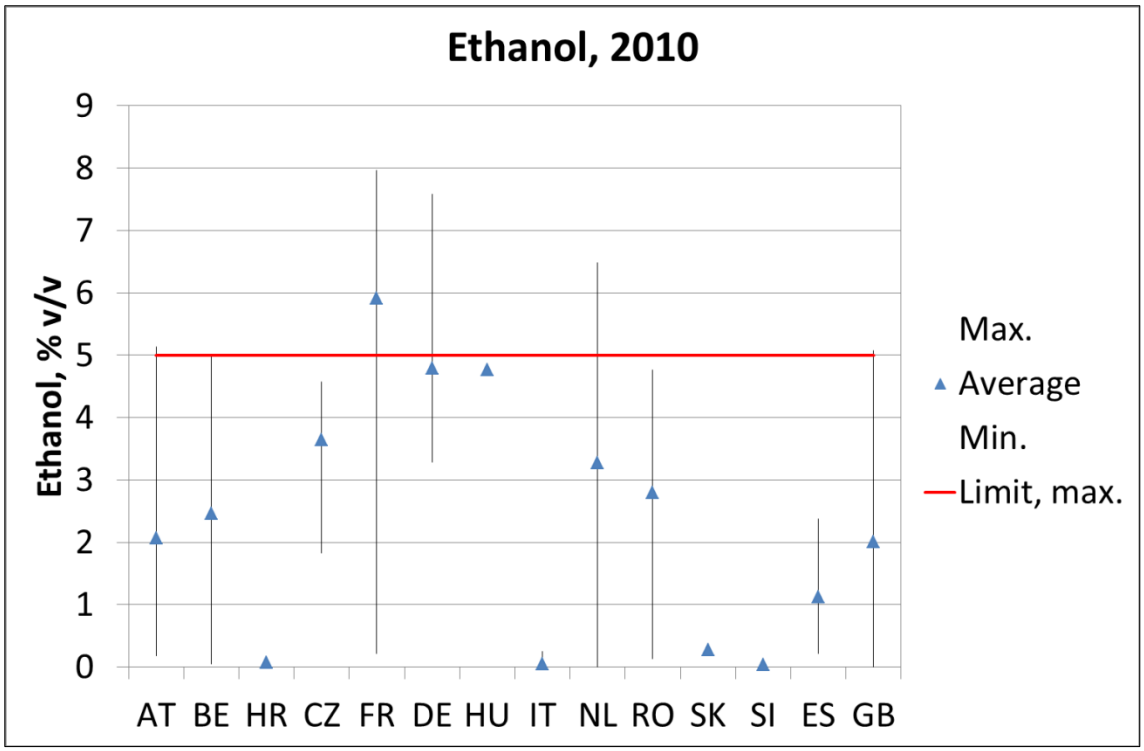


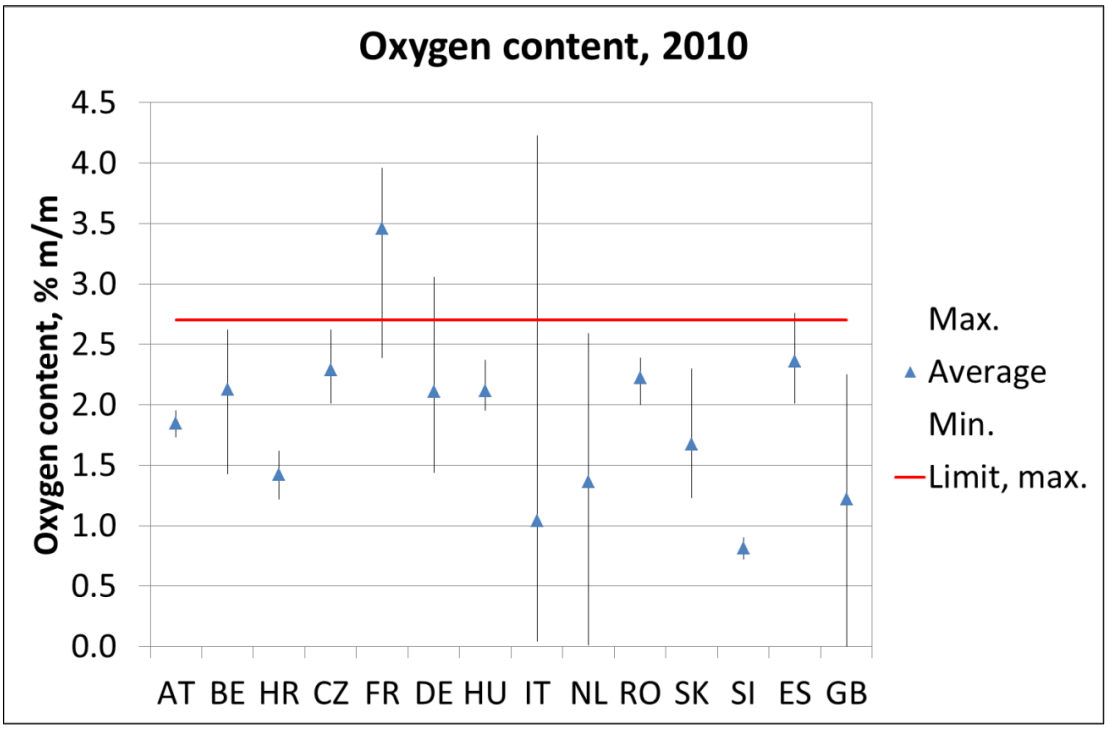
Figure 7. Ethanol content in 2010



3.1.5. Oxygen content

The oxygen content is shown in **Figure 8** and in most countries was measured to be below the 2.7% (V/V) limit at the time. France and Italy were the main exceptions to this although in Italy only one sample was over the limit which pulled the average up. By 2010 E10 had already been launchedin France which would explain the excusions above the 2.7% limit (E5) for that country.It should also be noted that in some countries it is possible to include more oxygenate if the samples are labelled accordingly and this might explain some of the data.The overall average oxygen content was 2.1% (V/V). Where there is a definite pan-European limit it is indicate by the red line on the chart.

Figure 8. Oxygen content in 2010



3.1.6. Distillation characteristics

Samples generally met the distillation parameters as shown in **Figures 9 – 12**. Where there is a definite pan-European limit it is indicate by the red line on the chart.

Figure 9. Gasoline E70 (% V/V) in 2010 (the limits indicated do not apply to classes A and B)

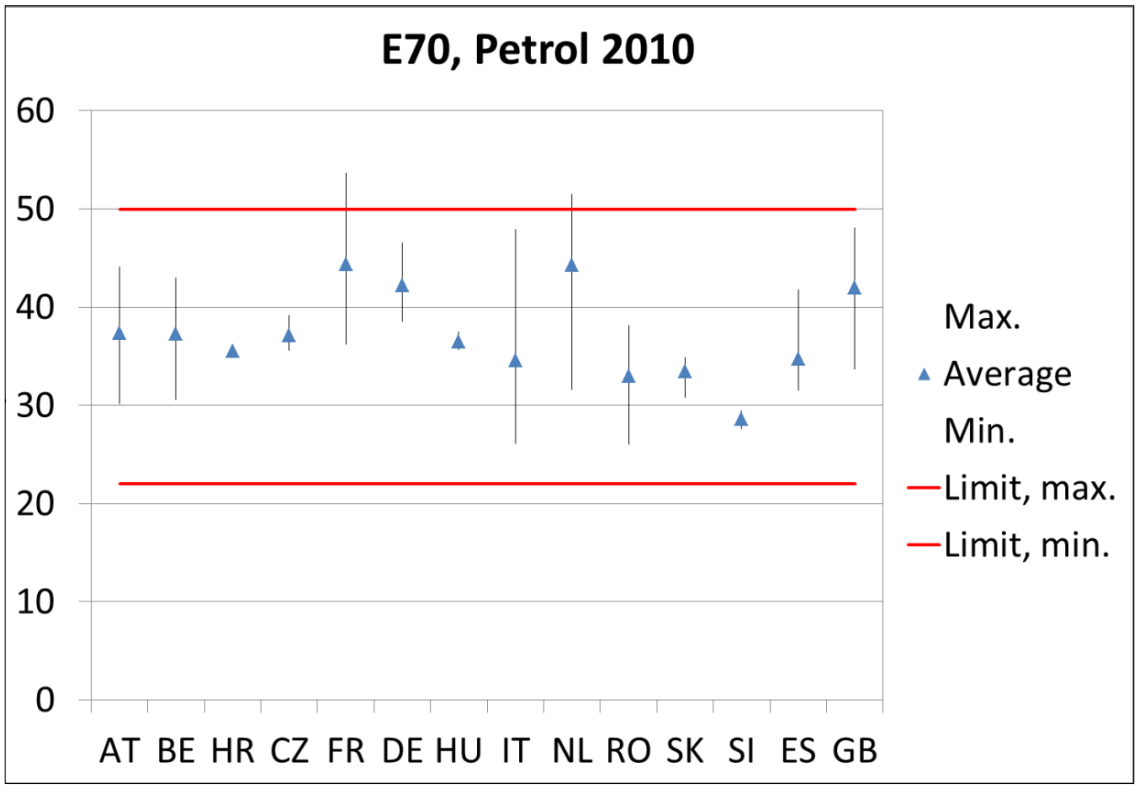


Figure 10. Gasoline E100 (%V/V) in 2010

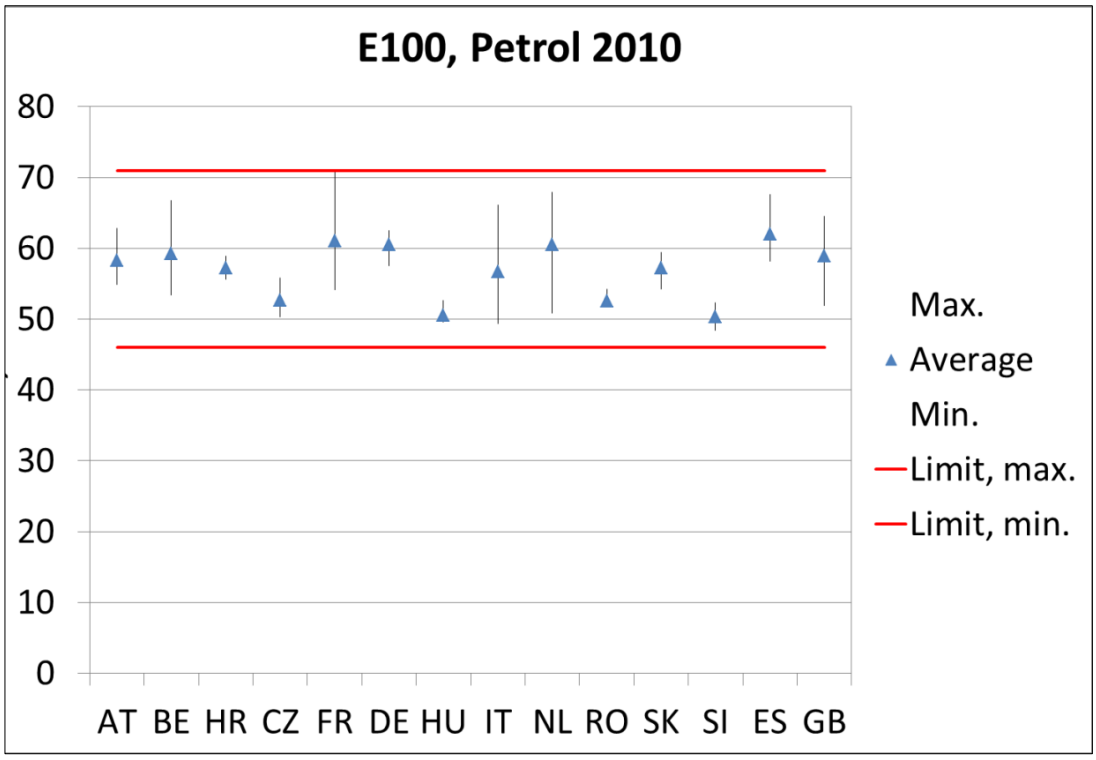


Figure 11. Gasoline E150 (% V/V) in 2010

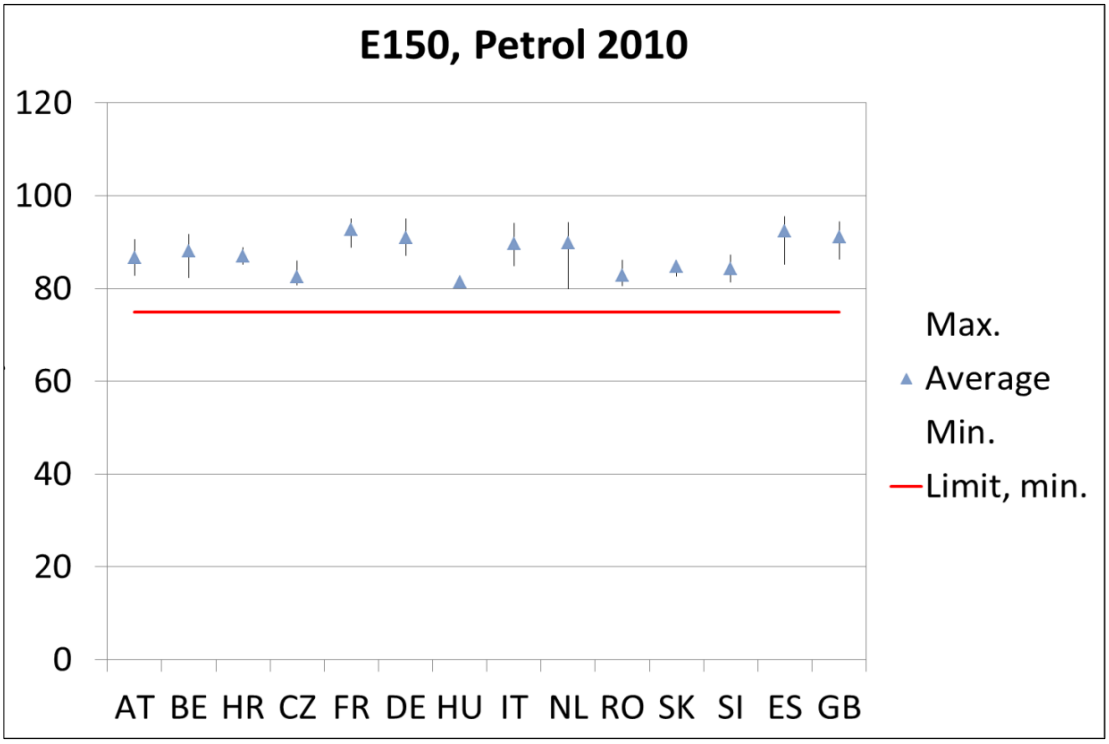
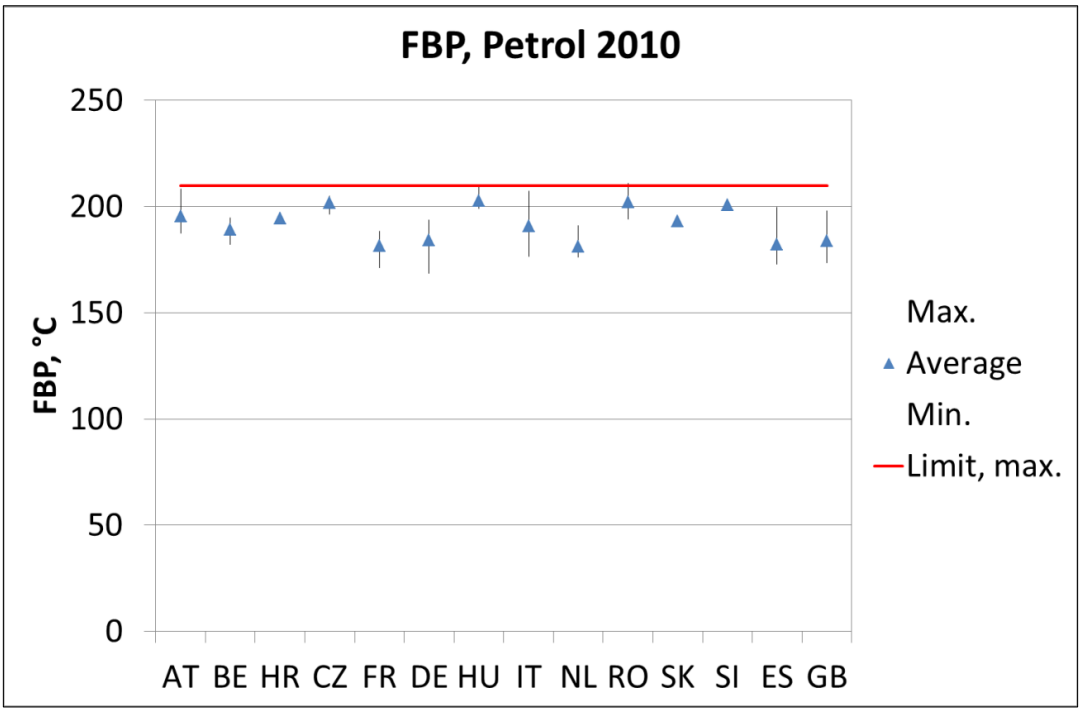


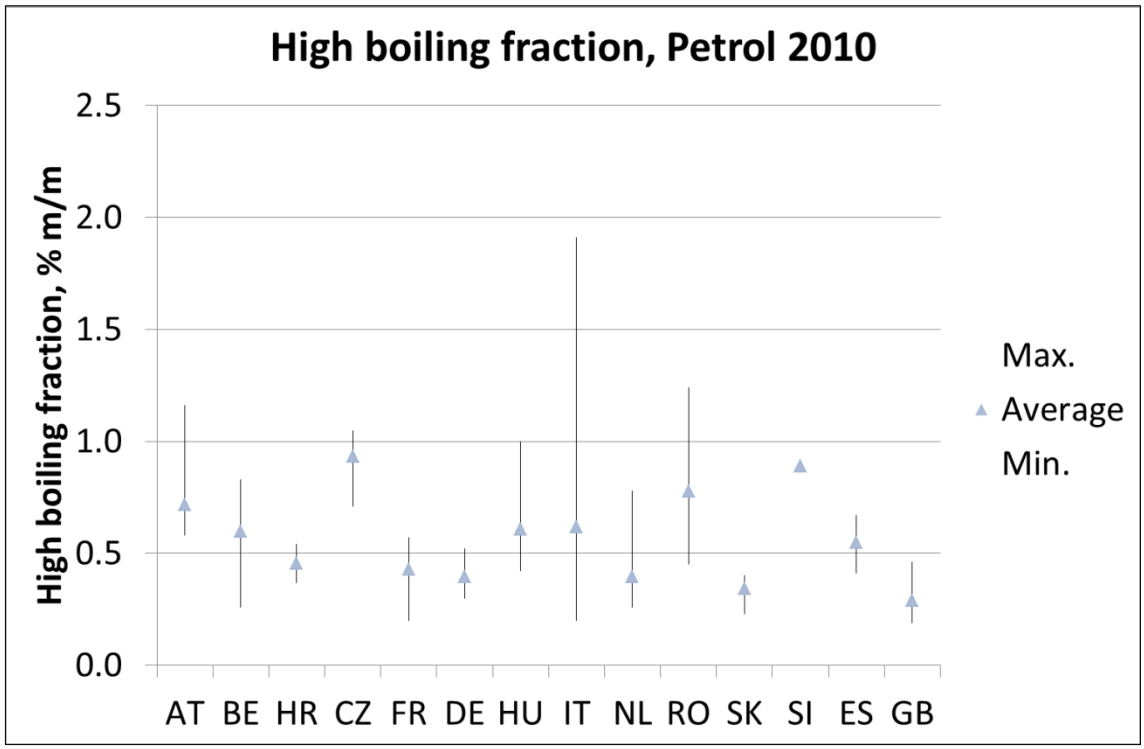
Figure 12. Gasoline FBP in 2010



3.1.7. High boiling fractions

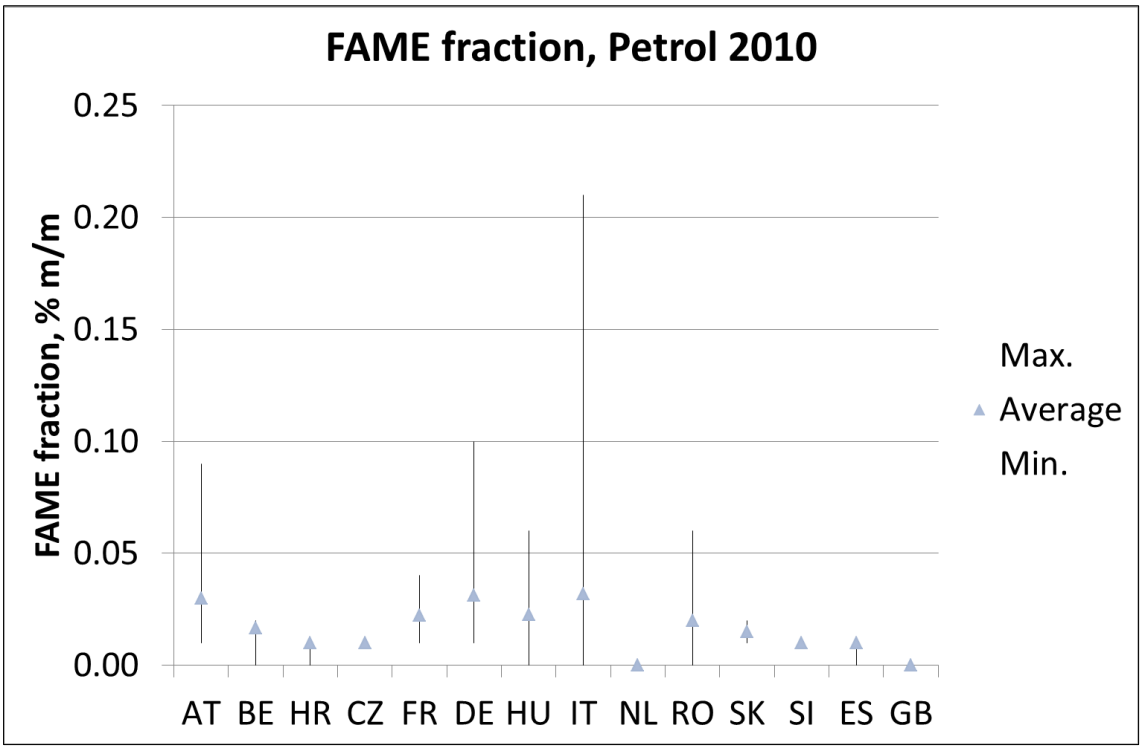
High boiling fractions give an indication of the heavier components in the fuel which can cause issues with gum formation. It is defined as the total fraction of high boiling material starting from 1-methylnaphthalene until and including dotriacontane. The results are shown in **Figure 13** and on average were generally below 1% (V/V).

Figure 13. Petrol high boiling fraction in 2010



To investigate potential for FAME contamination in gasoline, the FAME content was measured and the results are shown in **Figure 14**. The results were generally low with the highest levels observed in Italy.

Figure 14. FAME content in Petrol in 2010



3.2. DIESEL FUEL SURVEYS

3.2.1. Elemental analysis

In **Figure 15**, the average metals analyses in diesel for 2008 and 2010 are shown.

The ICP-MS instrument used in 2008 had a limit of detection that depended on the isotope to be tested ranging from 0.05 to around 5 ppb. The ICP-MS used in 2010 generally had a limit of detection of 5 ppb except for Al, Ca, Mg and Na which had limits of detection of 20ppb and Silicon with a limit of detection of 500ppb.

In 2008 the elements Ag, Cd, Ba, Al, Ti, V, Mn, Ni, As, Se and Mo were not detected or negligible. The concentrations for Ce, Pt and Au were uncertain by a factor of 3. This means a value of 1 ppb is in the range of 0.33 - 3 ppb. This was because no proper standard in organic solvent could be obtained. No major differences were detected between samples from different countries for most dissolved metals as can be seen in **Figure 16** which shows some selected metals of interest by country for 2008.

In 2010 for the metals which were detected, there appears to be an increase versus 2008 in most cases although the levels detected are still at very low levels from a few tenths of a ppb to a few hundred ppb for all metals, the only exception being the silicon content in 2010 where the average was around 600 ppb. This is likely to be due to the use of Si-based antifoam additives which are commonly used in Europe. Other metals

could originate from different sources i.e. additive packages, processing of crude, catalysts used in processing of biofuels.

Figure 15. Average metals content in 2008 and 2010

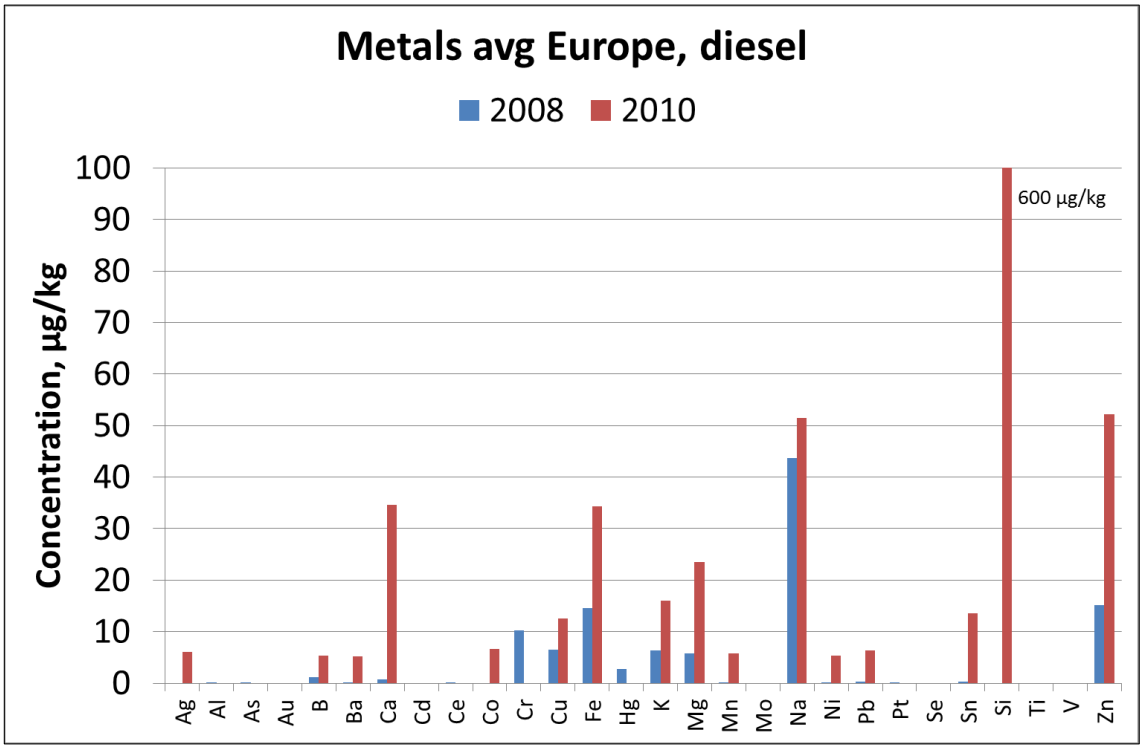
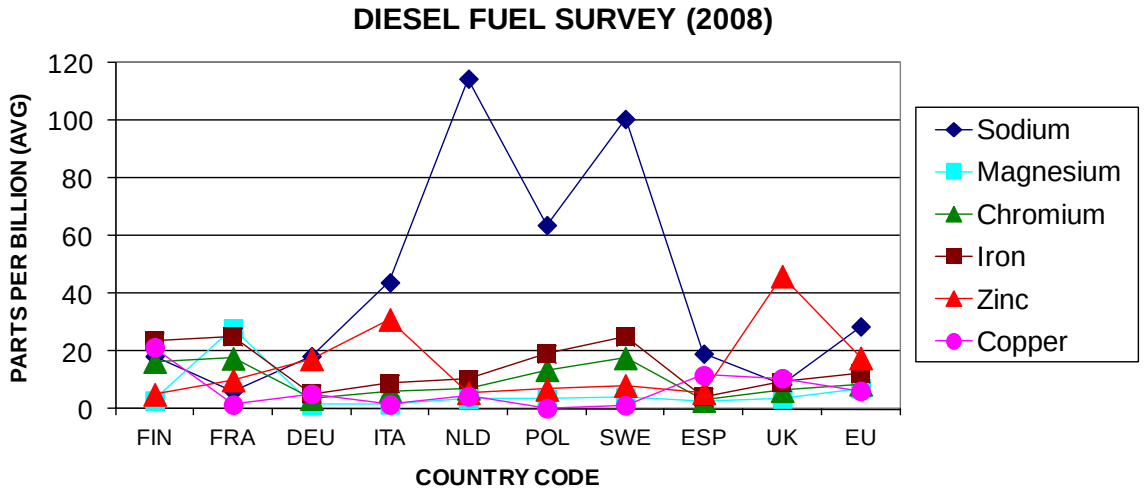


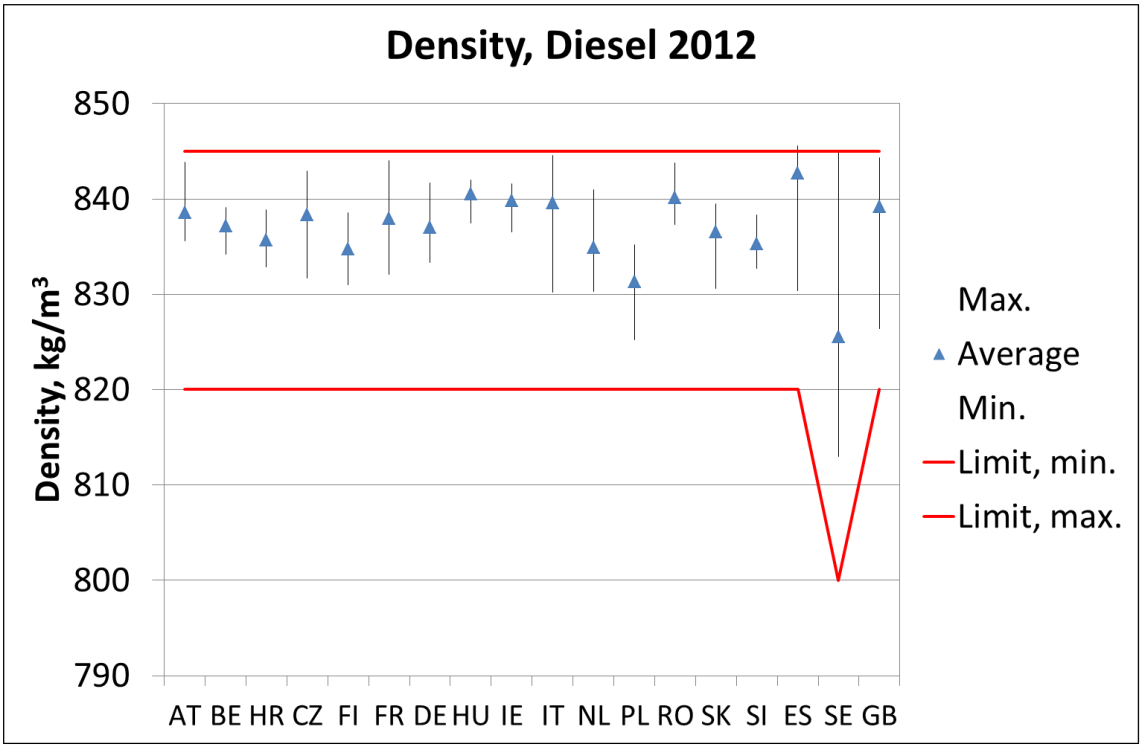
Figure 16. Average metals content for selected metals by country



3.2.2. Diesel properties

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 17**. The overall average density of the samples collected was 837 kg/m^3. Where there is a definite pan-European limit it is indicate by the red line on the chart in this figure and following figures in the report.

Figure 17. Density of diesels sampled in 2012



When FAME content in 2010 and 2012 are compared as in **Figures 18** and **19**, it can be seen that the current 7% specification limit was met in all cases. In 2012 Most of the countries were either at the same levels or slightly higher than in the previous survey. The average FAME content was 4.4% in 2010 and 5.1% in 2012.

Figure 18. FAME content in diesel in 2010

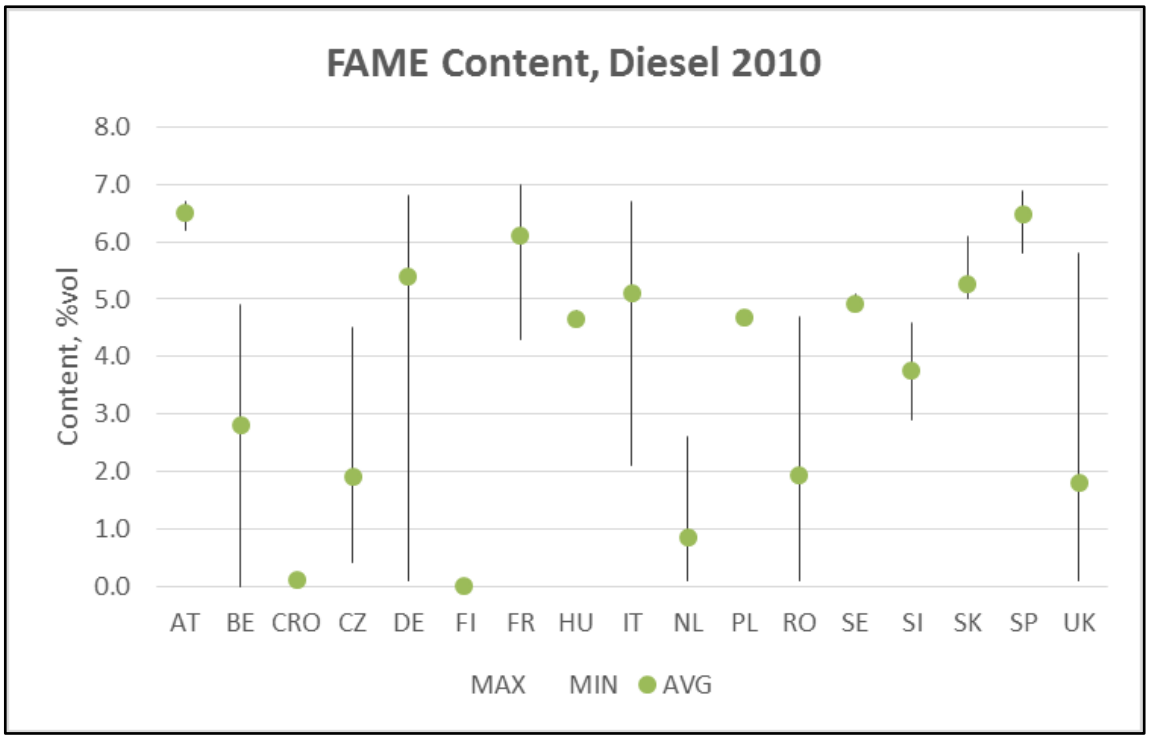
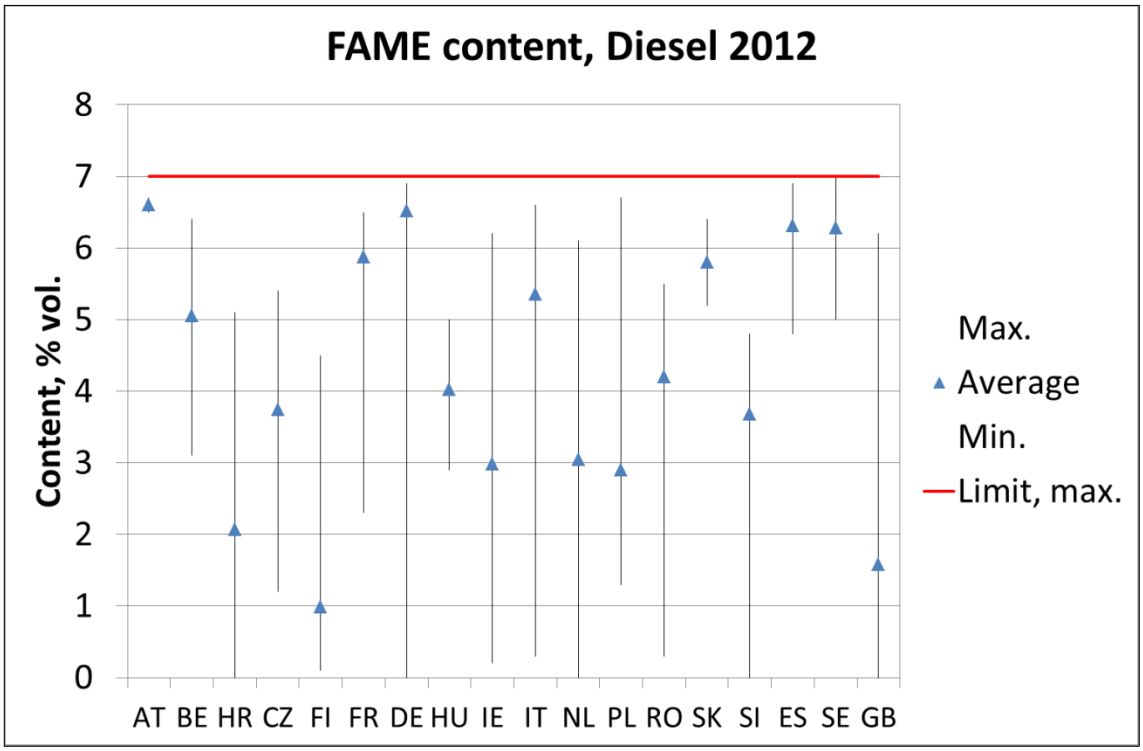


Figure 19. FAME content in diesel in 2012



Similarly cetane improver (Ethyl hexyl nitrate) content was also tested during 2010 and 2012 and the results can be seen in **Figure 20** and **Figure 21** respectively. In general the 2012 results were similar compared to those samples tested in 2010. The average EHN content was 531 mg/kg in 2010 and 476 mg/kg in 2012.

Figure 20. EHN Content in diesel in 2010

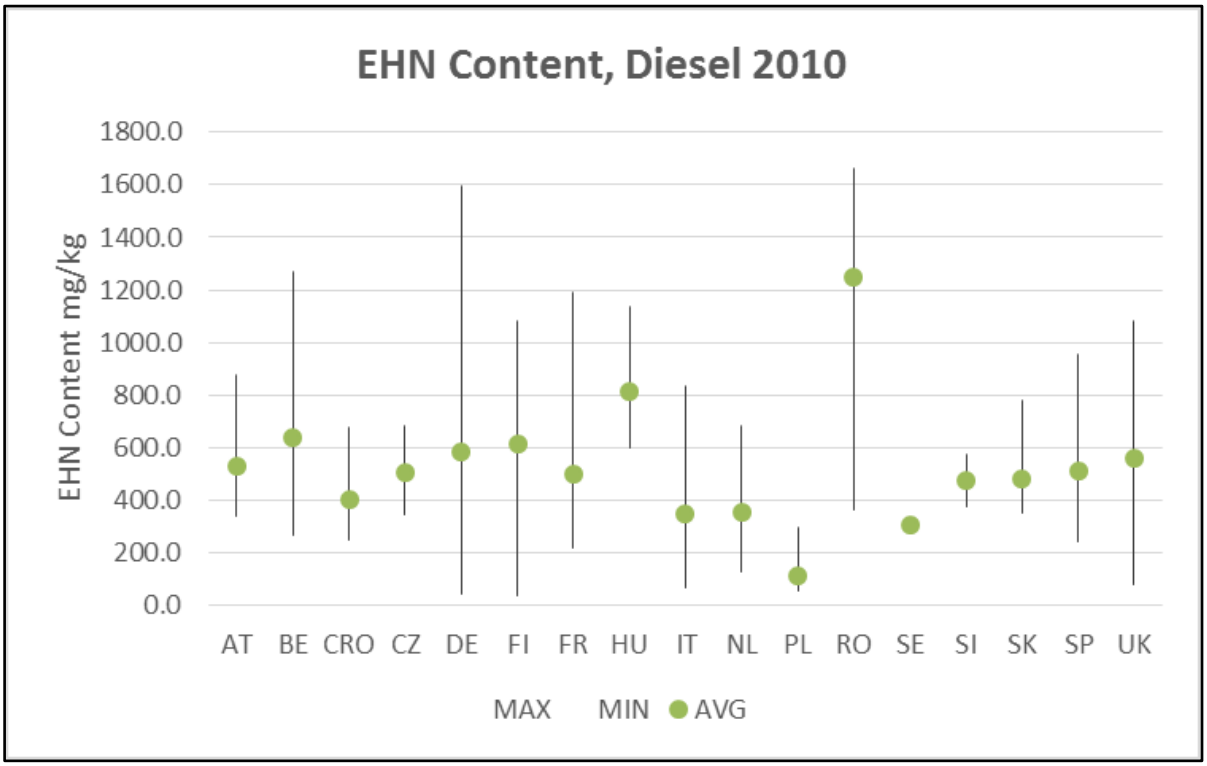
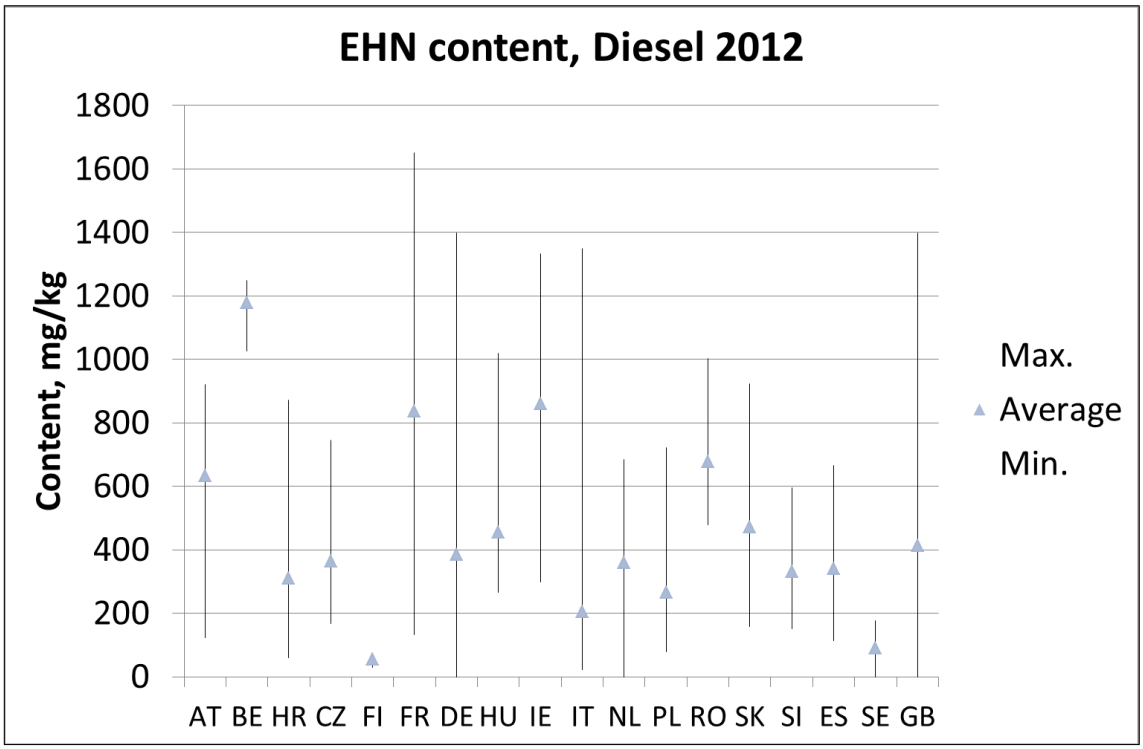


Figure 21. EHN content in diesel in 2012



3.2.3. Oxidation stability

One of tests related to oxidation stability in EN 590 is the Rancimat test run at 110°C. The minimum Rancimat specification is 20 hours. Rancimat tests were run in the 2010 and 2012 surveys as shown in **Figures 22** and **23** respectively. In 2012 the averages for the countries appear to be lower and closer to the specification limits than in 2010. The average overall induction periods for 2010 was 51 hours and for 2012 was 48 hours. It should be noted that the average results for Croatia, Italy and Poland were brought down by one off-specification result from each country in 2012.

Figure 22. Rancimat results at 110 °C in Diesel in 2010

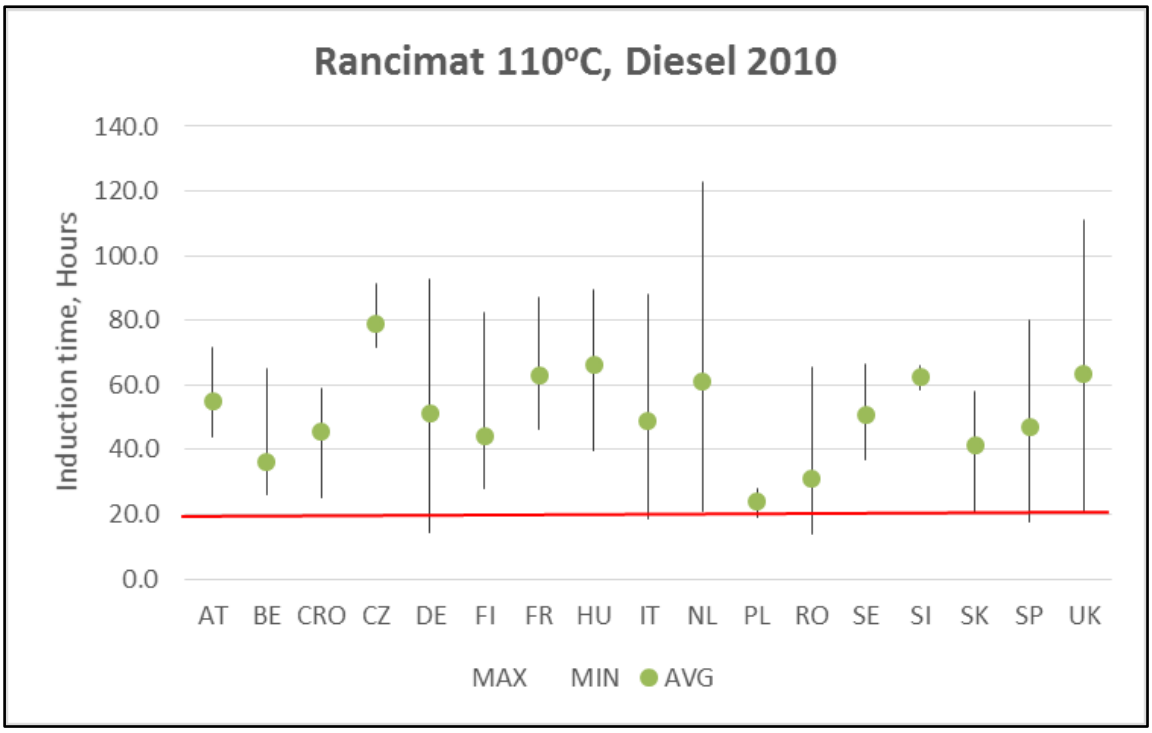
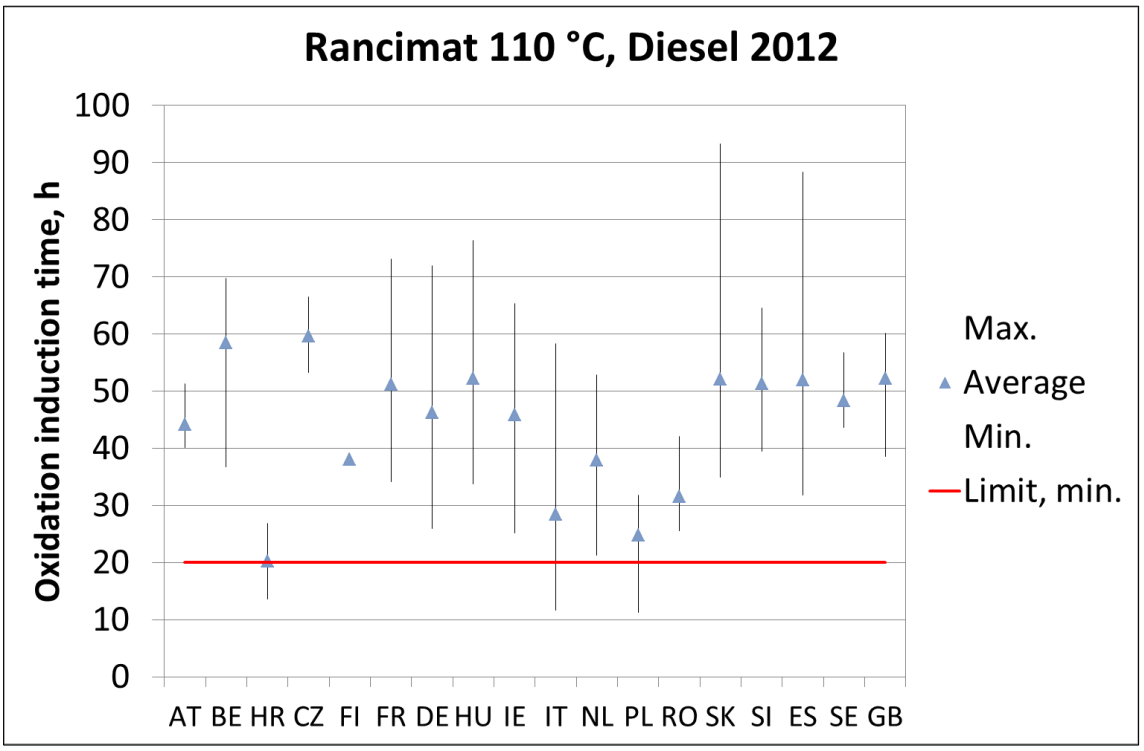


Figure 23. Rancimat results at 110 °C in diesel in 2012



3.2.4. Alternative oxidation stability test methods

There are ongoing discussions within Concawe and CEN 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: Rancimat at 120ºC, PetroOxy at 140ºC, Peroxide value and Delta TAN. The Rancimat test run at 120 °C is an attempt to speed up the test from 20 hours to around 10 hours was under development in 2012 although it has not been incorporated into EN_590. The Rancimat at 120ºC results from the 2012 survey are shown in **Figure 24**. The overall average result for the Rancimat at 120ºC was 19.2 hours These results correlated well with the 110 °C Rancimat test as would be expected as shown in **Figure 25**.

Figure 24. Rancimat results run at 120 °C in diesel in 2012

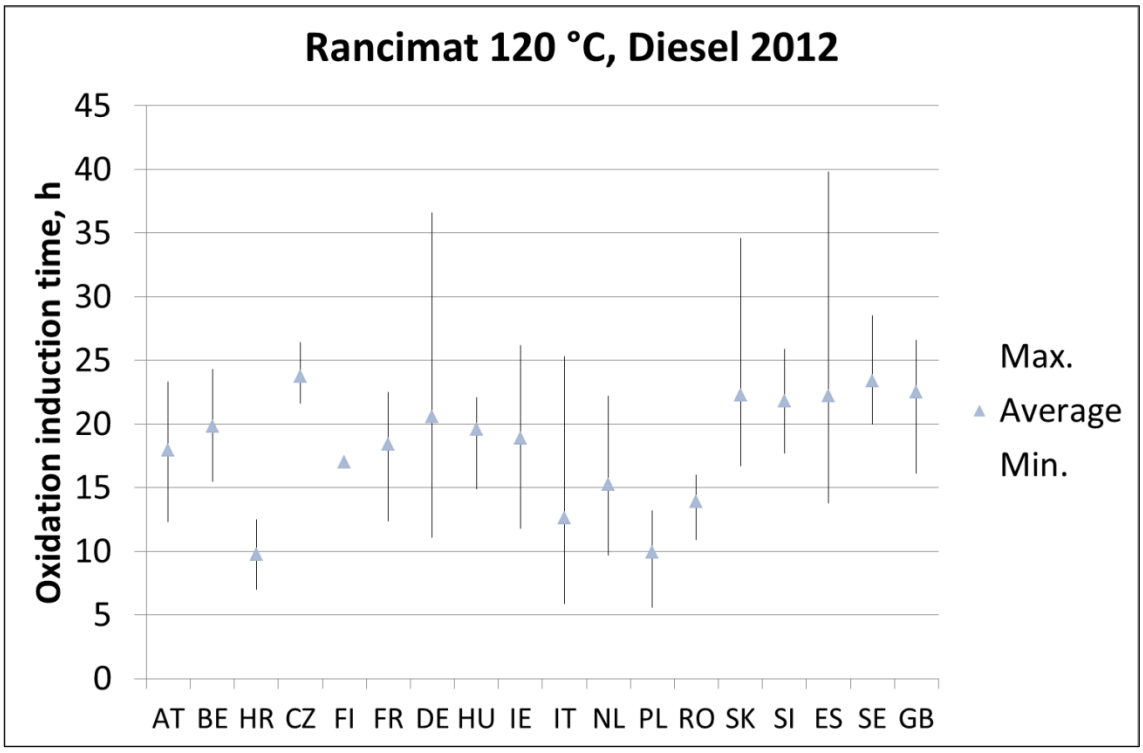
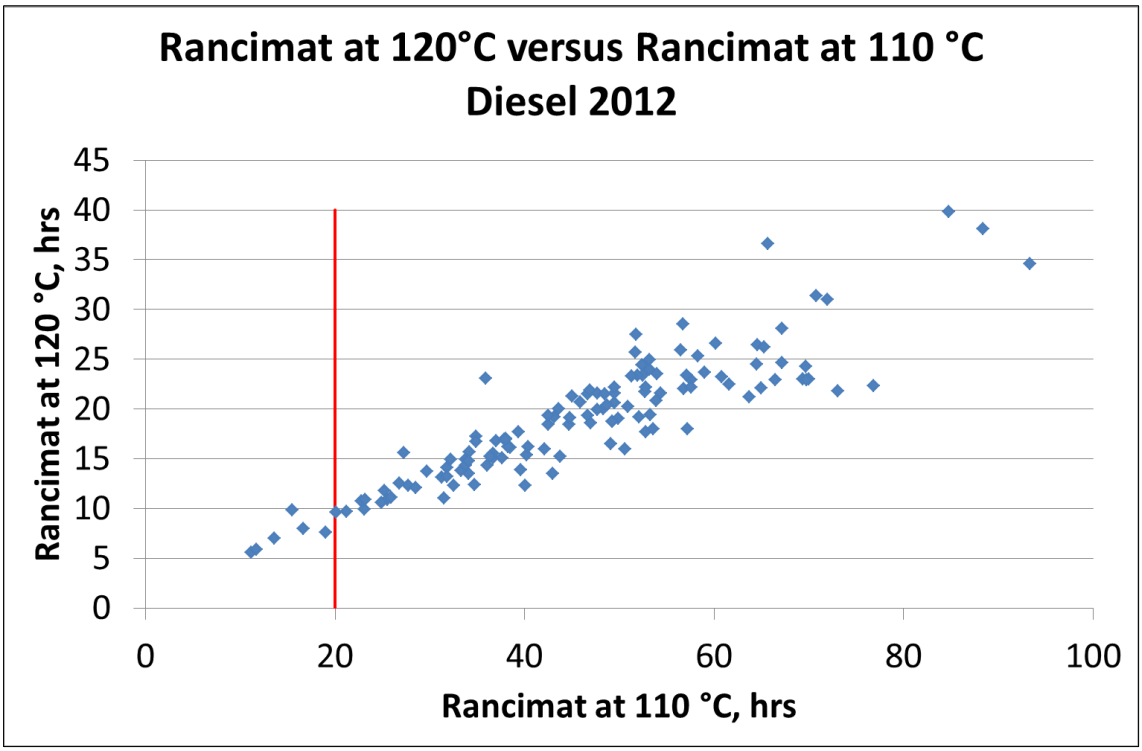


Figure 25. Rancimat run at 120 °C vs Rancimat at 110 °C in diesel in 2012



Another test method which has been developed is the PetroOxy test. In 2010 and 2012 this was included in the market surveys and **Figures 26** and **27** show the results. On average the results for 2012 were lower than 2010 which reflects the Rancimat results shown earlier where the averages were closer to the specification value. The overall average PetroOxy result in 2012 was 84 mins whereas the overall average result for 2010 was 94 mins. **Figure 28** shows how the PetroOxy results from the 2012 market survey correlate with the Rancimat at 110 °C. Although there was a broad correlation, the Rancimat PetroOxy correlation showed quite a spread of results and this has been further investigated in work by Concawe which will be published at a later date. The majority of samples tested were more stable than the Rancimat specification of 20 hrs and beyond 30 hours the spread of the results increased.

Figure 26. PetroOxy run at 140 °C in diesel in 2010

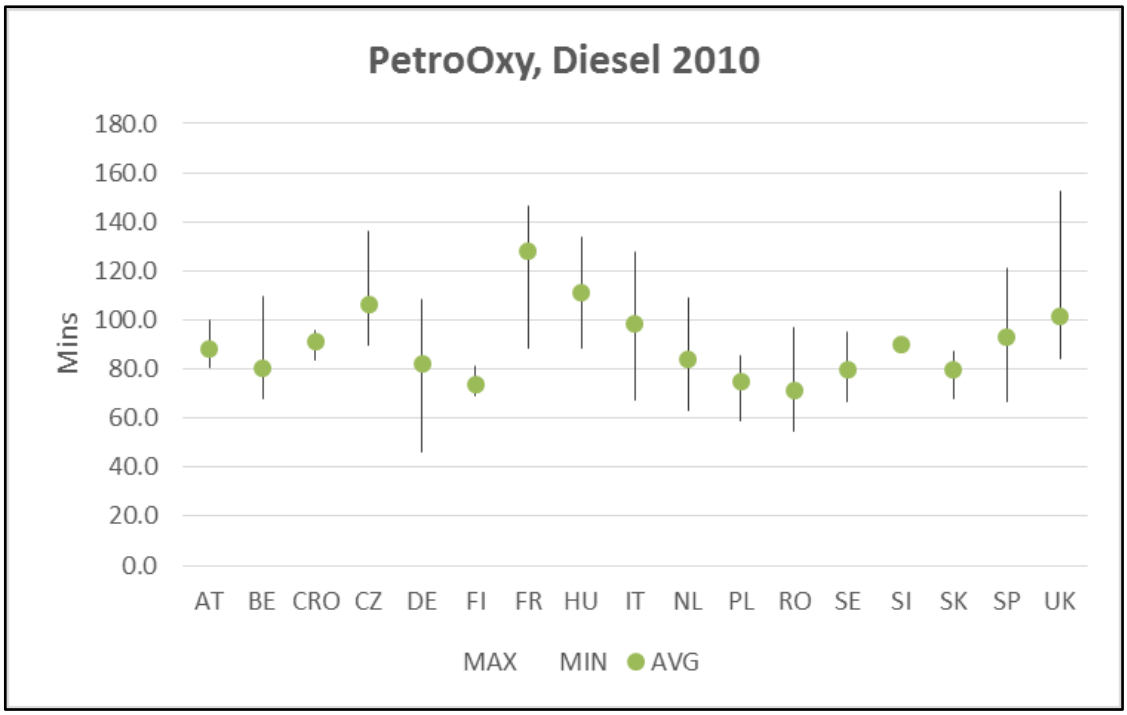


Figure 27. PetroOxy run at 140 °C in diesel in 2012

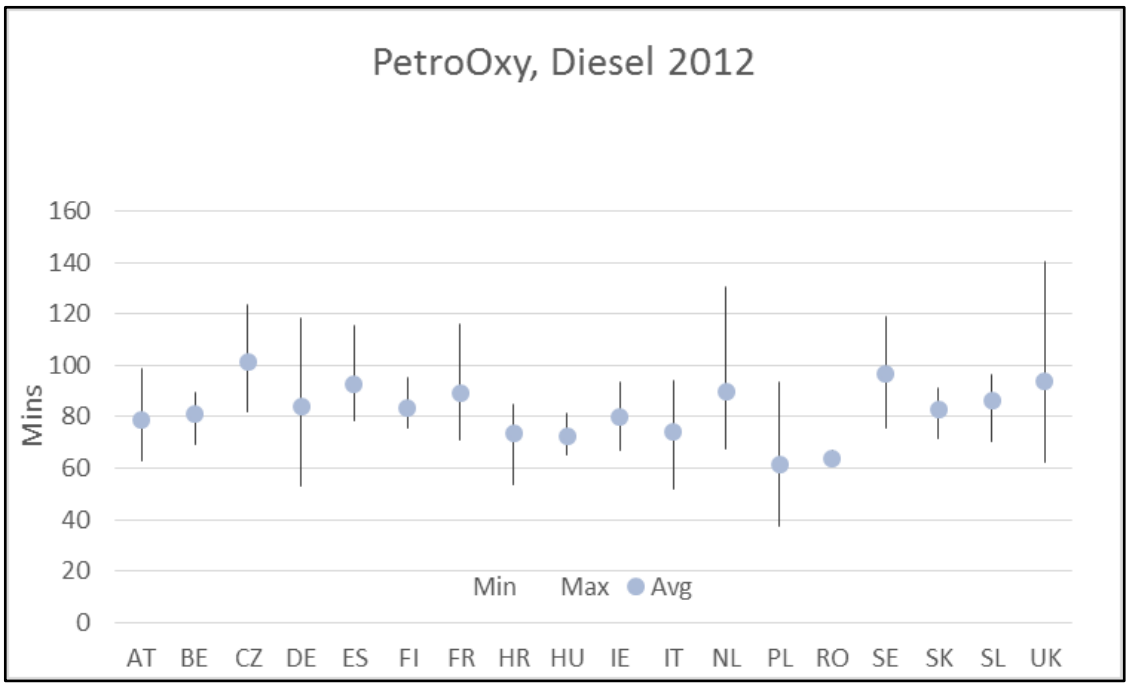
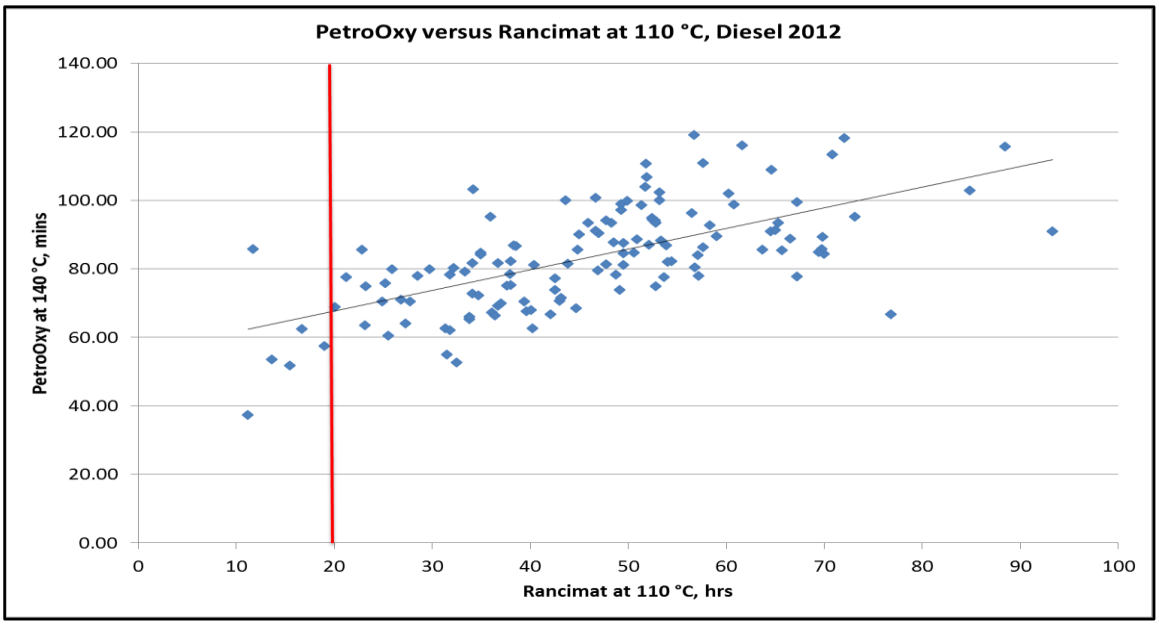


Figure 28. PetroOxy at 140 °C versus Rancimat at 110 °C on diesel in 2012



The Peroxide value is another oxidation stability test method which has been used to give an indication of stability and this test was carried out on samples from 2010 only. The results can be seen in **Figure 29.** Although there is no specification for this test, for a stable fuel the results would be expected to be very low and in the majority of cases they are with only samples from Finland and Poland giving individual results which were higher than would be expected. In 2010 the Delta TAN test was also carried out on samples and results are shown in **Figure 30**. On average the results were very low and again since there is no specification for this test no other conclusions can be made.

Figure 29. Peroxide value of diesel in 2010

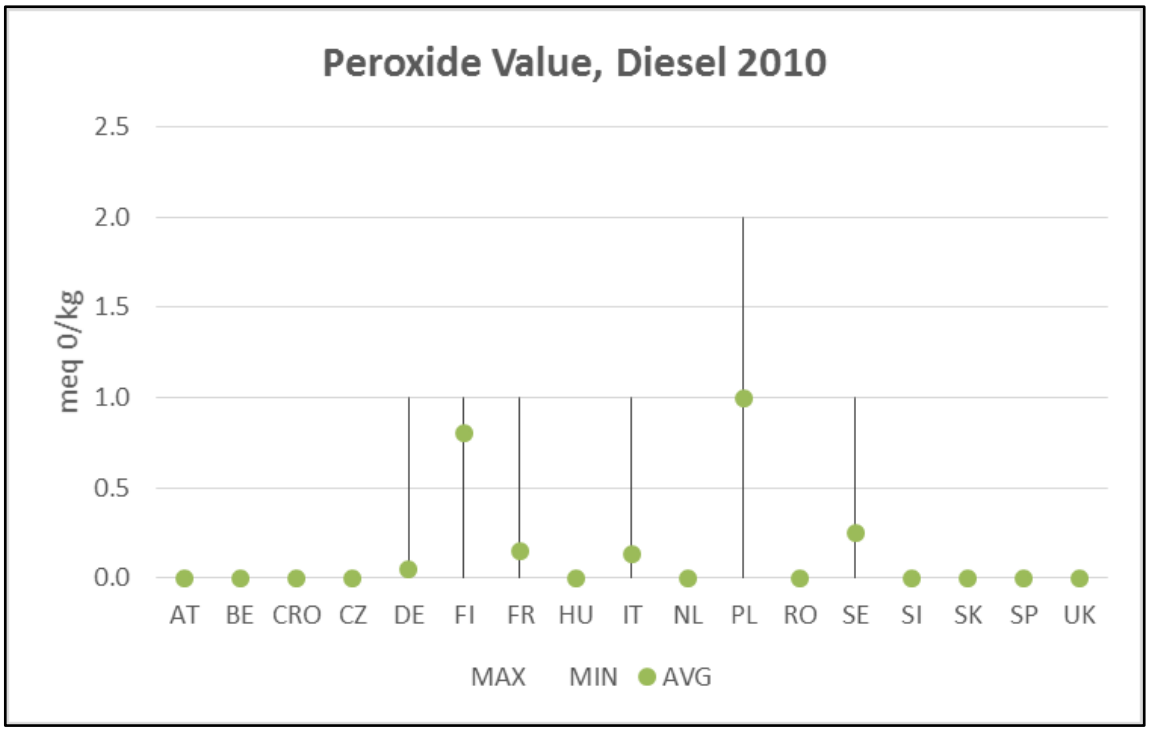
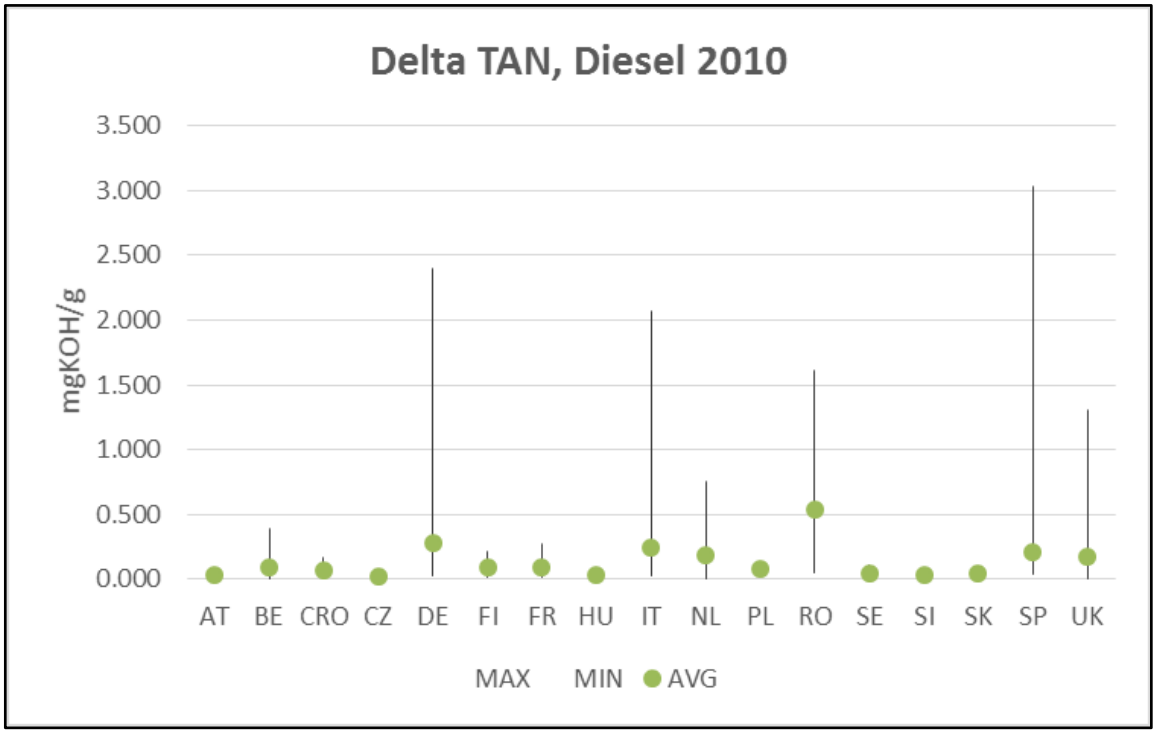


Figure 30. Delta TAN value of diesel in 2010



4. CONCLUSIONS

The main conclusion from these surveys from 2008 - 2012 are that for the years where samples were collected, by and large, fuels in Europe appear to be meeting the fuel standards and the quality appears to be on the whole consistently good.

Specific observations which were made were as follows:

Gasoline

- Comparison of the metal content in gasoline is difficult due to the different test methods used in different years and also different countries were tested in 2008 and 2010. Overall, metals levels in gasoline in 2008 were low at less than 25 ppb on average apart from the Zn which was thought to be due to contamination from some containers.

- ETBE was the most commonly used oxygenate followed by ethanol in 2010 with smaller amounts of MTBE, TAME and methanol in the samples tested.

- A few samples contained very low levels of tertiary butanol and tertiary amyl alcohol.

- Average high boiling fractions in gasoline are below 1% for all countries tested, with an average FAME contamination by country below 0,05%.

Diesel

- There appeared to be an increase in the average metals content reported between 2008 and 2010 although there were only six countries whose fuels were tested in both 2008 and 2010 and overall levels were low (generally under 50 ppb).

- No major differences were detected between samples from different countries for most dissolved metals.

- The average FAME content was 4.4% in 2010 and 5.1% in 2012.

- The average EHN content was 531mg/kg in 2010 and 476mg/kg in 2012.

- There was a good correlation between the Rancimat tests at 110 and 120^{o}C although there was a larger spread of results between the PetroOxy and Rancimat tests at 110^{o}C

5. GLOSSARY

AES	Atomic emission spectrometry
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
E70	Amount (%) which is evaporated at 70^{o}C
E100	Amount (%) which is evaporated at 100^{o}C
E150	Amount (%) which is evaporated at 150^{o}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-AES	Inductively coupled plasma-atomic emission spectrometry
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
TAN	Total Acid Number

6. ACKNOWLEDGEMENTS

Concawe and FE/STF-24 would like to acknowledge the contribution to this report of our colleague, Theo Tweekel of Kuwait Petroleum International (KPI) who sadly passed away in 2013.

We would also like to acknowledge the contributions of:

- DGMK who joined with Concawe for the 2010 diesel survey.
- ASG Analytik Service GmbH, (Germany) in carrying out testing for all three surveys described in this report.
- TNO (The Netherlands, www.TNO.nl) who carried out metals analysis for the 2008 survey.

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APPENDIX: SURVEY DATA PER COUNTRY

CONCAWE Gasoline survey 2010
Country: Austria
Measured properties: elemental analysis

	Austria	2010			
	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	5	<5	<5	<5	5
Al	5	<5	<5	<5	5
Ba	5	<5	<5	<5	5
Ca	5	<5	<5	<5	5
Cd	5	<5	<5	<5	5
Cr	5	<5	<5	<5	5
Cu	5	<5	<5	<5	5
Fe	5	<5	<5	<5	5
K	5	<5	<5	<5	5
Mg	5	<5	<5	<5	5
Mn	5	<5	<5	<5	5
Mo	5	<5	<5	<5	5
Na	5	<5	<5	<5	5
Ni	5	<5	<5	<5	5
P	5	<5	<5	<5	5
Pb	5	<5	<5	<5	5
Sn	5	<5	<5	<5	5
Si	5	<5	<5	<5	5
Ti	5	<5	<5	<5	5
V	5	<5	<5	<5	5
Zn	5	<5	<5	<5	5

CONCAWE Gasoline survey 2010
Country: Austria
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Austria	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		5	28.2	29.6	28.9	0
5		°C		5	37.1	44.7	42.0	0
10		°C		5	42.7	50.9	47.4	0
20		°C		5	49.6	60.9	55.1	0
30		°C		5	55.2	71.1	62.8	0
40		°C		5	65.8	82.5	73.1	0
50		°C		5	84.1	95.1	88.6	0
60		°C		5	98.0	109.7	104.8	0
70		°C		5	116.3	127.8	122.0	0
80		°C		5	135.2	147.3	140.5	0
90		°C		5	151.0	169.2	159.6	0
95		°C		5	168.6	186.9	175.4	0
FBP		°C	Max. 210	5	187.4	208.2	195.5	0
Residue		ml	Max. 2	5	1.0	1.1	1.0	0
E 70		% v/v	22 - 50	5	30.2	44.1	37.4	0
E 100		% v/v	46 - 71	5	54.9	62.8	58.3	0
E 150		% v/v	Min. 75	5	82.8	90.6	86.7	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	5	0.25	10.98	6.26	0
Ethanol		% v/v	Max. 5	5	0.18	5.14	2.06	0
Methanol		% v/v	Max. 3	5	<0.01	<0.01	<0.01	5
MTBE		% v/v	Max. 15	5	0.18	0.71	0.43	0
TAME		% v/v	Max. 15	5	0.07	0.20	0.13	0
tert-Butanol		% v/v	Max. 7	5	0.09	0.14	0.12	0
tert. Amylalk.		% v/v	Max. 10	5	<0.01	<0.01	<0.01	5
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	5	1.73	1.95	1.85	0
High boiling Fraction		% m/m		5	0.58	1.16	0.72	0
FAME fraction		% m/m		5	0.01	0.09	0.03	0

CONCAWE Diesel survey 2010
Country: Austria
Measured properties: elemental analysis

	Austria	2010			
	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	5	<5	<5	<5	5
Al	5	<20	<20	<20	5
B	5	<5	<5	<5	5
Ba	5	<5	<5	<5	5
Ca	5	<20	48	29	2
Ce	5	<5	<5	<5	5
Co	5	<5	20	8	2
Cr	5	<5	<5	<5	5
Cu	5	<5	47	16	1
Fe	5	9	52	19	0
K	5	6	28	13	0
Mg	5	<20	25	21	4
Mn	5	<5	7	5	2
Mo	5	<5	<5	<5	5
Na	5	<20	125	55	1
Ni	5	<5	7	5	4
Pb	5	<5	11	6	4
Sn	5	<5	14	7	4
Si	5	<500	880	576	4
Ti	5	<5	<5	<5	5
Zn	5	16	83	56	0

CONCAWE Diesel survey 2010 and 2012
Country: Austria
Measured properties: Density, FAME content, oxidation stability and EHN content

				Austria	2010			Austria	2012			
				n	Min.	Max.	Average	n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	5	835.6	843.9	838.5	0
FAME content	EN 14078	% v/v	Max. 7	5	6.2	6.7	6.5	5	6.5	6.7	6.6	0
Rancimat at 110°C	EN 15751	h	Min. 20	5	43.8	71.7	55.0	5	40.1	51.3	44.2	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	5	12.3	23.3	17.9	0
PetroOxy	prEN 16091	h		5	1.3433	1.6700	1.4684	5	1.0458	1.6439	1.3142	0
Peroxid value	ISO 3960:2007	meq O/kg		5	<1	<1	<1	-	-	-	-	5
Delta Tan 2010	2010 method	mg KOH/g		5	0.021	0.045	0.030	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		5	338	878	531	5	124	920	634	0

CONCAWE Gasoline survey 2010
Country: Belgium
Measured properties: elemental analysis

	Belgium	2010			
Property	n	Min.	Max.	Average	No. below detection limit
			ICP-AES		
Elements		mg/kg	mg/kg	mg/kg	
Ag	10	<0.5	<0.5	<0.5	10
Al	10	<0.5	<0.5	<0.5	10
Ba	10	<0.5	<0.5	<0.5	10
Ca	10	<0.5	<0.5	<0.5	10
Cd	10	<0.5	<0.5	<0.5	10
Cr	10	<0.5	<0.5	<0.5	10
Cu	10	<0.5	<0.5	<0.5	10
Fe	10	<0.5	<0.5	<0.5	10
K	10	<0.5	<0.5	<0.5	10
Mg	10	<0.5	<0.5	<0.5	10
Mn	10	<0.5	<0.5	<0.5	10
Mo	10	<0.5	<0.5	<0.5	10
Na	10	<0.5	<0.5	<0.5	10
Ni	10	<0.5	<0.5	<0.5	10
P	10	<0.5	<0.5	<0.5	10
Pb	10	<0.5	<0.5	<0.5	10
Si	10	<0.5	<0.5	<0.5	10
Sn	10	<0.5	<0.5	<0.5	10
Ti	10	<0.5	<0.5	<0.5	10
V	10	<0.5	<0.5	<0.5	10
Zn	10	<0.5	<0.5	<0.5	10

CONCAWE Gasoline survey 2010
Country: Belgium
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Belgium	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		10	24.2	27.4	25.9	0
5		°C		10	35.8	41.1	38.6	0
10		°C		10	41.1	47.5	44.0	0
20		°C		10	51.0	60.5	54.2	0
30		°C		10	58.6	74.1	64.6	0
40		°C		10	71.9	85.0	78.0	0
50		°C		10	87.0	98.8	93.1	0
60		°C		10	96.2	114.6	105.5	0
70		°C		10	107.0	129.9	117.8	0
80		°C		10	122.7	150.9	135.2	0
90		°C		10	157.0	166.0	161.8	0
95		°C		10	175.4	194.7	183.9	0
FBP		°C	Max. 210	10	182.2	194.7	189.0	0
Residue		ml	Max. 2	10	1.0	1.1	1.1	0
E 70		% v/v	22 - 50	10	30.6	43.0	37.3	0
E 100		% v/v	46 - 71	10	53.4	66.8	59.3	0
E 150		% v/v	Min. 75	10	82.4	91.8	88.1	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	10	0.40	11.40	5.45	0
Ethanol		% v/v	Max. 5	10	0.05	5.01	2.46	0
Methanol		% v/v	Max. 3	10	<0.01	<0.01	<0.01	10
MTBE		% v/v	Max. 15	10	0.09	7.86	2.67	0
TAME		% v/v	Max. 15	10	<0.01	0.07	0.03	2
tert-Butanol		% v/v	Max. 7	10	<0.01	0.08	0.06	4
tert. Amylalk.		% v/v	Max. 10	10	<0.01	<0.01	<0.01	10
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	10	1.43	2.62	2.13	0
High boiling Fraction		% m/m		10	0.26	0.83	0.60	0
FAME fraction		% m/m		10	<0.01	0.02	0.02	7

CONCAWE Diesel survey 2010
Country: Belgium
Measured properties: elemental analysis

	Belgium	2010			
	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	10	<5	<5	<5	10
Al	10	<20	<20	<20	10
B	10	<5	<5	<5	10
Ba	10	<5	<5	<5	10
Ca	10	<20	36	22	8
Ce	10	<5	<5	<5	10
Co	10	<5	<5	<5	10
Cr	10	<5	<5	<5	10
Cu	10	<5	75	18	6
Fe	10	<5	74	27	2
K	10	5	21	8	0
Mg	10	<20	<20	<20	10
Mn	10	<5	<5	<5	10
Mo	10	<5	<5	<5	10
Na	10	<20	87	42	2
Ni	10	<5	<5	<5	10
Pb	10	<5	<5	<5	10
Sn	10	<5	48	20	1
Si	10	<500	1050	652	4
Ti	10	<5	<5	<5	10
Zn	10	13	95	37	0

CONCAWE Diesel survey 2010 and 2012
Country: Belgium
Measured properties: Density, FAME content, oxidation stability and EHN content

				Belgium	2010			Belgium	2012			
				n	Min.	Max.	Average	n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	10	834.2	839.1	837.2	0
FAME content	EN 14078	% v/v	Max. 7	10	2.0	4.9	3.5	10	3.1	6.4	5.1	0
Rancimat at 110°C	EN 15751	h	Min. 20	8	26.9	65.0	38.1	10	36.7	69.8	58.5	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	10	15.5	24.3	19.8	0
PetroOxy	prEN 16091	h		10	1.1300	1.8294	1.3407	10	1.1556	1.4911	1.3516	0
Peroxid value	ISO 3960:2007	meq O/kg		10	<1	<1	<1	-	-	-	-	10
Delta Tan 2010	2010 method	mg KOH/g		10	0.008	0.388	0.094	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		10	270	1270	639	10	1026	1248	1178	0

CONCAWE Gasoline survey 2010
Country: Croatia
Measured properties: elemental analysis

	Croatia	2010			
Property	n	Min.	Max.	Average	No. below detection limit
			ICP-AES		
Elements		mg/kg	mg/kg	mg/kg	
Ag	2	<0.5	<0.5	<0.5	2
Al	2	<0.5	<0.5	<0.5	2
Ba	2	<0.5	<0.5	<0.5	2
Ca	2	<0.5	<0.5	<0.5	2
Cd	2	<0.5	<0.5	<0.5	2
Cr	2	<0.5	<0.5	<0.5	2
Cu	2	<0.5	<0.5	<0.5	2
Fe	2	<0.5	<0.5	<0.5	2
K	2	<0.5	<0.5	<0.5	2
Mg	2	<0.5	<0.5	<0.5	2
Mn	2	<0.5	5.6	3.1	1
Mo	2	<0.5	<0.5	<0.5	2
Na	2	<0.5	<0.5	<0.5	2
Ni	2	<0.5	<0.5	<0.5	2
P	2	<0.5	<0.5	<0.5	2
Pb	2	<0.5	<0.5	<0.5	2
Si	2	<0.5	<0.5	<0.5	2
Sn	2	<0.5	<0.5	<0.5	2
Ti	2	<0.5	<0.5	<0.5	2
V	2	<0.5	<0.5	<0.5	2
Zn	2	<0.5	<0.5	<0.5	2

CONCAWE Gasoline survey 2010
Country: Croatia
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Croatia	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		2	28.1	30.5	29.3	0
5		°C		2	41.0	43.6	42.3	0
10		°C		2	46.6	49.2	47.9	0
20		°C		2	56.2	57.9	57.1	0
30		°C		2	66.2	66.9	66.6	0
40		°C		2	77.3	78.3	77.8	0
50		°C		2	90.0	94.3	92.2	0
60		°C		2	104.3	114.4	109.4	0
70		°C		2	120.5	130.9	125.7	0
80		°C		2	136.5	145.9	141.2	0
90		°C		2	156.7	165.0	160.9	0
95		°C		2	176.9	185.2	181.1	0
FBP		°C	Max. 210	2	194.4	194.6	194.5	0
Residue		ml	Max. 2	2	1.0	1.0	1.0	0
E 70		% v/v	22 - 50	2	35.5	35.6	35.6	0
E 100		% v/v	46 - 71	2	55.6	58.9	57.3	0
E 150		% v/v	Min. 75	2	85.2	88.8	87.0	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	2	<0.01	7.94	3.98	1
Ethanol		% v/v	Max. 5	2	<0.01	0.14	0.08	1
Methanol		% v/v	Max. 3	2	<0.01	<0.01	<0.01	2
MTBE		% v/v	Max. 15	2	1.43	6.73	4.08	0
TAME		% v/v	Max. 15	2	0.02	0.14	0.08	0
tert-Butanol		% v/v	Max. 7	2	<0.01	0.09	0.05	1
tert. Amylalk.		% v/v	Max. 10	2	<0.01	<0.01	<0.01	2
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	2	1.22	1.62	1.42	0
High boiling Fraction		% m/m		2	0.37	0.54	0.46	0
FAME fraction		% m/m		2	<0.01	0.01	0.01	1

CONCAWE Diesel survey 2010
Country: Croatia
Measured properties: elemental analysis

	Croatia	2010			
	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	4	<5	<5	<5	4
Al	4	<20	<20	<20	4
B	4	<5	<5	<5	4
Ba	4	<5	<5	<5	4
Ca	4	<20	69	36	1
Ce	4	<5	<5	<5	4
Co	4	<5	<5	<5	4
Cr	4	<5	<5	<5	4
Cu	4	<5	12	7	3
Fe	4	7	45	23	4
K	4	<5	12	7	3
Mg	4	<20	<20	<20	4
Mn	4	<5	11	7	2
Mo	4	<5	<5	<5	4
Na	4	<20	91	38	3
Ni	4	<5	<5	<5	4
Pb	4	<5	8	6	3
Sn	4	<5	21	10	1
Si	4	<500	<500	<500	4
Ti	4	<5	<5	<5	4
Zn	4	18	45	35	0

CONCAWE Diesel survey 2010 and 2012
Country: Croatia
Measured properties: Density, FAME content, oxidation stability and EHN content

					2010				2012			
				n	Min.	Max.	Average	n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m³	820 - 845	-	-	-	-	5	832.9	838.9	835.7	0
FAME content	EN 14078	% v/v	Max. 7	4	0.1	0.1	0.1	5	<0.1	5.1	2.1	3
Rancimat at 110°C	EN 15751	h	Min. 20	4	24.0	59.0	45.7	2	13.6	26.8	20.2	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	2	7.0	12.5	9.8	0
PetroOxy	prEN 16091	h		4	1.3914	1.5997	1.5218	5	0.8944	1.4100	1.2281	0
Peroxid value	ISO 3960:2007	meq O/kg		4	<1	<1	<1	-	-	-	-	4
Delta Tan 2010	2010 method	mg KOH/g		4	0.020	0.166	0.068	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		4	250	680	403	5	59	873	309	0

CONCAWE Gasoline survey 2010
Country: Czech Republic
Measured properties: elemental analysis

	Czech Republic	2010			
Property	n	Min.	Max.	Average	No. below detection limit
			ICP-AES		
Elements		mg/kg	mg/kg	mg/kg	
Ag	3	<0.5	<0.5	<0.5	3
Al	3	<0.5	<0.5	<0.5	3
Ba	3	<0.5	<0.5	<0.5	3
Ca	3	<0.5	<0.5	<0.5	3
Cd	3	<0.5	<0.5	<0.5	3
Cr	3	<0.5	<0.5	<0.5	3
Cu	3	<0.5	<0.5	<0.5	3
Fe	3	<0.5	<0.5	<0.5	3
K	3	<0.5	<0.5	<0.5	3
Mg	3	<0.5	<0.5	<0.5	3
Mn	3	<0.5	<0.5	<0.5	3
Mo	3	<0.5	<0.5	<0.5	3
Na	3	<0.5	<0.5	<0.5	3
Ni	3	<0.5	<0.5	<0.5	3
P	3	<0.5	<0.5	<0.5	3
Pb	3	<0.5	<0.5	<0.5	3
Si	3	<0.5	<0.5	<0.5	3
Sn	3	<0.5	<0.5	<0.5	3
Ti	3	<0.5	<0.5	<0.5	3
V	3	<0.5	<0.5	<0.5	3
Zn	3	<0.5	<0.5	<0.5	3

CONCAWE Gasoline survey 2010
Country: Czech Republic
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Czech Republic	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		3	26.2	28.4	27.0	0
5		°C		3	38.7	44.1	40.7	0
10		°C		3	43.7	49.0	45.9	0
20		°C		3	53.8	56.1	54.7	0
30		°C		3	62.8	66.1	64.3	0
40		°C		3	80.1	84.6	82.4	0
50		°C		3	95.5	104.9	101.5	0
60		°C		3	111.5	123.1	118.2	0
70		°C		3	128.5	139.6	134.5	0
80		°C		3	144.4	155.8	151.1	0
90		°C		3	166.7	178.2	172.6	0
95		°C		3	180.2	192.5	186.5	0
FBP		°C	Max. 210	3	196.3	205.0	201.7	0
Residue		ml	Max. 2	3	1.1	1.1	1.1	0
E 70		% v/v	22 - 50	3	35.6	39.2	37.1	0
E 100		% v/v	46 - 71	3	50.3	55.8	52.6	0
E 150		% v/v	Min. 75	3	80.7	86.0	82.5	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	3	1.76	6.90	4.12	0
Ethanol		% v/v	Max. 5	3	1.83	4.58	3.64	0
Methanol		% v/v	Max. 3	3	<0.01	0.05	0.02	2
MTBE		% v/v	Max. 15	3	1.11	1.55	1.36	0
TAME		% v/v	Max. 15	3	0.12	0.27	0.20	0
tert-Butanol		% v/v	Max. 7	3	0.02	0.09	0.05	0
tert. Amylalk.		% v/v	Max. 10	3	<0.01	<0.01	<0.01	0
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	3	2.01	2.62	2.29	0
High boiling Fraction		% m/m		3	0.71	1.05	0.93	0
FAME fraction		% m/m		3	0.01	0.01	0.01	0

CONCAWE Diesel survey 2010
Country: Czech Republic
Measured properties: elemental analysis

	Czech Republic	2010			
	n	Min.	Max.	Average	No. Below detection limit
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	3	<5	<5	<5	3
Al	3	<20	<20	<20	3
B	3	<5	<5	<5	3
Ba	3	<5	<5	<5	3
Ca	3	<20	55	32	2
Ce	3	<5	<5	<5	3
Co	3	<5	<5	<5	3
Cr	3	<5	<5	<5	3
Cu	3	8	15	12	0
Fe	3	10	88	37	0
K	3	9	26	15	0
Mg	3	<20	<20	<20	3
Mn	3	<5	<5	<5	3
Mo	3	<5	<5	<5	3
Na	3	<20	21	20	2
Ni	3	<5	<5	<5	3
Pb	3	<5	<5	<5	3
Sn	3	<5	<5	<5	3
Si	3	<500	<500	<500	3
Ti	3	<5	<5	<5	3
Zn	3	<5	19	13	1

CONCAWE Diesel survey 2010 and 2012
Country: Czech Republic
Measured properties: Density, FAME content, oxidation stability and EHN content

				Czech	2010			Czech	2012			
				n	Min.	Max.	Average	n	Min.	Max.	Average	No. below limit of detection
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	5	831.7	842.9	838.3	0
FAME content	EN 14078	% v/v	Max. 7	3	0.4	4.5	1.9	5	1.2	5.4	3.7	0
Rancimat at 110°C	EN 15751	h	Min. 20	1	71.6	71.6	71.6	4	53.2	66.5	59.7	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	4	21.6	26.4	23.7	0
PetroOxy	prEN 16091	h		3	1.4928	2.2708	1.7694	5	1.3700	2.0567	1.6860	0
Peroxid value	ISO 3960: 2007	meq O/kg		3	<1	<1	<1	-	-	-	-	3
Delta Tan 2010	2010 method	mg KOH/g		3	0.020	0.025	0.023	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		3	348	683	504	5	167	745	363	0

CONCAWE Gasoline survey 2008
Country: Finland
Measured properties: elemental analysis

	Finland	2008			
Property	n	Min.	Max.	Average	No. below 0.01ppb
			ICP-MS		
Elements		µg/kg	µg/kg	µg/kg	
Ag	5	0.12	0.41	0.21	0
Al	5	0.33	0.63	0.51	0
As	5	0.09	0.20	0.14	0
Au	5	0.00	0.00	0.00	5
B	5	1.23	4.35	2.98	0
Ba	5	0.01	0.06	0.04	0
Ca	5	1.00	1.52	1.24	0
Cd	5	0.89	3.21	1.66	0
Ce	5	0.00	0.00	0.00	5
Cr	5	2.66	7.26	4.20	0
Cu	5	12.12	17.99	14.69	0
Fe	5	3.14	9.68	5.72	0
Hg	5	15.70	34.75	25.82	0
K	5	1.09	67.95	24.91	0
Mg	5	1.78	11.05	6.86	0
Mn	5	0.38	2.30	1.17	0
Mo	5	0.04	0.11	0.06	0
Na	5	2.52	116.33	39.20	0
Ni	5	3.94	5.07	4.19	0
Pb	5	5.52	8.73	7.34	0
Pt	5	0.00	0.00	0.00	5
Se	5	0.14	0.24	0.20	0
Sn	5	0.24	1.72	0.77	0
Ti	5	0.12	0.50	0.27	0
V	5	0.07	0.39	0.23	0
Zn	5	651.45	1666.11	1114.57	0

CONCAWE Diesel survey 2008
Country: Finland
Measured properties: elemental analysis

	Finland	2008			
	n	Min.	Max.	Average	No. below 0.01ppb
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	5	0.00	0.00	0.00	5
Al	5	0.00	0.00	0.00	5
As	5	0.00	0.00	0.00	5
Au	5	0.00	0.00	0.00	5
4B	5	0.00	1.83	0.70	1
Ba	5	0.00	0.00	0.00	5
Ca	5	0.00	0.00	0.00	5
Cd	5	0.00	0.00	0.00	5
Ce	5	0.00	0.01	0.00	4
Cr	5	0.29	45.57	16.50	0
Cu	5	0.00	98.59	21.43	4
Fe	5	0.28	64.70	23.56	0
Hg	5	2.16	12.60	4.54	0
K	5	0.00	20.01	8.27	1
Mg	5	0.93	7.26	2.94	0
Mn	5	0.00	0.45	0.09	1
Mo	5	0.00	0.00	0.00	5
Na	5	1.56	42.74	18.37	0
Ni	5	0.00	0.00	0.00	5
Pb	5	0.00	3.69	0.74	1
Pt	5	0.30	3.79	1.19	0
Se	5	0.00	0.00	0.00	5
Sn	5	0.00	0.00	0.00	5
Ti	5	0.00	0.00	0.00	5
V	5	0.00	0.00	0.00	5
Zn	5	0.31	8.78	5.12	0

CONCAWE Diesel survey 2010 and 2012
Country: Finland
Measured properties: Density, FAME content, oxidation stability and EHN content

				Finland	2010			
				n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.					
FAME content	EN 14078	% v/v	Max. 7	5	<0.1	<0.1	<0.1	5
Rancimat at 110°C	EN 15751	h	Min. 20	5	28.1	`82.4	44.3	0
PetroOxy at 140°C	prEN 16091	h		5	69.3	81.0	73.7	0
EHN content	EN ISO 13759	mg/kg		5	36.	1084.	617	0
Peroxide value	ISO 3960: 2007	meq O/kg		5	<1	1	<1	1
Delta Tan 2010	2010 method	mg KOH/g		5	0.010	0.210	0.092	0
				Finland	2012			
				n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.					
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	5	831.0	838.6	834.8	0
FAME content	EN 14078	% v/v	Max. 7	5	0.1	4.5	1.0	0
Rancimat at 110°C	EN 15751	h	Min. 20	1	38.0	38.0	38.0	0
Rancimat at 120°C	analog DIN EN 15751	h		1	17.0	17.0	17.0	0
PetroOxy at140°C	prEN 16091	h		5	1.2561	1.5850	1.3859	0
EHN content	EN ISO 13759	mg/kg		5	30	74	56	0

CONCAWE Gasoline survey 2008 and 2010
Country: France
Measured properties: elemental analysis

	France	2008					2010			
Property	n	Min.	Max.	Average	No. below 0.01 ppb	n	Min.	Max.	Average	No. below detection limit
			ICP-MS					ICP-AES		
Elements		µg/kg	µg/kg	µg/kg			mg/kg	mg/kg	mg/kg	
Ag	10	0.01	0.07	0.04	0	10	<0.5	<0.5	<0.5	10
Al	10	0.02	0.72	0.27	0	10	<0.5	<0.5	<0.5	10
As	10	0.04	0.31	0.21	0	-	-	-	-	0
Au	10	0.00	0.00	0.00	10	-	-	-	-	0
B	10	4.12	30.66	10.34	0	-	-	-	-	0
Ba	10	0.00	0.16	0.03	3	10	<0.5	<0.5	<0.5	10
Ca	10	1.43	5.23	3.08	0	10	<0.5	<0.5	<0.5	10
Cd	10	0.04	3.20	0.68	0	10	<0.5	<0.5	<0.5	10
Ce	10	0	0	0	10	-	-	-	-	0
Cr	10	0.04	11.74	4.32	0	10	<0.5	<0.5	<0.5	10
Cu	10	0.48	31.07	6.36	0	10	<0.5	<0.5	<0.5	10
Fe	10	0.05	17.03	6.07	0	10	<0.5	1.2	0.6	8
Hg	10	1.07	31.80	15.58	0	-	-	-	-	0
K	10	1.04	9.39	4.67	0	10	<0.5	<0.5	<0.5	10
Mg	10	0.46	4.88	2.84	0	10	<0.5	<0.5	<0.5	10
Mn	10	0.29	3.00	1.04	0	10	<0.5	<0.5	<0.5	10
Mo	10	0.01	0.09	0.06	0	10	<0.5	<0.5	<0.5	10
Na	10	0.39	85.64	30.38	0	10	<0.5	<0.5	<0.5	10
Ni	10	0.21	1.60	1.02	0	10	<0.5	<0.5	<0.5	10
P	-	-	-	-	-	10	<0.5	<0.5	<0.5	10
Pb	10	0.05	13.32	3.00	0	10	<0.5	<0.5	<0.5	10
Pt	10	0.00	0.00	0.00	10	-	-	-	-	0
Se	10	0.18	0.33	0.24	0	-	-	-	-	0
Si	-	-	-	-	-	10	<0.5	<0.5	<0.5	10
Sn	10	0.02	1.19	0.16	0	10	<0.5	<0.5	<0.5	10
Ti	10	0.31	0.97	0.61	10	10	<0.5	<0.5	<0.5	10
V	10	0.20	3.07	1.05	10	10	<0.5	<0.5	<0.5	10
Zn	10	0.04	717.23	77.93	10	10	<0.5	<0.5	<0.5	10

CONCAWE Gasoline survey 2010
Country: France
Measured properties: Distillation characteristics, oxygenates and high boiling components

				France	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		10	25.7	31.4	28.4	0
5		°C		10	39.5	44.2	41.4	0
10		°C		10	43.5	49.5	46.3	0
20		°C		10	50.0	57.6	54.1	0
30		°C		10	56.0	65.7	60.9	0
40		°C		10	61.4	76.3	67.6	0
50		°C		10	66.4	97.0	84.7	0
60		°C		10	87.6	111.1	101.2	0
70		°C		10	101.7	123.5	114.3	0
80		°C		10	119.1	138.6	129.5	0
90		°C		10	141.3	156.0	149.3	0
95		°C		10	158.2	175.2	169.8	0
FBP		°C	Max. 210	10	171.1	188.4	181.6	0
Residue		ml	Max. 2	10	0.9	1.0	1.0	0
E 70		% v/v	22 - 50	10	36.2	53.7	44.4	0
E 100		% v/v	46 - 71	10	54.1	70.8	61.1	0
E 150		% v/v	Min. 75	10	88.9	95.1	92.7	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	10	4.88	14.77	7.34	0
Ethanol		% v/v	Max. 5	10	0.22	7.97	5.91	0
Methanol		% v/v	Max. 3	10	<0.01	<0.01	<0.01	10
MTBE		% v/v	Max. 15	10	0.10	0.51	0.19	0
TAME		% v/v	Max. 15	10	0.02	1.60	0.23	0
tert-Butanol		% v/v	Max. 7	10	0.03	0.14	0.05	0
tert. Amylalk.		% v/v	Max. 10	10	<0.01	<0.01	<0.01	10
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	10	2.39	3.96	3.46	0
High boiling Fraction		% m/m		10	0.20	0.57	0.43	0
FAME fraction		% m/m		10	0.01	0.04	0.02	0

CONCAWE Diesel survey 2008 and 2010
Country: France
Measured properties: elemental analysis

	France	2008				France	2010			
	n	Min.	Max.	Average	No. below 0.01 ppb	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg			µg/kg	µg/kg	µg/kg	
			ICP-MS					ICP-MS		
Ag	20	0.00	0.00	0.00	20	20	<5	9	5	19
Al	20	0.00	0.08	0.00	19	20	<20	<20	<20	20
As	20	0.00	0.00	0.00	20	-	-	-	-	-
Au	20	0.00	0.00	0.00	20	-	-	-	-	-
B	20	0.00	1.07	0.13	19	20	<5	11	5	19
Ba	20	0.00	0.00	0.00	20	20	<5	8	5	19
Ca	20	0.00	1.38	0.34	19	20	<20	38	28	19
Cd	20	0.00	0.00	0.00	20	-	-	-	-	-
Ce	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
Co	-	-	-	-	-	20	<5	<5	<5	20
Cr	20	0.00	91.37	17.61	1	20	<5	<5	<5	20
Cu	20	0.00	7.00	1.53	1	20	<5	19	6	18
Fe	20	0.00	129.69	25.19	1	20	6	119	40	0
Hg	20	1.33	2.32	1.57	0	-	-	-	-	-
K	20	0.00	17.99	2.41	1	20	<5	16	7	7
Mg	20	0.80	134.65	27.96	0	20	<20	<20	<20	20
Mn	20	0.00	0.64	0.05	1	20	<5	<5	<5	20
Mo	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
Na	20	0.00	26.47	6.25	1	20	34	590	162	0
Ni	20	0.00	0.13	0.01	1	20	<5	<5	<5	20
Pb	20	0.00	0.01	0.00	19	20	<5	13	5	18
Pt	20	0.03	0.35	0.12	0	-	-	-	-	-
Se	20	0.00	0.00	0.00	20	-	-	-	-	-
Sn	20	0.00	12.18	1.78	19	20	<5	41	13	5
Si	-	-	-	-	-	20	<500	1040	819	1
Ti	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
V	20	0.00	0.00	0.00	20	-	-	-	-	-
Zn	20	1.08	40.12	10.10	0	20	9	78	26	0

CONCAWE Diesel survey 2010 and 2012
Country: France
Measured properties: Density, FAME content, oxidation stability and EHN content

				France	2010			France	2012			
				n	Min.	Max.	Av.	n	Min.	Max.	Av.	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	15	832.1	844.0	837.9	0
FAME content	EN 14078	% v/v	Max. 7	20	4.3	7.0	6.1	15	2.3	6.5	5.9	0
Rancimat at 110°C	EN 15751	h	Min. 20	20	46.1	86.9	63.1	15	34.1	73.1	51.2	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	15	12.4	22.5	18.4	0
PetroOxy	prEN 16091	h		20	1.4789	2.4364	2.1308	15	1.1783	1.9344	1.4907	0
Peroxide value	ISO 3960:2007	meq O/kg		20	<1	1	<1	-	-	-	-	17
Delta Tan 2010	2010 method	mg KOH/g		20	0.010	0.278	0.091	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		20	220	1190	502	15	132	1652	837	0

CONCAWE Gasoline survey 2008 and 2010
Country: Germany
Measured properties: elemental analysis

	Germany	2008				Germany	2010			
Property	n	Min.	Max.	Ave.	No. below 0.01ppb	n	Min.	Max.	Ave.	No. below detection limit
			ICP-MS					ICP-AES		
Elements		µg/kg	µg/kg	µg/kg			mg/kg	mg/kg	mg/kg	
Ag	10	0.01	0.18	0.08	0	11	<0.5	<0.5	<0.5	11
Al	10	0.07	0.40	0.26	0	11	<0.5	<0.5	<0.5	11
As	10	0.04	2.09	0.33	0	-	-	-	-	-
Au	10	0.00	0.00	0.00	10	-	-	-	-	-
B	10	5.13	18.90	12.19	0	-	-	-	-	-
Ba	10	0.00	0.03	0.01	2	11	<0.5	<0.5	<0.5	11
Ca	10	0.52	1.18	0.86	0	11	<0.5	<0.5	<0.5	11
Cd	10	0.00	0.92	0.22	0	11	<0.5	<0.5	<0.5	11
Ce	10	0.00	0.00	0.00	10	-	-	-	-	-
Cr	10	0.73	13.19	4.26	0	11	<0.5	<0.5	<0.5	11
Cu	10	0.03	2.80	1.07	0	11	<0.5	<0.5	<0.5	11
Fe	10	0.85	18.09	5.82	0	11	<0.5	<0.5	<0.5	11
Hg	10	3.10	19.64	6.86	0	-	-	-	-	-
K	10	1.06	16.52	5.03	0	11	<0.5	<0.5	<0.5	11
Mg	10	0.73	13.19	4.26	0	11	<0.5	<0.5	<0.5	11
Mn	10	0.01	2.49	0.92	0	11	<0.5	<0.5	<0.5	11
Mo	10	0.21	0.40	0.32	0	11	<0.5	<0.5	<0.5	11
Na	10	1.11	49.18	14.24	0	11	<0.5	<0.5	<0.5	11
Ni	10	0.01	0.70	0.32	0	11	<0.5	<0.5	<0.5	11
P	-	-	-	-	-	11	<0.5	<0.5	<0.5	11
Pb	10	0.05	0.39	0.27	0	11	<0.5	<0.5	<0.5	11
Pt	10	0.00	0.00	0.00	10	-	-	-	-	-
Se	10	0.03	0.18	0.12	0	-	-	-	-	-
Si	-	-	-	-	-	11	<0.5	0.8	0.5	9
Sn	10	0.01	0.26	0.10	0	11	<0.5	<0.5	<0.5	11
Ti	10	0.23	0.42	0.30	0	11	<0.5	<0.5	<0.5	11
V	10	1.40	15.43	6.10	0	11	<0.5	<0.5	<0.5	11
Zn	10	0.09	10.04	3.29	0	11	<0.5	<0.5	<0.5	11

CONCAWE Gasoline survey 2010
Country: Germany
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Germany	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		11	21.5	29.8	27.8	0
5		°C		11	39.8	43.2	41.2	0
10		°C		11	43.9	47.5	45.1	0
20		°C		11	50.4	53.2	51.5	0
30		°C		11	56.1	62.0	58.5	0
40		°C		11	66.1	78.6	70.0	0
50		°C		11	82.8	91.8	87.2	0
60		°C		11	98.1	109.0	103.4	0
70		°C		11	113.2	122.4	117.8	0
80		°C		11	125.1	140.4	132.7	0
90		°C		11	146.3	159.0	152.5	0
95		°C		11	163.0	181.7	173.3	0
FBP		°C	Max. 210	11	168.5	193.6	184.1	0
Residue		ml	Max. 2	11	1.0	1.0	1.0	0
E 70		% v/v	22 - 50	11	38.5	46.6	42.2	0
E 100		% v/v	46 - 71	11	57.5	62.5	60.5	0
E 150		% v/v	Min. 75	11	87.1	95.0	90.9	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	11	<0.01	2.52	0.60	1
Ethanol		% v/v	Max. 5	11	3.28	7.58	4.79	0
Methanol		% v/v	Max. 3	11	<0.01	0.07	0.02	10
MTBE		% v/v	Max. 15	11	<0.01	3.65	1.04	1
TAME		% v/v	Max. 15	11	0.01	0.58	0.10	0
tert-Butanol		% v/v	Max. 7	11	<0.01	<0.01	<0.01	11
tert. Amylalk.		% v/v	Max. 10	11	<0.01	<0.01	<0.01	11
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	11	1.44	3.06	2.11	0
High boiling Fraction		% m/m		11	0.3	0.5	0.4	0
FAME fraction		% m/m		11	0.0	0.1	0.0	3

CONCAWE Diesel survey 2008 and 2010
Country: Germany
Measured properties: elemental analysis

	Germany	2008				Germany	2010			
	n	Min.	Max.	Average	No. below 0.01ppb	n	Min.	Max.	Aver age	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg			µg/kg	µg/kg	µg/kg	
			ICP-MS					ICP-MS		
Ag	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
Al	20	0.00	0.00	0.00	20	20	<20	<20	<20	20
As	20	0.00	0.00	0.00	20	-	-	-	-	-
Au	20	0.00	0.00	0.00	20	-	-	-	-	-
B	20	0.00	3.21	0.77	4	20	<5	<5	<5	20
Ba	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
Ca	20	0.00	1.70	0.36	9	20	<20	200	46	12
Cd	20	0.00	0.00	0.00	20	-	-	-	-	-
Ce	20	0.00	0.01	0.00	19	20	<5	<5	<5	20
Co	-	-	-	-	-	20	<5	<5	<5	20
Cr	20	0.00	9.00	3.64	1	20	<5	<5	<5	20
Cu	20	0.00	36.99	5.26	3	20	<5	177	36	9
Fe	20	0.00	13.42	5.33	1	20	<5	64	15	5
Hg	20	1.31	2.42	1.44	0	-	-	-	-	-
K	20	0.00	25.61	4.60	2	20	<5	44	10	5
Mg	20	0.00	3.76	1.52	2	20	<20	200	29	19
Mn	20	0.00	0.95	0.08	19	20	<5	<5	<5	20
Mo	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
Na	20	2.96	54.30	18.37	0	20	<20	125	56	3
Ni	20	0.00	5.05	0.35	16	20	<5	<5	<5	20
Pb	20	0.00	7.99	0.68	16	20	<5	<5	<5	20
Pt	20	0.02	0.39	0.06	0	-	-	-	-	-
Se	20	0.00	0.00	0.00	20	-	-	-	-	-
Sn	20	0.00	6.13	1.47	11	20	<5	9	5	19
Si	-	-	-	-	-	20	<500	1400	705	9
Ti	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
V	20	0.00	0.00	0.00	20	-	-	-	-	-
Zn	20	0.51	129.63	17.43	0	20	<5	53	14	2

CONCAWE Diesel survey 2010 and 2012
Country: Germany
Measured properties: Density, FAME content, oxidation stability and EHN content

					2010				2012			
				n	Min.	Max.	Ave.	n	Min.	Max.	Ave.	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	30	833.3	841.7	837.0	0
FAME content	EN 14078	% v/v	Max. 7	20	0.1	6.8	5.4	30	<0.1	6.9	6.5	1
Rancimat at 110°C	EN 15751	h	Min. 20	17	14.2	76.6	48.8	29	25.9	72.0	46.3	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	29	11.1	36.6	20.6	0
PetroOxy	prEN 16091	h		20	0.7697	1.8089	1.3698	30	0.8797	1.9692	1.3980	0
Peroxid value	ISO 3960:2007	meq O/kg		20	<1	<1	<1	-	-	-	-	20
Delta Tan 2010	2010 method	mg KOH/g		20	0.028	2.400	0.279	-	-	-		0
EHN content	EN ISO 13759	mg/kg		20	45	1599	585	30	<20	1398	386	2

CONCAWE Gasoline survey 2010
Country: Hungary
Measured properties: elemental analysis

	Hungary	2010			
Property	n	Min.	Max.	Average	No. below detection limit
			ICP-AES		
Elements		mg/kg	mg/kg	mg/kg	
Ag	5	<0.5	<0.5	<0.5	5
Al	5	<0.5	<0.5	<0.5	5
Ba	5	<0.5	<0.5	<0.5	5
Ca	5	<0.5	<0.5	<0.5	5
Cd	5	<0.5	<0.5	<0.5	5
Cr	5	<0.5	<0.5	<0.5	5
Cu	5	<0.5	<0.5	<0.5	5
Fe	5	<0.5	<0.5	<0.5	5
K	5	<0.5	<0.5	<0.5	5
Mg	5	<0.5	<0.5	<0.5	5
Mn	5	<0.5	<0.5	<0.5	5
Mo	5	<0.5	<0.5	<0.5	5
Na	5	<0.5	<0.5	<0.5	5
Ni	5	<0.5	<0.5	<0.5	5
P	5	<0.5	<0.5	<0.5	5
Pb	5	<0.5	<0.5	<0.5	5
Si	5	<0.5	<0.5	<0.5	5
Sn	5	<0.5	<0.5	<0.5	5
Ti	5	<0.5	<0.5	<0.5	5
V	5	<0.5	<0.5	<0.5	5
Zn	5	<0.5	<0.5	<0.5	5

CONCAWE Gasoline survey 2010
Country: Hungary
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Hungary	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		5	29.1	34.4	31.3	0
5		°C		5	43.4	46.4	44.4	0
10		°C		5	48.3	50.4	49.0	0
20		°C		5	55.3	56.3	55.7	0
30		°C		5	62.2	66.1	63.7	0
40		°C		5	79.8	88.6	85.1	0
50		°C		5	98.9	107.0	103.8	0
60		°C		5	116.8	122.3	119.5	0
70		°C		5	133.8	138.0	135.2	0
80		°C		5	151.3	156.2	152.8	0
90		°C		5	171.1	180.9	173.8	0
95		°C		5	188.3	193.8	190.3	0
FBP		°C	Max. 210	5	199.2	209.6	202.5	0
Residue		ml	Max. 2	5	1.1	1.1	1.1	0
E 70		% v/v	22 - 50	5	35.7	37.5	36.4	0
E 100		% v/v	46 - 71	5	49.6	52.7	50.6	0
E 150		% v/v	Min. 75	5	80.9	82.0	81.4	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	5	0.04	0.31	0.21	0
Ethanol		% v/v	Max. 5	5	4.67	4.86	4.76	0
Methanol		% v/v	Max. 3	5	<0.01	<0.01	<0.01	5
MTBE		% v/v	Max. 15	5	0.86	1.67	1.30	0
TAME		% v/v	Max. 15	5	<0.01	2.57	0.52	3
tert-Butanol		% v/v	Max. 7	5	<0.01	<0.01	<0.01	5
tert. Amylalk.		% v/v	Max. 10	5	<0.01	0.03	0.01	4
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	5	1.95	2.37	2.11	0
High boiling Fraction		% m/m		5	0.42	1.00	0.61	0
FAME fraction		% m/m		5	<0.01	0.06	0.02	1

CONCAWE Diesel survey 2010
Country: Hungary
Measured properties: elemental analysis

	Hungary	2010			
	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	5	<5	<5	<5	5
Al	5	<20	<20	<20	5
B	5	<5	<5	<5	5
Ba	5	<5	<5	<5	5
Ca	5	<20	101	77	1
Ce	5	<5	<5	<5	5
Co	5	<5	<5	<5	5
Cr	5	<5	<5	<5	5
Cu	5	<5	12	7	3
Fe	5	15	97	55	0
K	5	6	83	63	0
Mg	5	<20	22	20	4
Mn	5	<5	5	5	4
Mo	5	<5	<5	<5	5
Na	5	<20	40	24	2
Ni	5	<5	<5	<5	5
Pb	5	<5	<5	<5	5
Sn	5	8	26	17	0
Si	5	<500	1100	620	4
Ti	5	<5	<5	<5	5
Zn	5	12	21	17	0

CONCAWE Diesel survey 2010 and 2012
Country: Hungary
Measured properties: Density, FAME content, oxidation stability and EHN content

					2010				2012			
				n	Min.	Max.	Ave.	n	Min.	Max.	Ave.	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	5	837.5	842.0	840.5	0
FAME content	EN 14078	% v/v	Max. 7	5	4.6	4.8	4.7	5	2.9	5.0	4.0	0
Rancimat at 110°C	EN 15751	h	Min. 20	5	39.5	89.5	66.2	5	33.8	76.4	52.2	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	5	14.9	22.1	19.6	0
PetroOxy	prEN 16091	h		5	1.4733	2.2272	1.8504	5	1.0897	1.3531	1.2080	0
Peroxid value	ISO 3960:2007	meq O/kg		5	<1	<1	<1	-	-	-	-	5
Delta Tan 2010	2010 method	mg KOH/g		5	0.022	0.034	0.027	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		5	600	1140	816	5	266	1020	456	0

CONCAWE Diesel survey 2012
Country: Ireland
Measured properties: Density, FAME content, oxidation stability and EHN content

				Ireland	2012			
				n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.					
Density at 15°C	DIN EN ISO 12185	kg/m³	820 - 845	5	836.5	841.6	839.8	0
FAME content	EN 14078	% v/v	Max. 7	5	0.2	6.2	3.0	0
Rancimat at 110°C	EN 15751	h	Min. 20	3	25.2	65.3	45.8	0
Rancimat at 120°C	analog DIN EN 15751	h		3	11.8	26.2	18.9	0
PetroOxy	prEN 16091	h		5	1.1183	1.5592	1.3342	0
EHN content	EN ISO 13759	mg/kg		5	298	1334	859	0

CONCAWE Gasoline survey 2008 and 2010
Country: Italy
Measured properties: elemental analysis

		2008				Italy	2010			
Property	n	Min.	Max.	Average	No. below 0.01ppb	n	Min.	Max.	Average	No. below detection limit
			ICP-MS					ICP-AES		
Elements		µg/kg	µg/kg	µg/kg			mg/kg	mg/kg	mg/kg	
Ag	10	0.00	0.04	0.02	1	10	<0.5	<0.5	<0.5	10
Al	10	0.22	7.07	1.82	0	10	<0.5	<0.5	<0.5	10
As	10	0.02	0.55	0.18	0	-	-	-	-	-
Au	10	0.00	0.00	0.00	10	-	-	-	-	-
B	10	2.58	14.47	5.02	0	-	-	-	-	-
Ba	10	0.00	0.48	0.06	1	10	<0.5	<0.5	<0.5	10
Ca	10	0.52	1.17	0.88	0	10	<0.5	<0.5	<0.5	10
Cd	10	0.02	0.53	0.10	0	10	<0.5	<0.5	<0.5	10
Ce	10	0.00	0.00	0.00	10	-	-	-	-	-
Cr	10	3.70	16.77	7.20	0	10	<0.5	<0.5	<0.5	10
Cu	10	0.27	31.38	8.24	0	10	<0.5	<0.5	<0.5	10
Fe	10	4.78	23.30	9.97	0	10	<0.5	<0.5	<0.5	10
Hg	10	2.26	13.11	4.76	0	-	-	-	-	-
K	10	1.06	4.27	2.10	0	10	<0.5	<0.5	<0.5	10
Mg	10	0.81	2.68	1.45	0	10	<0.5	<0.5	<0.5	10
Mn	10	0.14	1.13	0.51	0	10	<0.5	<0.5	<0.5	10
Mo	10	0.06	0.25	0.11	0	10	<0.5	<0.5	<0.5	10
Na	10	1.07	9.32	3.07	0	10	<0.5	<0.5	<0.5	10
Ni	10	0.05	3.50	0.61	0	10	<0.5	<0.5	<0.5	10
P	-	-	-	-	-	10	<0.5	<0.5	<0.5	10
Pb	10	0.31	3.90	1.18	0	10	<0.5	<0.5	<0.5	10
Pt	10	0.00	0.00	0.00	10	-	-	-	-	-
Se	10	0.05	0.30	0.15	0	-	-	-	-	-
Si	-	-	-	-	-	10	<0.5	<0.5	<0.5	10
Sn	10	0.04	1.26	0.52	0	10	<0.5	<0.5	<0.5	10
Ti	10	0.11	0.30	0.19	0	10	<0.5	<0.5	<0.5	10
V	10	0.12	0.86	0.35	0	10	<0.5	<0.5	<0.5	10
Zn	10	0.98	237.52	49.03	0	10	<0.5	<0.5	<0.5	10

CONCAWE Gasoline survey 2010
Country: Italy
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Italy	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		10	25.7	30.5	28.6	0
5		°C		10	39.5	46.0	42.2	0
10		°C		10	45.4	53.2	48.1	0
20		°C		10	52.0	64.6	58.1	0
30		°C		10	58.3	76.2	68.4	0
40		°C		10	65.7	89.4	80.0	0
50		°C		10	75.9	102.6	93.1	0
60		°C		10	92.3	114.9	107.7	0
70		°C		10	117.7	127.7	122.7	0
80		°C		10	130.3	143.5	137.4	0
90		°C		10	147.3	163.2	155.6	0
95		°C		10	166.6	195.0	175.1	0
FBP		°C	Max. 210	10	176.4	207.5	190.7	0
Residue		ml	Max. 2	10	1.0	1.0	1.0	0
E 70		% v/v	22 - 50	10	26.1	47.9	34.6	0
E 100		% v/v	46 - 71	10	49.4	66.1	56.7	0
E 150		% v/v	Min. 75	10	84.8	94.1	89.7	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	10	<0.01	6.08	1.81	3
Ethanol		% v/v	Max. 5	10	<0.01	0.25	0.05	6
Methanol		% v/v	Max. 3	10	<0.01	<0.01	<0.01	10
MTBE		% v/v	Max. 15	10	0.07	10.26	2.07	0
TAME		% v/v	Max. 15	10	<0.01	0.09	0.03	2
tert-Butanol		% v/v	Max. 7	10	<0.01	<0.01	<0.01	10
tert. Amylalk.		% v/v	Max. 10	10	<0.01	0.07	0.02	8
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	10	0.04	4.23	1.04	0
High boiling Fraction		% m/m		10	0.20	1.91	0.62	0
FAME fraction		% m/m		10	<0.01	0.21	0.03	5

CONCAWE Diesel surveys 2008 and 2010
Country: Italy
Measured properties: elemental analysis

	Italy	2008				Italy	2010			
	n	Min.	Max.	Average	No. below 0.01ppb	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg			µg/kg	µg/kg	µg/kg	
			ICP-MS					ICP-MS		
Ag	15	0.00	0.00	0.00	15	15	<5	<5	<5	15
Al	15	0.00	0.00	0.00	15	15	<20	<20	<20	15
As	15	0.00	0.00	0.00	15	-	-	-	-	-
Au	15	0.00	0.00	0.00	15	-	-	-	-	-
B	15	0.00	3.80	0.86	5	15	<5	<5	<5	15
Ba	15	0.00	0.00	0.00	15	15	<5	<5	<5	15
Ca	15	0.00	2.19	0.64	10	15	<20	<20	<20	15
Cd	15	0.00	0.00	0.00	15	-	-	-	-	-
Ce	15	0.00	0.02	0.00	14	15	<5	<5	<5	15
Co	-	-	-	-	-	15	<5	<5	<5	15
Cr	15	0.02	21.71	6.24	0	15	<5	<5	<5	15
Cu	15	0.00	10.22	1.57	5	15	<5	<5	<5	15
Fe	15	0.00	30.53	8.87	2	15	14	160	58	0
Hg	15	1.31	5.30	2.89	0	-	-	-	-	-
K	15	0.00	18.64	5.20	2	15	<5	7	5	11
Mg	15	0.00	6.13	1.64	2	15	<20	<20	<20	15
Mn	15	0.00	1.13	0.11	11	15	<5	<5	<5	15
Mo	15	0.00	0.00	0.00	15	15	<5	<5	<5	15
Na	15	0.00	197.83	43.94	1	15	<20	102	35	4
Ni	15	0.00	0.00	0.00	15	15	<5	<5	<5	15
Pb	15	0.00	4.20	0.49	7	15	<5	<5	<5	15
Pt	15	0.02	0.86	0.24	0	-	-	-	-	-
Se	15	0.00	0.00	0.00	15	-	-	-	-	-
Sn	15	0.00	0.00	0.00	15	15	<5	6	5	14
Si	-	-	-	-	-	15	<500	<500	<500	15
Ti	15	0.00	0.00	0.00	15	15	<5	<5	<5	15
V	15	0.00	0.00	0.00	15	-	-	-	-	-
Zn	15	1.15	82.69	31.10	0	15	<5	13	7	8

CONCAWE Diesel survey 2010 and 2012
Country: Italy
Measured properties: Density, FAME content, oxidation stability and EHN content

					2010				2012			
				n	Min.	Max.	Ave.	n	Min.	Max.	Ave.	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	15	830.2	844.6	839.6	0
FAME content	EN 14078	% v/v	Max. 7	15	2.1	6.7	5.1	15	0.3	6.6	5.4	0
Rancimat at 110°C	EN 15751	h	Min. 20	15	18.6	88.3	48.7	13	11.7	58.3	28.4	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	13	5.9	25.3	12.6	0
PetroOxy	prEN 16091	h		15	1.1236	2.1256	1.6392	15	0.8628	1.5700	1.2352	0
Peroxid value	ISO 3960:2007	meq O/kg		15	<1	1.0	1.0	-	-	-	-	12
Delta Tan 2010	2010 method	mg KOH/g		15	0.026	2.074	0.243	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		15	68	838	348	15	23	1349	205	0

CONCAWE Gasoline survey 2008 and 2010
Country: Netherlands
Measured properties: elemental analysis

		2008					2010			
Property	n	Min.	Max.	Ave.	No. below 0.01ppb	n	Min.	Max.	Ave.	No. below detection limit
			ICP-MS					ICP-AES		
Elements		µg/kg	µg/kg	µg/kg			mg/kg	mg/kg	mg/kg	
Ag	5	0.02	0.17	0.10	0	5	<0.5	<0.5	<0.5	5
Al	5	0.15	1.11	0.44	0	5	<0.5	<0.5	<0.5	5
As	5	0.05	0.71	0.31	0	-	-	-	-	-
Au	5	0.00	0.00	0.00	5	-	-	-	-	-
B	5	0.79	5.94	2.51	0	-	-	-	-	-
Ba	5	0.01	0.04	0.03	0	5	<0.5	<0.5	<0.5	5
Ca	5	0.39	2.72	1.47	0	5	<0.5	<0.5	<0.5	5
Cd	5	0.00	0.06	0.03	1	5	<0.5	<0.5	<0.5	5
Ce	5	0.00	0.00	0.00	5	-	-	-	-	-
Cr	5	3.97	50.08	22.43	0	5	<0.5	<0.5	<0.5	5
Cu	5	0.56	6.94	4.36	0	5	<0.5	<0.5	<0.5	5
Fe	5	5.51	71.14	32.05	0	5	0.5	1.2	0.6	4
Hg	5	4.61	29.97	11.07	0	-	-	-	-	-
K	5	1.47	11.53	5.15	0	5	<0.5	<0.5	<0.5	5
Mg	5	1.03	3.75	1.90	0	5	<0.5	<0.5	<0.5	5
Mn	5	0.07	0.90	0.47	0	5	<0.5	<0.5	<0.5	5
Mo	5	0.00	0.10	0.05	1	5	<0.5	<0.5	<0.5	5
Na	5	3.16	74.17	23.39	0	5	<0.5	<0.5	<0.5	5
Ni	5	0.12	2.56	0.81	0	5	<0.5	<0.5	<0.5	5
P	-	-	-	-	-	5	<0.5	<0.5	<0.5	5
Pb	5	0.00	0.33	0.18	1	5	<0.5	<0.5	<0.5	5
Pt	5	0.00	0.00	0.00	5	-	-	-	-	-
Se	5	0.13	0.39	0.22	0	-	-	-	-	-
Si	-	-	-	-	-	5	0.8	0.8	0.8	0
Sn	5	0.01	0.09	0.05	0	5	<0.5	<0.5	<0.5	5
Ti	5	0.07	0.85	0.46	0	5	<0.5	<0.5	<0.5	5
V	5	0.39	2.51	1.23	0	5	<0.5	<0.5	<0.5	5
Zn	5	4.45	29.61	12.39	0	5	<0.5	<0.5	<0.5	5

CONCAWE Gasoline survey 2010
Country: Netherlands
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Netherlands	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		5	25.4	28.5	26.8	0
5		°C		5	36.4	39.5	37.4	0
10		°C		5	40.6	43.8	42.0	0
20		°C		5	47.3	57.6	50.3	0
30		°C		5	53.3	74.4	59.3	0
40		°C		5	60.0	90.5	69.2	0
50		°C		5	76.4	104.4	86.7	0
60		°C		5	93.6	118.4	104.4	0
70		°C		5	108.3	136.2	119.6	0
80		°C		5	124.5	158.4	135.8	0
90		°C		5	149.0	167.7	156.3	0
95		°C		5	156.8	190.3	174.2	0
FBP		°C	Max. 210	5	176.3	191.1	181.2	0
Residue		ml	Max. 2	5	1.0	1.1	1.0	0
E 70		% v/v	22 - 50	5	31.6	51.5	44.3	0
E 100		% v/v	46 - 71	5	50.9	67.9	60.5	0
E 150		% v/v	Min. 75	5	79.9	94.2	89.8	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	5	<0.01	0.61	0.23	1
Ethanol		% v/v	Max. 5	5	<0.01	6.48	3.28	2
Methanol		% v/v	Max. 3	5	<0.01	<0.01	<0.01	5
MTBE		% v/v	Max. 15	5	<0.01	0.89	0.42	1
TAME		% v/v	Max. 15	5	<0.01	0.17	0.05	1
tert-Butanol		% v/v	Max. 7	5	<0.01	<0.01	<0.01	5
tert. Amylalk.		% v/v	Max. 10	5	<0.01	<0.01	<0.01	5
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	5	0.01	2.59	1.36	0
High boiling Fraction		% m/m		5	0.26	0.78	0.39	0
FAME fraction		% m/m		5	<0.01	<0.01	<0.01	5

CONCAWE Diesel survey 2008 and 2010
Country: Netherlands
Measured properties: elemental analysis

	Netherlands	2008				Netherlands	2010				
	n	Min.	Max.	Average	No. below 0.01ppb	n	Min.	Max.	Average	No. below detection limit	
Elements		µg/kg	µg/kg	µg/kg			µg/kg	µg/kg	µg/kg		
			ICP-MS					ICP-MS			
Ag	5	0.00	0.00	0.00	5	5	<5	<5	<5	5	
Al	5	0.00	0.00	0.00	5	5	<20	<20	<20	5	
As	5	0.00	0.00	0.00	5	-	-	-	-	-	
Au	5	0.00	0.00	0.00	5	-	-	-	-	-	
B	5	0.93	2.50	1.48	0	5	<5	<5	<5	5	
Ba	5	0.00	0.00	0.00	5	5	<5	<5	<5	5	
Ca	5	1.51	2.30	1.77	0	5	<20	40	25	3	
Cd	5	0.00	0.00	0.00	5	-	-	-	-	-	
Ce	5	0.00	0.00	0.00	5	5	<5	<5	<5	5	
Co	-	-	-	-	-	5	<5	<5	<5	5	
Cr	5	2.91	13.56	7.21	0	5	<5	<5	<5	5	
Cu	5	0.37	17.16	4.40	0	5	<5	29	10	4	
Fe	5	4.18	19.16	10.30	0	5	<5	90	31	1	
Hg	5	2.62	3.62	3.00	0	-	-	-	-	-	
K	5	2.74	42.09	14.56	0	5	<5	8	6	2	
Mg	5	2.38	6.58	3.61	0	5	<20	<20	<20	5	
Mn	5	0.00	0.00	0.00	5	5	<5	<5	<5	5	
Mo	5	0.00	0.00	0.00	5	5	<5	<5	<5	5	
Na	5	57.93	224.94	114.60	0	5	<20	124	68	1	
Ni	5	0.00	0.00	0.00	5	5	<5	<5	<5	5	
Pb	5	0.00	0.26	0.11	2	5	<5	<5	<5	5	
Pt	5	0.07	0.21	0.12	0	-	-	-	-	-	
Se	5	0.00	0.00	0.00	5	-	-	-	-	-	
Sn	5	0.00	0.00	0.00	5	5	<5	<5	<5	5	
Si	-	-	-	-	-	5	<500	1000	660	3	
Ti	5	0.00	0.00	0.00	5	5	<5	<5	<5	5	
V	5	0.00	0.00	0.00	5	-	-	-	-	-	
Zn	5	1.22	11.54	5.67	0	5	<5	10	7	1	

CONCAWE Diesel survey 2010 and 2012
Country: Netherlands
Measured properties: Density, FAME content, oxidation stability and EHN content

					2010				2012			
				n	Min.	Max.	Ave,	n	Min.	Max.	Ave.	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	5	830.3	841.0	834.9	0
FAME content	EN 14078	% v/v	Max. 7	5	0.1	2.6	0.8	5	<0.1	6.1	3.0	2
Rancimat at 110°C	EN 15751	h	Min. 20	1	84.9	84.9	84.9	3	21.2	52.8	37.9	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	3	9.7	22.2	15.3	0
PetroOxy	prEN 16091	h		5	1.0506	1.8125	1.4006	5	1.1264	2.1736	1.4911	0
Peroxid value	ISO 3960:2007	meq O/kg		5	<1	<1	<1	-	-	-	-	5
Delta Tan 2010	2010 method	mg KOH/g		5	0.006	0.757	0.185	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		5	127	682	354	5	<20	684	359	1

CONCAWE Gasoline survey 2008
Country: Poland
Measured properties: elemental analysis

	Poland	2008			
Property	n	Min.	Max.	Average	No. below 0.01ppb
			ICP-MS		
Elements		µg/kg	µg/kg	µg/kg	
Ag	5	0.03	0.07	0.05	0
Al	5	0.06	0.38	0.24	0
As	5	0.08	0.19	0.13	0
Au	5	0.00	0.00	0.00	5
B	5	2.25	5.37	3.11	0
Ba	5	0.00	0.02	0.01	1
Ca	5	0.66	1.14	0.89	0
Cd	5	0.04	0.13	0.09	0
Ce	5	0.00	0.00	0.00	0
Cr	5	2.12	16.47	7.33	0
Cu	5	0.72	17.45	4.54	0
Fe	5	2.65	22.69	9.86	0
Hg	5	3.89	9.18	5.37	0
K	5	1.63	5.49	3.55	0
Mg	5	1.05	7.61	5.07	0
Mn	5	0.19	1.18	0.61	0
Mo	5	0.03	0.10	0.07	0
Na	5	2.06	17.29	6.08	0
Ni	5	0.21	0.71	0.36	0
Pb	5	0.46	1.08	0.69	0
Pt	5	0.00	0.00	0.00	5
Se	5	0.04	0.11	0.08	0
Sn	5	0.02	0.10	0.04	0
Ti	5	0.13	0.27	0.21	0
V	5	0.25	6.25	3.22	0
Zn	5	1.87	4.73	2.92	0

CONCAWE Diesel survey 2008
Country: Poland
Measured properties: elemental analysis

	Poland	2008			
	n	Min.	Max.	Average	No. below 0.01ppb
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	5	0.00	0.00	0.00	5
Al	5	0.00	0.00	0.00	5
As	5	0.00	0.00	0.00	5
Au	5	0.00	0.00	0.00	5
B	5	1.19	1.69	1.45	0
Ba	5	0.00	0.00	0.00	5
Ca	5	0.17	2.21	1.22	0
Cd	5	0.00	0.00	0.00	5
Ce	5	0.00	0.00	0.00	5
Cr	5	4.55	21.22	13.65	0
Cu	5	0.00	0.72	0.27	1
Fe	5	6.98	29.51	19.15	0
Hg	5	2.53	3.76	2.86	0
K	5	5.49	7.96	6.52	0
Mg	5	1.69	5.32	3.42	0
Mn	5	0.00	0.00	0.00	5
Mo	5	0.00	0.00	0.00	5
Na	5	25.01	110.87	63.82	0
Ni	5	0.00	0.00	0.00	5
Pb	5	0.00	0.00	0.00	5
Pt	5	0.04	0.11	0.07	0
Se	5	0.00	0.00	0.00	5
Sn	5	0.00	0.00	0.00	5
Ti	5	0.00	0.00	0.00	5
V	5	0.00	0.00	0.00	5
Zn	5	0.52	14.83	6.85	0

CONCAWE Diesel survey 2010 & 2012
Country: Poland
Measured properties: Density, FAME content, oxidation stability and EHN content

				Poland	2010			
				n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.					
FAME content	EN 14078	% v/v	Max. 7	5	4.6	4.7	4.7	0
Rancimat at 110°C	EN 15751	h	Min. 20	5	19.0	28.1	23.9	0
PetroOxy @140°C	prEN 16091	h		5	59.0	85.2	74.7	0
EHN content	EN ISO 13759	mg/kg		5	57.8	296.0	112.5	0
Peroxide value	ISO 3960: 2007	meq O/kg		5	<1.0	2.0	1.0	1
Delta Tan 2010	2010 method	mg KOH/g		5	0.065	0.100	0.081	0
				Poland	2012			
				n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.					
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	5	825.2	835.2	831.3	0
FAME content	EN 14078	% v/v	Max. 7	5	1.3	6.7	2.9	0
Rancimat at 110°C	EN 15751	h	Min. 20	3	11.2	31.8	24.8	0
Rancimat at 120°C	analog DIN EN 15751	h		3	5.6	13.2	9.9	0
PetroOxy at 140°C	prEN 16091	h		5	0.6236	1.5581	1.0227	0
EHN content	EN ISO 13759	mg/kg		5	78	721	267	0

CONCAWE Gasoline survey 2010
Country: Romania
Measured properties: elemental analysis

	Romania	2010			
Property	n	Min.	Max.	Average	No. below detection limit
			ICP-AES		
Elements		mg/kg	mg/kg	mg/kg	
Ag	5	<0.5	<0.5	<0.5	5
Al	5	<0.5	<0.5	<0.5	5
Ba	5	<0.5	<0.5	<0.5	5
Ca	5	<0.5	<0.5	<0.5	5
Cd	5	<0.5	<0.5	<0.5	5
Cr	5	<0.5	<0.5	<0.5	5
Cu	5	<0.5	<0.5	<0.5	5
Fe	5	<0.5	<0.5	<0.5	5
K	5	<0.5	<0.5	<0.5	5
Mg	5	<0.5	<0.5	<0.5	5
Mn	5	<0.5	<0.5	<0.5	5
Mo	5	<0.5	<0.5	<0.5	5
Na	5	<0.5	<0.5	<0.5	5
Ni	5	<0.5	<0.5	<0.5	5
P	5	<0.5	<0.5	<0.5	5
Pb	5	<0.5	<0.5	<0.5	5
Si	5	<0.5	<0.5	<0.5	5
Sn	5	<0.5	<0.5	<0.5	5
Ti	5	<0.5	<0.5	<0.5	5
V	5	<0.5	<0.5	<0.5	5
Zn	5	<0.5	<0.5	<0.5	5

CONCAWE Gasoline survey 2010
Country: Romania
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Romania	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		5	26.4	30.5	27.7	0
5		°C		5	41.4	45.6	44.1	0
10		°C		5	46.5	53.3	50.0	0
20		°C		5	54.1	66.1	59.1	0
30		°C		5	61.4	77.2	67.9	0
40		°C		5	77.8	88.2	82.6	0
50		°C		5	96.1	101.6	99.3	0
60		°C		5	114.5	117.3	115.7	0
70		°C		5	130.8	134.7	132.7	0
80		°C		5	144.7	151.6	149.1	0
90		°C		5	162.3	172.6	169.0	0
95		°C		5	180.9	194.0	186.8	0
FBP		°C	Max. 210	5	194.1	211.0	202.1	0
Residue		ml	Max. 2	5	1.0	1.1	1.1	0
E 70		% v/v	22 - 50	5	26.0	38.1	33.0	0
E 100		% v/v	46 - 71	5	51.7	54.2	52.6	0
E 150		% v/v	Min. 75	5	80.5	86.1	82.9	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	5	<0.01	10.24	4.08	3
Ethanol		% v/v	Max. 5	5	0.13	4.76	2.79	0
Methanol		% v/v	Max. 3	5	<0.01	0.27	0.13	2
MTBE		% v/v	Max. 15	5	0.35	3.35	1.50	0
TAME		% v/v	Max. 15	5	0.15	2.88	1.35	0
tert-Butanol		% v/v	Max. 7	5	<0.01	0.04	0.02	3
tert. Amylalk.		% v/v	Max. 10	5	<0.01	0.03	0.02	1
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	5	2.00	2.39	2.22	0
High boiling Fraction		% m/m		5	0.45	1.24	0.78	0
FAME fraction		% m/m		5	<0.01	0.06	0.02	1

CONCAWE Diesel survey 2010
Country: Romania
Measured properties: elemental analysis

	Romania	2010			
	n	Min.	Max.	Average	Below detection limit
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	5	<5	<5	<5	5
Al	5	<20	<20	<20	5
B	5	<5	<5	<5	5
Ba	5	<5	<5	<5	5
Ca	5	<20	34	25	3
Ce	5	<5	<5	<5	5
Co	5	<5	<5	<5	5
Cr	5	<5	<5	<5	5
Cu	5	<5	24	9	3
Fe	5	33	170	69	0
K	5	5	7	6	0
Mg	5	<20	<20	<20	5
Mn	5	<5	10	7	2
Mo	5	<5	<5	<5	5
Na	5	<20	70	46	1
Ni	5	<5	<5	<5	5
Pb	5	<5	12	6	4
Sn	5	<5	7	6	1
Si	5	<500	<500	<500	5
Ti	5	<5	<5	<5	5
Zn	5	14	81	35	0

CONCAWE Diesel survey 2010 and 2012
Country: Romania
Measured properties: Density, FAME content, oxidation stability and EHN content

					2010				2012			
				n	Min.	Max.	Ave.	n	Min.	Max.	Ave.	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	5	837.3	843.8	840.1	0
FAME content	EN 14078	% v/v	Max. 7	5	0.1	4.7	1.9	5	0.3	5.5	4.2	0
Rancimat at 110°C	EN 15751	h	Min. 20	2	26.7	31.6	29.2	4	25.5	42.1	31.6	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	4	10.9	16.0	13.9	0
PetroOxy	prEN 16091	h		5	0.9072	1.6183	1.1890	5	1.0081	1.1131	1.0580	0
Peroxid value	ISO 3960:2007	meq O/kg		5	<1	<1	<1	-	-	-	-	5
Delta Tan 2010	2010 method	mg KOH/g		5	0.053	1.613	0.534	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		5	362	1664	1248	5	478	1002	678	0

CONCAWE Gasoline survey 2010
Country: Slovakia
Measured properties: elemental analysis

	Slovakia	2010			
Property	n	Min.	Max.	Average	No. below detection limit
			ICP-AES		
Elements		mg/kg	mg/kg	mg/kg	
Ag	3	<0.5	<0.5	<0.5	3
Al	3	<0.5	<0.5	<0.5	3
Ba	3	<0.5	<0.5	<0.5	3
Ca	3	<0.5	<0.5	<0.5	3
Cd	3	<0.5	<0.5	<0.5	3
Cr	3	<0.5	<0.5	<0.5	3
Cu	3	<0.5	<0.5	<0.5	3
Fe	3	<0.5	<0.5	<0.5	3
K	3	<0.5	<0.5	<0.5	3
Mg	3	<0.5	<0.5	<0.5	3
Mn	3	<0.5	<0.5	<0.5	3
Mo	3	<0.5	<0.5	<0.5	3
Na	3	<0.5	<0.5	<0.5	3
Ni	3	<0.5	<0.5	<0.5	3
P	3	<0.5	<0.5	<0.5	3
Pb	3	<0.5	<0.5	<0.5	3
Si	3	<0.5	<0.5	<0.5	3
Sn	3	<0.5	<0.5	<0.5	3
Ti	3	<0.5	<0.5	<0.5	3
V	3	<0.5	<0.5	<0.5	3
Zn	3	<0.5	<0.5	<0.5	3

CONCAWE Gasoline survey 2010
Country: Slovakia
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Slovakia	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Ave.	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		3	27.0	30.1	28.7	0
5		°C		3	38.7	44.9	41.7	0
10		°C		3	44.3	50.8	47.5	0
20		°C		3	55.7	60.7	58.0	0
30		°C		3	67.7	71.0	69.0	0
40		°C		3	79.2	82.7	80.5	0
50		°C		3	91.1	96.5	93.6	0
60		°C		3	105.4	111.5	108.5	0
70		°C		3	125.5	128.2	126.5	0
80		°C		3	144.2	148.1	145.9	0
90		°C		3	166.5	169.2	167.8	0
95		°C		3	181.9	190.0	187.0	0
FBP		°C	Max. 210	3	192.1	194.6	193.2	0
Residue		ml	Max. 2	3	1.1	1.1	1.1	0
E 70		% v/v	22 - 50	3	30.8	34.9	33.5	0
E 100		% v/v	46 - 71	3	54.2	59.4	57.2	0
E 150		% v/v	Min. 75	3	82.7	86.0	84.7	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	3	6.80	12.05	9.02	0
Ethanol		% v/v	Max. 5	3	0.26	0.29	0.27	0
Methanol		% v/v	Max. 3	3	<0.01	0.27	0.10	2
MTBE		% v/v	Max. 15	3	0.10	0.66	0.32	0
TAME		% v/v	Max. 15	3	0.03	0.16	0.11	0
tert-Butanol		% v/v	Max. 7	3	0.01	0.09	0.06	0
tert. Amylalk.		% v/v	Max. 10	3	<0.01	<0.01	<0.01	3
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	3	1.23	2.30	1.67	0
High boiling Fraction		% m/m		3	0.23	0.40	0.34	0
FAME fraction		% m/m		3	0.01	0.02	0.02	0

CONCAWE Diesel survey 2010
Country: Slovakia
Measured properties: elemental analysis

	Slovakia	2010			
	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	4	<5	<5	<5	4
Al	4	<20	<20	<20	4
B	4	<5	<5	<5	4
Ba	4	<5	<5	<5	4
Ca	4	<20	21	20	3
Ce	4	<5	<5	<5	4
Co	4	<5	<5	<5	4
Cr	4	<5	<5	<5	4
Cu	4	<5	8	6	2
Fe	4	7	90	31	0
K	4	8	25	15	0
Mg	4	<20	<20	<20	4
Mn	4	<5	<5	<5	4
Mo	4	<5	<5	<5	4
Na	4	39	61	53	0
Ni	4	<5	<5	<5	4
Pb	4	<5	<5	<5	4
Sn	4	6	10	9	0
Si	4	<500	<500	<500	4
Ti	4	<5	<5	<5	4
Zn	4	12	84	54	0

CONCAWE Diesel survey 2010 and 2012
Country: Slovakia
Measured properties: Density, FAME content, oxidation stability and EHN content

					2010				2012			
				n	Min.	Max.	Ave.	n	Min.	Max.	Ave.	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	5	830.6	839.5	836.5	0
FAME content	EN 14078	% v/v	Max. 7	4	5.0	6.1	5.3	5	5.2	6.4	5.8	0
Rancimat at 110°C	EN 15751	h	Min. 20	4	20.2	58.1	41.3	5	34.9	93.3	52.0	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	5	16.7	34.6	22.2	0
PetroOxy	prEN 16091	h		4	1.1369	1.4569	1.3303	5	1.1936	1.5161	1.3787	0
Peroxid value	ISO 3960:2007	meq O/kg		4	<1	<1	<1	-	-	-	-	4
Delta Tan 2010	2010 method	mg KOH/g		4	0.028	0.055	0.040	-	-	-		0
EHN content	EN ISO 13759	mg/kg		4	350	780	480	5	158	924	472	0

CONCAWE Gasoline survey 2010
Country: Slovenia
Measured properties: elemental analysis

	Slovenia	2010			
Property	n	Min.	Max.	Average	No. below detection limit
			ICP-AES		
Elements		mg/kg	mg/kg	mg/kg	
Ag	2	<0.5	<0.5	<0.5	2
Al	2	<0.5	<0.5	<0.5	2
Ba	2	<0.5	<0.5	<0.5	2
Ca	2	<0.5	<0.5	<0.5	2
Cd	2	<0.5	<0.5	<0.5	2
Cr	2	<0.5	<0.5	<0.5	2
Cu	2	<0.5	<0.5	<0.5	2
Fe	2	<0.5	<0.5	<0.5	2
K	2	<0.5	<0.5	<0.5	2
Mg	2	<0.5	<0.5	<0.5	2
Mn	2	<0.5	<0.5	<0.5	2
Mo	2	<0.5	<0.5	<0.5	2
Na	2	<0.5	<0.5	<0.5	2
Ni	2	<0.5	<0.5	<0.5	2
P	2	<0.5	<0.5	<0.5	2
Pb	2	<0.5	<0.5	<0.5	2
Si	2	<0.5	<0.5	<0.5	2
Sn	2	<0.5	<0.5	<0.5	2
Ti	2	<0.5	<0.5	<0.5	2
V	2	<0.5	<0.5	<0.5	2
Zn	2	<0.5	<0.5	<0.5	2

CONCAWE Gasoline survey 2010
Country: Slovenia
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Slovenia	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Ave.	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		2	28.3	30.6	29.5	0
5		°C		2	43.7	44.0	43.9	0
10		°C		2	50.3	50.4	50.4	0
20		°C		2	61.0	62.7	61.9	0
30		°C		2	72.4	75.8	74.1	0
40		°C		2	85.3	90.3	87.8	0
50		°C		2	99.0	105.6	102.3	0
60		°C		2	111.2	120.1	115.7	0
70		°C		2	122.7	134.1	128.4	0
80		°C		2	138.1	151.1	144.6	0
90		°C		2	160.2	171.7	166.0	0
95		°C		2	177.6	189.9	183.8	0
FBP		°C	Max. 210	2	198.2	203.0	200.6	0
Residue		ml	Max. 2	2	1.0	1.1	1.1	0
E 70		% v/v	22 - 50	2	27.6	29.5	28.6	0
E 100		% v/v	46 - 71	2	48.4	52.3	50.4	0
E 150		% v/v	Min. 75	2	81.4	87.2	84.3	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	2	0.07	0.28	0.18	0
Ethanol		% v/v	Max. 5	2	0.01	0.06	0.04	0
Methanol		% v/v	Max. 3	2	<0.01	0.05	0.03	1
MTBE		% v/v	Max. 15	2	3.60	3.64	3.62	0
TAME		% v/v	Max. 15	2	<0.01	1.01	0.51	1
tert-Butanol		% v/v	Max. 7	2	<0.01	<0.01	<0.01	0
tert. Amylalk.		% v/v	Max. 10	2	<0.01	0.06	0.04	1
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	2	0.72	0.90	0.81	0
High boiling Fraction		% m/m		2	0.87	0.91	0.89	0
FAME fraction		% m/m		2	0.01	0.01	0.01	0

CONCAWE Diesel survey 2010
Country: Slovenia
Measured properties: elemental analysis

	Slovenia	2010			
	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	2	<5	<5	<5	2
Al	2	<20	<20	<20	2
B	2	<5	<5	<5	2
Ba	2	<5	<5	<5	2
Ca	2	<20	95	58	1
Ce	2	<5	<5	<5	2
Co	2	<5	5	5	1
Cr	2	<5	<5	<5	2
Cu	2	7	11	9	0
Fe	2	15	19	17	0
K	2	6	77	42	0
Mg	2	<20	<20	<20	2
Mn	2	<5	5	5	1
Mo	2	<5	<5	<5	2
Na	2	<20	59	40	1
Ni	2	<5	<5	<5	2
Pb	2	<5	<5	<5	2
Sn	2	<5	<5	<5	2
Si	2	<500	590	590	1
Ti	2	<5	<5	<5	2
Zn	2	<5	18	12	1

CONCAWE Diesel survey 2010 and 2012
Country: Slovenia
Measured properties: Density, FAME content, oxidation stability and EHN content

					2010				2012			
				n	Min.	Max.	Average	n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-	-	5	832.7	838.3	835.3	0
FAME content	EN 14078	% v/v	Max. 7	2	2.9	4.6	3.8	5	<0.1	4.8	3.7	1
Rancimat at 110°C	EN 15751	h	Min. 20	2	58.7	66.1	62.4	4	39.4	64.5	51.3	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	4	17.7	25.9	21.8	0
PetroOxy	prEN 16091	h		2	1.4492	1.5453	1.4973	5	1.1739	1.6056	1.4425	0
Peroxid value	ISO 3960:2007	meq O/kg		2	<1	<1	<1	-	-	-	-	2
Delta Tan 2010	2010 method	mg KOH/g		2	0.021	0.036	0.029	-	-	-	-	0
EHN content	EN ISO 13759	mg/kg		2	379	574	477	5	151	595	330	0

CONCAWE Gasoline survey 2008 and 2010
Country: Spain
Measured properties: elemental analysis

		2008					2010			
Property	n	Min.	Max.	Average	No. below 0.01ppb	n	Min.	Max.	Average	No. below detection limit
			ICP-MS					ICP-AES		
Elements		µg/kg	µg/kg	µg/kg			mg/kg	mg/kg	mg/kg	
Ag	5	0.03	0.12	0.08	0	5	<0.5	<0.5	<0.5	5
Al	5	0.23	0.98	0.55	0	5	<0.5	<0.5	<0.5	5
As	5	0..10	0.39	0.19	0	-	-	-	-	-
Au	5	0.00	0.00	0.00	5	-	-	-	-	-
B	5	2.96	4.67	3.52	0	-	-	-	-	-
Ba	5	0.01	0.05	0.03	0	5	<0.5	<0.5	<0.5	5
Ca	5	1.19	2.84	1.90	0	5	<0.5	<0.5	<0.5	5
Cd	5	0.02	0.11	0.07	0	5	<0.5	<0.5	<0.5	5
Ce	5	0.00	0.00	0.00	5	-	-	-	-	-
Cr	5	1.48	2.72	2.12	0	5	<0.5	<0.5	<0.5	5
Cu	5	0.09	6.70	3.17	0	5	<0.5	<0.5	<0.5	5
Fe	5	1.19	2.84	1.90	0	5	<0.5	<0.5	<0.5	5
Hg	5	2.13	11.86	5.73	0	-	-	-	-	-
K	5	1.93	6.37	3.45	0	5	<0.5	<0.5	<0.5	5
Mg	5	2.15	4.73	3.02	0	5	<0.5	<0.5	<0.5	5
Mn	5	0.20	1.33	0.57	0	5	<0.5	<0.5	<0.5	5
Mo	5	0.04	0.16	0.08	0	5	<0.5	<0.5	<0.5	5
Na	5	0.72	5.85	2.57	0	5	<0.5	<0.5	<0.5	5
Ni	5	0.17	0.34	0.28	0	5	<0.5	<0.5	<0.5	5
P	-	-	-	-	-	5	0.6	0.8	0.7	0
Pb	5	0.10	1.57	0.63	0	5	<0.5	<0.5	<0.5	5
Pt	5	0.00	0.00	0.00	5	-	-	-	-	-
Se	5	0.08	0.20	0.14	0	-	-	-	-	-
Si	-	-	-	-	-	5	<0.5	<0.5	<0.5	5
Sn	5	0.03	1.09	0.31	0	5	<0.5	<0.5	<0.5	5
Ti	5	0.21	0.62	0.43	0	5	<0.5	<0.5	<0.5	5
V	5	0.02	0.18	0.08	0	5	<0.5	<0.5	<0.5	5
Zn	5	2.01	53.61	16.02	0	5	<0.5	<0.5	<0.5	5

CONCAWE Gasoline survey 2010
Country: Spain
Measured properties: Distillation characteristics, oxygenates and high boiling components

				Spain	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	Below detection limit
Distillation	EN ISO 3405							
IBP		°C		5	28.3	29.5	28.8	0
5		°C		5	40.8	44.8	43.2	0
10		°C		5	45.3	50.8	48.6	0
20		°C		5	52.5	60.0	57.7	0
30		°C		5	60.1	70.6	67.3	0
40		°C		5	69.8	82.2	77.7	0
50		°C		5	82.3	92.8	88.5	0
60		°C		5	93.7	104.3	99.7	0
70		°C		5	104.9	117.5	112.9	0
80		°C		5	119.0	141.5	128.8	0
90		°C		5	138.2	165.5	148.3	0
95		°C		5	155.5	185.4	164.5	0
FBP		°C	Max. 210	5	173.0	199.6	182.0	0
Residue		ml	Max. 2	5	1.0	1.1	1.0	0
E 70		% v/v	22 - 50	5	31.5	41.8	34.7	0
E 100		% v/v	46 - 71	5	58.2	67.6	62.0	0
E 150		% v/v	Min. 75	5	85.2	95.6	92.4	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	5	10.16	12.62	11.54	0
Ethanol		% v/v	Max. 5	5	0.22	2.38	1.12	0
Methanol		% v/v	Max. 3	5	<0.01	<0.01	<0.01	5
MTBE		% v/v	Max. 15	5	0.14	0.28	0.20	0
TAME		% v/v	Max. 15	5	0.04	0.09	0.05	0
tert-Butanol		% v/v	Max. 7	5	<0.01	<0.01	<0.01	5
tert. Amylalk.		% v/v	Max. 10	5	<0.01	<0.01	<0.01	5
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	5	2.01	2.76	2.36	0
High boiling Fraction		% m/m		5	0.41	0.67	0.55	0
FAME fraction		% m/m		5	<0.01	0.01	0.01	4

CONCAWE Diesel survey 2008 and 2010
Country: Spain
Measured properties: elemental analysis

	Spain	2008				Spain	2010			
	n	Min.	Max.	Average	No. below 0.01ppb	n	Min.	Max.	Average	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg			µg/kg	µg/kg	µg/kg	
			ICP-MS					ICP-MS		
Ag	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
Al	20	0.00	0.00	0.00	20	20	<20	<20	<20	20
As	20	0.00	0.00	0.00	20	-	-	-	-	-
Au	20	0.00	0.00	0.00	20	-	-	-	-	-
B	20	1.00	5.80	2.38	0	20	<5	<5	<5	20
Ba	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
Ca	20	0.00	0.00	0.00	20	20	<20	170	29	18
0Cd	20	0.00	0.00	0.00	20	-	-	-	-	-
Ce	20	0.00	0.01	0.00	20	20	<5	<5	<5	20
Co	-	-	-	-	-	20	<5	<5	<5	20
Cr	20	0.12	10.12	2.97	0	20	<5	<5	<5	20
Cu	20	0.00	95.52	11.71	5	20	<5	16	6	13
Fe	20	0.00	14.99	4.18	2	20	8	130	33	0
Hg	20	2.42	3.30	2.65	0	-	-	-	-	-
K	20	1.08	16.24	3.78	0	20	<5	23	8	5
Mg	20	0.49	6.51	2.78	0	20	<20	<20	<20	20
Mn	20	0.00	0.79	0.04	19	20	<5	<5	<5	20
Mo	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
Na	20	2.73	43.13	19.21	0	20	<20	530	53	14
Ni	20	0.00	0.60	0.03	19	20	<5	<5	<5	20
Pb	20	0.00	3.13	0.24	16	20	<5	54	7	19
Pt	20	0.01	0.09	0.03	0	-	-	-	-	-
Se	20	0.00	0.00	0.00	20	-	-	-	-	-
Sn	20	0.00	0.00	0.00	20	20	<5	13	6	15
Si	-	-	-	-	-	20	<500	<500	<500	20
Ti	20	0.00	0.00	0.00	20	20	<5	<5	<5	20
V	20	0.00	0.00	0.00	20	-	-	-	-	-
Zn	20	0.00	75.35	5.69	3	20	<5	22	9	4

CONCAWE Diesel survey 2010 and 2012
Country: Spain
Measured properties: Density, FAME content, oxidation stability and EHN content

					2010				2012			
				n	Min.	Max.	Ave.	n	Min.	Max.	Ave.	No. below detection limit
Property	Method	Unit	Spec.									
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	-	-	-		15	830.4	845.6	842.7	0
FAME content	EN 14078	% v/v	Max. 7	20	5.8	6.9	6.5	15	4.8	6.9	6.3	0
Rancimat at 110°C	EN 15751	h	Min. 20	20	17.4	80.2	47.0	15	31.8	88.4	52.0	0
Rancimat at 120°C	analog DIN EN 15751	h		-	-	-	-	15	13.8	39.8	22.2	0
PetroOxy	prEN 16091	h		20	1.1136	2.0183	1.5477	15	1.3047	1.9283	1.5417	0
Peroxid value	ISO 3960:2007	meq O/kg		20	<1	<1	<1	-	-	-	-	20
Delta Tan 2010	2010 method	mg KOH/g		20	0.039	3.038	0.207	-	-	-	--	0
EHN content	EN ISO 13759	mg/kg		20	244	954	511	15	114	667	341	0

CONCAWE Gasoline survey 2008
Country: Sweden
Measured properties: elemental analysis

	Sweden	2008			
Property	n	Min.	Max.	Average	No. below 0.01ppb
			ICP-MS		
Elements		µg/kg	µg/kg	µg/kg	
Ag	5	0.02	0.03	0.02	0
Al	5	0.44	1.06	0.74	0
As	5	0.00	0.02	0.01	1
Au	5	0.00	0.00	0.00	5
B	5	3.53	5.96	4.58	0
Ba	5	0.00	0.02	0.01	1
Ca	5	0.05	0.50	0.26	0
Cd	5	0.03	0.45	0.18	0
Ce	5	0.00	0.00	0.00	5
Cr	5	1.33	3.61	2.15	0
Cu	5	0.72	4.54	1.72	0
Fe	5	1.59	5.04	2.93	0
Hg	5	1.86	7.29	4.77	0
K	5	3.22	8.36	5.36	0
Mg	5	1.97	4.00	2.91	0
Mn	5	0.25	1.40	0.52	0
Mo	5	0.04	0.10	0.08	0
Na	5	13.49	51.71	24.95	0
Ni	5	0.14	0.61	0.40	0
Pb	5	0.09	1.87	0.62	0
Pt	5	0.00	0.00	0.00	5
Se	5	0.02	0.18	0.09	0
Sn	5	0.00	0.16	0.05	1
Ti	5	0.01	0.22	0.10	0
V	5	0.21	0.59	0.45	0
Zn	5	14.71	41.67	28.94	0

CONCAWE Diesel survey 2008
Country: Sweden
Measured properties: elemental analysis

	Sweden	2008			
	n	Min.	Max.	Average	No. below 0.01ppb
Elements		µg/kg	µg/kg	µg/kg	
			ICP-MS		
Ag	5	0.00	0.00	0.00	5
Al	5	0.00	0.00	0.00	5
As	5	0.00	0.00	0.00	5
Au	5	0.00	0.00	0.00	5
B	5	1.09	2.42	1.59	0
Ba	5	0.00	0.00	0.00	5
Ca	5	0.60	1.70	1.24	0
Cd	5	0.00	0.00	0.00	5
Ce	5	0.00	0.04	0.01	1
Cr	5	12.40	28.48	17.75	0
Cu	5	0.22	3.89	1.32	0
Fe	5	17.25	40.76	25.02	0
Hg	5	2.48	2.52	2.50	0
K	5	2.65	22.81	10.22	0
Mg	5	2.06	5.88	3.99	0
Mn	5	0.00	0.00	0.00	5
Mo	5	0.00	0.00	0.00	5
Na	5	32.04	251.65	100.63	0
Ni	5	0.00	0.00	0.00	5
Pb	5	0.00	0.08	0.02	1
Pt	5	0.03	0.04	0.03	0
Se	5	0.00	0.00	0.00	5
Sn	5	0.00	0.00	0.00	5
Ti	5	0.00	0.00	0.00	5
V	5	0.00	0.00	0.00	5
Zn	5	3.17	18.87	8.19	0

CONCAWE Diesel survey 2010 and 2012
Country: Sweden
Measured properties: Density, FAME content, oxidation stability and EHN content

				Sweden	2010			
				n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.					
FAME content	EN 14078	% v/v	Max. 7	4	4.8	5,1	4.9	0
Rancimat at 110°C	EN 15751	h	Min. 20	4	36.9	66.1	50.8	0
PetroOxy at 140°C	prEN 16091	h		4	66.9	95.1	80.0	0
EHN content	EN ISO 13759	mg/kg		4	<5	305	76	3
Peroxide value	ISO 3960: 2007	meq O/kg		4	<0.1	0.1	<0.1	3
Delta Tan 2010	2010 method	mg KOH/g		4	0.021	0.112	0.046	0
				Sweden	2012			
				n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.					
Density at 15°C	DIN EN ISO 12185	kg/m^3	820 - 845	8	813.0	845.1	825.5	0
FAME content	EN 14078	% v/v	Max. 7	8	5.0	7.0	6.3	0
Rancimat at 110°C	EN 15751	h	Min. 20	8	43.6	56.7	48.3	0
Rancimat at 120°C	analog DIN EN 15751	h		8	20.0	28.5	23.4	0
PetroOxy at 140°C	prEN 16091	h		8	1.2636	1.9861	1.6135	0
EHN content	EN ISO 13759	mg/kg		8	<20	176	91	2

CONCAWE Gasoline survey 2008 and 2010
Country: United Kingdom
Measured properties: elemental analysis

	United Kingdom	2008				United Kingdom	2010			
Property	n	Min.	Max.	Ave.	No. below 0.01ppb	n	Min.	Max.	Average	No. below detection limit
			ICP-MS					ICP-AES		
Elements		µg/kg	µg/kg	µg/kg			mg/kg	mg/kg	mg/kg	
Ag	15	0.01	0.07	0.03	0	10	<0.5	<0.5	<0.5	10
Al	15	0.17	2.76	0.67	0	10	<0.5	<0.5	<0.5	10
As	15	0.11	1.35	0.51	0	-	-	-	-	-
Au	15	0.00	0.00	0.00	15	-	-	-	-	-
B	15	0.11	18.34	8.68	0	-	-	-	-	-
Ba	15	0.00	0.02	0.01	2	10	<0.5	<0.5	<0.5	10
Ca	15	1.37	4.92	3.55	0	10	<0.5	<0.5	<0.5	10
Cd	15	0.00	0.70	0.18	2	10	<0.5	<0.5	<0.5	10
Ce	15	0.00	0.00	0.00	15	-	-	-	-	-
Cr	15	0.13	11.74	3.30	0	10	<0.5	<0.5	<0.5	10
Cu	15	0.27	28.30	3.99	0	10	<0.5	<0.5	<0.5	10
Fe	15	0.17	16.29	4.55	0	10	<0.5	<0.5	<0.5	10
Hg	15	3.00	17.02	5.83	0	-	-	-	-	-
K	15	1.39	8.46	4.34	0	10	<0.5	<0.5	<0.5	10
Mg	15	0.77	9.27	1.96	0	10	<0.5	<0.5	<0.5	10
Mn	15	0.07	1.96	0.76	0	10	<0.5	1.1	0.6	9
Mo	15	0.01	0.15	0.06	0	10	<0.5	<0.5	<0.5	10
Na	15	0.15	47.63	10.35	0	10	<0.5	<0.5	<0.5	10
Ni	15	0.02	64.23	8.15	0	10	<0.5	<0.5	<0.5	10
P	-	-	-	-	-	10	0.5	0.8	0.6	0
Pb	15	0.05	12.72	3.38	0	10	<0.5	<0.5	<0.5	10
Pt	15	0.00	0.00	0.00	15	-	-	-	-	-
Se	15	0.11	0.66	0.28	0	-	-	-	-	-
Si	-	-	-	-	-	10	<0.5	<0.5	<0.5	10
Sn	15	0.01	0.23	0.08	0	10	<0.5	<0.5	<0.5	10
Ti	15	0.28	0.96	0.72	0	10	<0.5	<0.5	<0.5	10
V	15	0.05	3.91	0.66	0	10	<0.5	<0.5	<0.5	10
Zn	15	1.33	203.71	37.64	0	10	<0.5	0.8	0.6	3

CONCAWE Gasoline survey 2010
Country: United Kingdom
Measured properties: Distillation characteristics, oxygenates and high boiling components

				United Kingdom	2010			
Property	Method	Unit	Spec.	n	Min.	Max.	Average	No. below detection limit
Distillation	EN ISO 3405							
IBP		°C		10	22.4	30.2	26.5	0
5		°C		10	34.7	39.6	36.7	0
10		°C		10	40.0	45.0	41.5	0
20		°C		10	47.7	57.5	50.4	0
30		°C		10	55.2	70.4	59.9	0
40		°C		10	64.3	85.5	72.0	0
50		°C		10	82.4	102.1	90.6	0
60		°C		10	97.4	118.2	107.3	0
70		°C		10	110.4	130.5	120.9	0
80		°C		10	125.0	146.3	134.9	0
90		°C		10	144.9	169.9	156.0	0
95		°C		10	158.6	194.4	171.8	0
FBP		°C	Max. 210	10	173.6	198.0	183.8	0
Residue		ml	Max. 2	10	1.0	3.3	1.3	0
E 70		% v/v	22 - 50	10	33.7	48.1	42.0	0
E 100		% v/v	46 - 71	10	51.9	64.5	59.0	0
E 150		% v/v	Min. 75	10	86.3	94.4	91.1	0
Oxygenates content	EN ISO 22854							
ETBE		% v/v	Max. 15	10	<0.01	0.78	0.09	9
Ethanol		% v/v	Max. 5	10	<0.01	5.08	2.01	6
Methanol		% v/v	Max. 3	10	<0.01	0.07	0.02	7
MTBE		% v/v	Max. 15	10	<0.01	2.05	0.38	3
TAME		% v/v	Max. 15	10	<0.01	0.59	0.08	7
tert-Butanol		% v/v	Max. 7	10	<0.01	<0.01	<0.01	10
tert. Amylalk.		% v/v	Max. 10	10	<0.01	<0.01	<0.01	10
Oxygen content	EN ISO 22854	% m/m	Max. 2.7	10	<0.01	2.25	1.22	1
High boiling Fraction		% m/m		10	0.19	0.46	0.29	0
FAME fraction		% m/m		10	<0.01	<0.01	<0.01	10

CONCAWE Diesel survey 2008 and 2010
Country: United Kingdom
Measured properties: elemental analysis

	United Kingdom	2008				United Kingdom	2010			
	n	Min.	Max.	Ave.	No. below 0.01ppb	n	Min.	Max.	Ave.	No. below detection limit
Elements		µg/kg	µg/kg	µg/kg			µg/kg	µg/kg	µg/kg	
			ICP-MS					ICP-MS		
Ag	15	0.00	0.00	0.00	15	10	7.00	7.00	7.00	0
Al	15	0.00	0.00	0.00	15	10	<20	<20	<20	10
As	15	0.00	0.08	0.01	14	-	-	-	-	-
Au	15	0.00	0.00	0.00	15	-	-	-	-	-
B	15	0.42	2.00	1.02	0	10	<5	<5	<5	10
Ba	15	0.00	1.99	0.33	4	10	<5	<5	<5	10
Ca	15	0.00	2.56	0.85	3	10	<20	36	23	7
Cd	15	0.00	0.00	0.00	15	-	-	-	-	-
Ce	15	0.00	1.49	0.11	14	10	<5	<5	<5	10
Co	-	-	-	-	-	10	<5	<5	<5	10
Cr	15	0.00	26.45	6.38	4	10	<5	<5	<5	10
Cu	15	0.00	49.82	10.71	6	10	<5	110	21	2
Fe	15	0.00	37.99	9.28	4	10	<5	75	25	1
Hg	15	2.41	4.22	2.74	0	-	-	-	-	-
K	15	0.00	8.52	1.55	6	10	5	56	19	0
Mg	15	1.14	7.25	3.69	0	10	<20	<20	<20	10
Mn	15	0.00	0.01	0.00	14	10	<5	<5	<5	10
Mo	15	0.00	0.00	0.00	15	10	<5	<5	<5	10
Na	15	0.15	30.07	8.64	0	10	<20	72	29	6
Ni	15	0.00	0.00	0.00	15	10	<5	<5	<5	10
Pb	15	0.00	0.56	0.05	11	10	<5	17	7	7
Pt	15	0.01	0.22	0.06	0	-	-	-	-	-
Se	15	0.00	0.00	0.00	15	-	-	-	-	-
Sn	15	0.00	0.00	0.00	15	10	<5	260	52	6
Si	-	-	-	-	-	10	<500	700	590	2
Ti	15	0.00	0.00	0.00	15	10	<5	<5	<5	10
V	15	0.00	0.00	0.00	15	-	-	-	-	-
Zn	15	0.54	440.13	46.10	0	10	190	830	370	0

CONCAWE Diesel survey 2010 and 2012
Country: United Kingdom
Measured properties: Density, FAME content, oxidation stability and EHN content

				United Kingdom	**2010**			
				n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.					
FAME content	EN 14078	% v/v	Max. 7	10	0.1	5.8	1.8	0
Rancimat at 110°C	EN 15751	h	Min. 20	3	42.9	64.9	51.9	0
PetroOxy	prEN 16091	h		10	1.4050	2.5456	1.6894	0
Peroxid value	ISO 3960:2007	meq O/kg		10	<1	<1	<1	10
Delta Tan 2010	2010 method	mg KOH/g		10	0.004	1.305	0.170	0
EHN content	EN ISO 13759	mg/kg		10	80	1081	558	0

				United Kingdom	**2012**			
				n	Min.	Max.	Average	No. below detection limit
Property	Method	Unit	Spec.					
Density at 15°C	DIN EN ISO 12185	kg/m3	820 - 845	15	826.4	844.3	839.2	0
FAME content	EN 14078	% v/v	Max. 7	15	<0.1	6.2	1.6	6
Rancimat at 110°C	EN 15751	h	Min. 20	4	38.5	60.2	52.2	0
Rancimat at 120°C	analog DIN EN 15751	h		4	16.1	26.6	22.5	0
PetroOxy	prEN 16091	h		15	1.0383	2.3353	1.5654	0
EHN content	EN ISO 13759	mg/kg		15	<20	1399	412	3

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