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Quality of petrol and diesel fuel used for road transport in the European Union:
Ninth annual report (Reporting year 2010)

Delegations will find attached Commission document COM(2012) 749 final.

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**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND
THE COUNCIL**

**Quality of petrol and diesel fuel used for road transport in the European Union:
Ninth annual report
(Reporting year 2010)**

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

Quality of petrol and diesel fuel used for road transport in the European Union: Ninth annual report (Reporting year 2010)

EXECUTIVE SUMMARY

Directive 98/70/EC¹ sets minimum technical specifications on health and environmental grounds for fuels to be used for vehicles equipped with positive-ignition and compression-ignition engines. Fuel quality is environmentally important because it affects engine pollution emissions and thus air quality. It also affects the ease and cost with which desired pollution and greenhouse gas emission limits can be achieved by manufacturers.

Non-respect of the fuel specification can lead to increased emissions (for example excess oxygenates can increase NO_x emissions) and might damage engine and exhaust after-treatment systems (for example excess sulphur damaging catalysts) leading to greater air pollution. In order to ensure compliance with the fuel quality standards mandatory under this Directive, Member States are required to introduce fuel quality monitoring systems.

Article 8 of Directive 98/70/EC requires the Commission to publish an annual report on fuel quality in the Member States. This ninth Commission Report summarises Member States' submissions on the quality of petrol and diesel, as well as the volumes sold, for 2010. All Member States submitted a full report for 2010. Some Member States reported later than the required deadline of 30 June.

The timeliness of the submission of reports was slightly worse than in 2009, 17 Member States submitted their 2010 report before the annual deadline, of the remaining 10 reports 5 were received 3 months or more after the reporting deadline.

Fuel quality monitoring data in 2010 showed that the specifications for petrol and diesel laid down in Directive 98/70/EC were in general met and few exceedances were identified. For petrol the main parameters where exceedances were identified were research/motor octane number (RON/MON)², summer vapour pressure³, distillation/evaporation at 100/150°C⁴ and

¹ Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC O.J. L 350, 28.12.1998, p. 58.

² Research Octane Number (RON) is a quantitative measure of the maximum compression ratio at which petrol can be used in an engine without some of the mixture self-igniting in the engine. Self-ignition leads to excess fuel consumption and an increase in Volatile Organic Compound and Carbon Monoxide emissions.

³ Vapour pressure is a measure of the propensity of the fuel to evaporate. It is regulated in summer because temperatures at that time of year can lead to high emissions of Volatile Organic Compounds, which are a precursor of ground level ozone. Exceedances will result in increased Volatile Organic Compound emissions.

⁴ The distillation parameter establishes the proportion of the fuel that evaporates at 100°C and 150°C. It limits the range of lighter components that can be blended in the petrol. Exceedances could lead to vapour locks and driveability problems.

the maximum sulphur content. For diesel the main parameters where exceedances were identified were sulphur content, distillation 95% point and cetane number.

As exceedances are relatively rare, and most Member States take action to remove non-compliant fuel from sale, the Commission is not aware of any negative repercussions on vehicle emissions or engine functioning. However, the Commission urges Member States to continue to take action to ensure full compliance so that such problems do not arise in the future.

Low sulphur content helps reduce air pollution and the introduction of new engine technology. A new specification for automotive road fuels came into force on 1 January 2009 which limits the sulphur content of all automotive road fuels in the EU to 10 ppm (sulphur-free fuels). This represents the second year of reporting since this requirement came into force and the average sulphur continued below this level in 2010, as shown in Table 1:

Table 1: Annual trend in average sulphur content in petrol and diesel fuels

EU	Average sulphur content, ppm*								
Fuel/Year	2002	2003*	2004*	2005*	2006**	2007***	2008***	2009***	2010
<i>Petrol</i>	51	37	38	19	18	18	14	6	6
<i>Diesel</i>	169	125	113	25	22	23	18	8	7.5

*Excludes France, which did not report in 2003 – 2005.

**Excludes Malta, which did not report in 2006.

***Excludes Luxembourg, which did not report in 2007, 2008 or fully in 2009.

National fuel quality monitoring systems still differ considerably. However, the Directive's requirements are expected to promote homogeneity and to improve the quality of reporting.

2. INTRODUCTION

The specifications for petrol and diesel sold in the European Union are laid down in the Directive 98/70/EC. The Directive requires Member States to report summaries of the quality of fuels sold in their territories. From 2004 onwards, Member States are required to report their monitoring in accordance with European Standard, EN 14274⁵, or with systems having an equivalent degree of confidence. Article 8 of Directive 98/70/EC, as amended by Article 1(5) of Directive 2003/17/EC, requires the Commission to publish the results of Member States' fuel quality reporting. In compliance with this request, this ninth Commission Report summarises the quality of petrol and diesel, as well as the volumes sold, in the EU for the year 2010. Previous years' reports can be found on the Commission's web pages⁶.

⁵ EN 14274:2003 - Automotive fuels - Assessment of petrol and diesel quality - Fuel Quality Monitoring System (FQMS).

⁶ <https://circabc.europa.eu/w/browse/5e89b837-2bec-4284-b9fe-c156271268f7>

3. NATIONAL MONITORING SYSTEMS

Commission Decision 2002/159/EC and European Standard EN 14274, have enhanced the usefulness of the information and facilitated analysis of EU fuel trends. The quality of the monitoring systems' design, compliance with limit values and information provided in submissions is continuing to improve. However, there are still a few key areas for improvement, summarised as follows:

Member States are encouraged to continue to improve the timeliness of the submissions.

Several Member States do not complete sufficient sampling for all fuels or are not sampling sufficiently at service stations (as opposed to depot/refinery) to meet the requirements of EN 14274⁷, see Table 4.

Where Member States use their own national monitoring systems, they should be fully described in order to be able to verify whether they comply with the European Standard. This description should show the monitoring system's equivalency in statistical confidence to EN 14274.

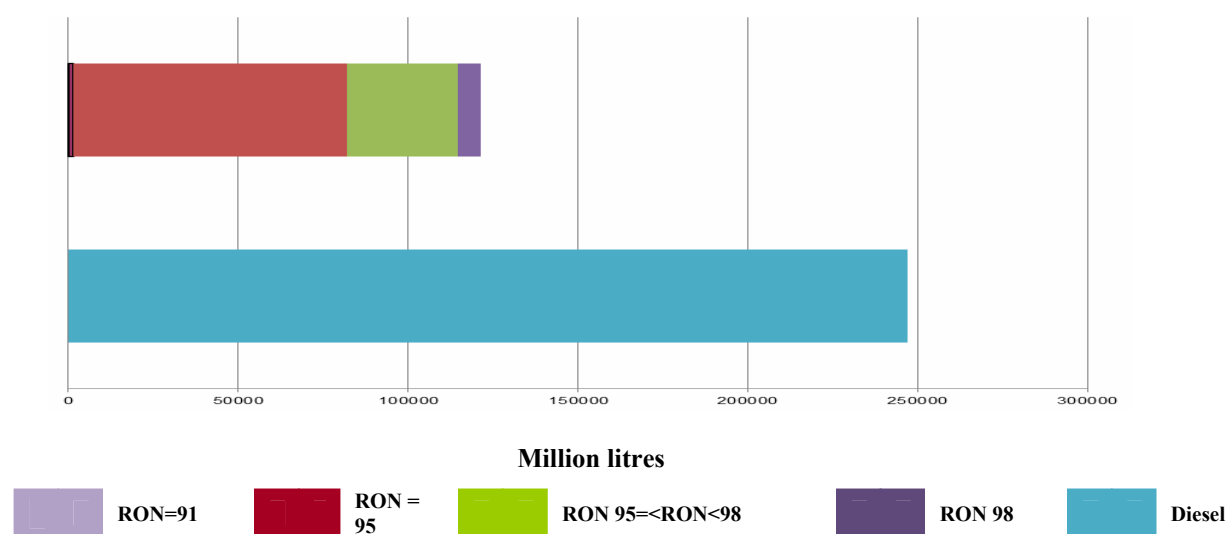
Member State reports are assessed according to the appropriate seasonal periods to ensure comparability for EU-wide reporting. Where a Member State has chosen to use a different seasonal period to that specified, appropriate information should be provided in the national annex within the Fuel Quality Monitoring report.

4. 2010 REPORTING

4.1 Fuel qualities and volumes

In contrast to previous years, the new sulphur content limit of a maximum of 10 ppm (introduced in 2009) for all automotive road fuels has precipitated a switch from RON 95 (<50 mg/kg) to RON 95 (<10 mg/kg) petrol. Concerning the octane number, the majority 67% of petrol sales in 2010 comprised RON 95. Of the remainder, 27% was 95=<RON<98, RON 98 was around 5% and RON 91 at 1% of the total sales.

Figure 1: 2010 EU fuel sales proportions by fuel type (%)*



⁷ See section 5 for details.

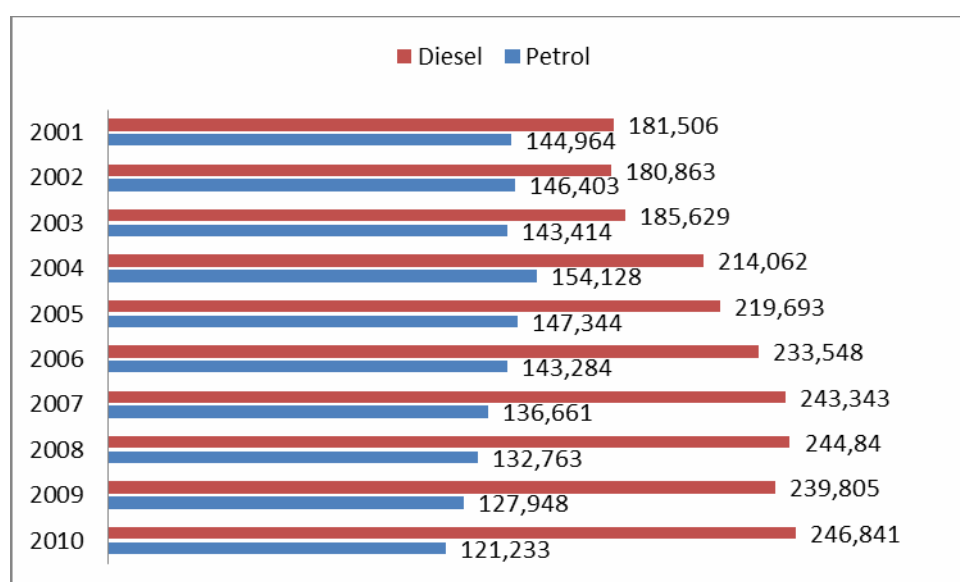
Table 2: 2010 Summary by fuel type

Fuel grade	Million litres	EU market share
Unleaded min. RON=91	1,618	1%
Unleaded min. RON=95	80,308	67%
Unleaded 95≤RON<98	32,898	27%
Unleaded RON≥98	6,409	5%
Total petrol	121,233	100.0%
Diesel (<10 ppm S)	246,841	100.0%
Total diesel	246,841	100.0%

Temporal trends in EU fuel sales

Figure 2 illustrates the evolution of the fuel consumption in the EU for the last 10 years and shows a clear increase in the consumption of diesel compared to petrol.

Figure 2: evolution of fuel consumption in the EU



Million litres

Excludes France in 2003 - 2005, as no submissions were provided; excludes Luxembourg in 2007 to 2009 and Malta in 2006 and 2009 when no reports were provided.

EU27 Fuel Sales by type

Table 3 shows fuel consumption per type and Member State for 2010:

Table 3: Fuel consumption per type and Member State

Fuel Type	Petrol Sales (million litres)	Diesel Sales (million litres)
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Member State	min. RON=91	min. RON=95	95≤ RON <98	RON ≥98	Total Petrol	Total Diesel
Austria	150	-	2,251	64	2,465	7,437
Belgium	-	1,251	-	363	1,614	7,733
Bulgaria	-	847	-	-	847	2,168
Cyprus	-	479	-	47	526	428
Czech Rep.	5	-	2,459	49	2,513	4,637
Denmark	517	1,570	-	3	2,090	3,101
Estonia	-	-	338	33	371	572
Finland	-	2,075	162	-	2,237	2,790
France	-	8,677	-	2,202	10,879	39,749
Germany	943	-	24,901	740	26,584	38,356
Greece	-	4,634	220	153	5,007	2,977
Hungary	-	1,743	-	47	1,790	3,274
Ireland	-	1,974	-	-	1,974	2,672
Italy	-	11,678	-	-	11,678	30,238
Latvia	-	-	347	29	376	801
Lithuania	-	385	-	9	394	1,190
Luxembourg	1	373	-	92	466	1,894
Malta	-	-	91	10	101	120
Netherlands	-	5,496	-	75	5,571	7,634
Poland	-	5,138	-	513	5,651	13,896
Portugal	-	-	1,703	187	1,890	5,898
Romania	-	-	1,274	793	2,067	4,997
Slovakia	-	781	-	19	800	1,281
Slovenia	-	-	660	79	739	1,419
Spain	-	6,908	-	766	7,674	31,540
Sweden	-	4,394	-	138	4,532	5,164
UK	-	19,444	953	-	20,397	24,875

Table 3 shows the volume of fuel sales per Member State by fuel type. Some general trends can be noted:

- Diesel dominates the market in all but two of the Member States.
- Belgium demonstrates the heaviest dependence on diesel which dominates fuel sales having 82.7% share of the market – the highest proportion of all the Member States.
- The greatest volume of fuel sales in 2010 took place in Germany, with 17.6 % of total EU fuel sales and a petrol/diesel share of 21.9% petrol and 15.5% diesel. The next biggest market was the France with a 13.8% share of EU petrol and diesel fuel sales of 9.0% and 16.1% respectively while UK fuel sales totalled 12.3% of all fuel sales with a breakdown of 16.8% (petrol) and 10.1% (diesel).

Similar to the period from 2001 to 2009, France, Germany, Italy, Spain and the United Kingdom had the greatest volume of fuel sales in 2010.

Since 2001 there has been increased homogeneity in the types of grades of fuel reported to be available across the EU. Petrol distinction between grades has mainly resulted from different octane levels (RON category). In 2010, only six Member States reported three petrol grades available, with the remainder reporting two petrol grades (no Member State has reported the availability of only one petrol fuel grade).

Before 2009, two diesel grades were available for use in automotive road vehicles: low sulphur and sulphur free (i.e. concentrations of less than 10 ppm sulphur). As expected, and confirmed by the 2010 data, all Member States have transitioned to 100% sulphur free diesel fuels in accordance with the mandatory sulphur content limit, hence, the number of grades of diesel has recede to one.

5. SAMPLING AND REPORTING

There are detailed requirements in EN 14274 on the number and location of samples to be taken and reported in Member States' fuel quality reports. EN 14274 lists a number of factors to be taken into account when assessing the sampling regime: such as the number of refineries supplying the market, the number of fuel grades available and the number of different imported fuel grades and sources. The standard specifies a minimum number of samples per fuel grade in each of the winter and summer periods. In previous years, there was some uncertainty in Member States about the sampling requirements – however sample quantities and the division of reporting between summer and winter periods have improved in recent years.

Table 4 provides a breakdown of individual Member States sampling and reporting in 2010. The total minimum samples required is calculated where the Member State has used a statistical model as outlined in EN 14274, given that the minimum sample requirement is known for each model⁸. The table also provides a breakdown of the total samples taken and the sampling carried out at service stations. Not all Member States provided this breakdown in 2010 (Sweden, the UK, Spain, Germany and Latvia). EN 14274 specifies that the minimum sampling requirement should be taken from fuel dispensing sites – which are defined as a “site, retail or commercial where fuel is dispensed into road vehicles for propulsion.” Therefore any sampling taken at distribution terminals or refineries should be taken in addition to those from service stations in order to meet minimum sampling requirements.

⁸ EN 14274 sets minimum sampling numbers for each fuel (dependant on the statistical model used and sales proportion). The standard specifies a minimum number of samples to be taken per fuel grade
Samples per grade and per winter and summer period*

Model	Small country	Large country
EN 14274 Statistical Model A	50	100
EN 14274 Statistical Model B	100	200
EN 14274 Statistical Model C	50	-
National system	-	-

* Annual sampling requirements are therefore double the table values per grade.

Where Member States have reported using a "national monitoring system"⁹ – an assessment has been made of the equivalent minimum sample requirements on the basis of the size of the country, and other details provided. Where the location of samples is known – it is possible to determine whether sample quantities demonstrate compliance with EN 14274.

Seven Member States (either using a system based on EN 14274 or a national monitoring system) failed to fully comply with the requirements of the standard. This was due to the locations where samples were taken and also the number of samples collected; however, those problems do not compromise the effectiveness and credibility of the results reported to the Commission.

The Commission is currently working with the Member States to clarify the reasons for those deviations and trying to guarantee that this situation will be improved in the future.

Table 4 details the minimum sample number required to be taken from service stations for Member States to have demonstrated compliance with the Directive.

Table 4: Summary of Member State sampling and reporting in relation to the requirements of Directive 98/70/EC and of European Standard EN 14274

MS		FQMS Model (1)	Size (2)	Separate S&W? (3)	Samples per grade per period (4)	Total samples required (5)		Samples Taken (6)		Samples Taken at Service Stations (7)	
						Pet.	Dsl.	Pet.	Dsl.	Pet.	Dsl.
Austria	AT	C	S	✓	50	102	100	203	100	203	100
Belgium	BE	N	S	✓	100	400	200	2133	4985	2133	4958
Bulgaria	BG	B	S	✓	100	200	200	427	468	418	456
Cyprus	CY	C	S	✓	50	100	100	293	167	149	167
Czech Republic	CZ	C	S	✓	50	101	100	747	877	747	877
Denmark	DK	N	S	✓	50	201	100	42	22	42	22
Estonia	EE	C	S	✓	50	103	100	350	200	350	200
Finland	FI	A	S	✓	50	103	100	185	162	140	117
France	FR	B	L	✓	200	416	400	827	395	827	395
Germany	DE	N	L	✓	200	405	400	417	305	-	-
Greece	EL	A	S	✓	50	105	100	250	120	29	17
Hungary	HU	C	S	✓	50	101	100	120	120	120	120
Ireland	IE	C	S	✓	50	100	100	144	126	92	92
Italy	IT	A	L	✓	100	200	200	200	200	100	100
Latvia	LV	N	S	✓	100	400	200	438	674	-	-
Lithuania	LT	C	S	✓	50	101	100	101	100	97	95
Luxembourg	LU	C	S	✓	50	104	100	47	75	43	71
Malta	MT	N	S	✓	100	209	200	49	43	39	30

⁹ "National monitoring systems" are permitted by the Directive so long as it gives results of an equal confidence to EN 14274.

MS		FQMS Model (1)	Size (2)	Separate S&W? (3)	Samples per grade per period (4)	Total samples required (5)		Samples Taken (6)		Samples Taken at Service Stations (7)	
						Pet.	Dsl.	Pet.	Dsl.	Pet.	Dsl.
Netherlands	NL	A	S	✓	50	100	100	100	100	100	100
Poland	PL	B	L	✓	200	408	400	291	229	291	229
Portugal	PT	N	S	✓	100	209	200	236	118	200	100
Romania	RO	B	S	✓	100	400	200	360	210	360	210
Slovakia	SK	C	S	✓	50	101	100	168	137	168	137
Slovenia	SI	C	S	✓	50	103	100	149	181	145	115
Spain	ES	N	L	✓	200	409	400	520	264	-	-
Sweden	SE	N	S	✓	100	203	200	553	620	-	-
UK	UK	N	L	✓	200	404	400	2195	2428	-	-

6. COMPLIANCE WITH DIRECTIVE 98/70/EC IN 2010

6.1 Petrol

In 2010, most Member States provided full information about petrol sample compliance. In order to determine compliance, it is necessary to know which test method has been used to test for some parameters (because reproducibility and tolerance levels differ according to test method). Provision has been made for Member States to give this information within the reporting template – although this is not a mandatory part of the reporting it is vital to determine compliance levels. In 2010 11,531 samples were collected for petrol and 13,391 for diesel.

The parameters found to be out of specification most frequently within the Union in 2010 were:

- Summer vapour pressure was exceeded 215 times in 2010 or 1.85% of the total samples. However it is becoming apparent that many exceedences are the result of transitional fuels when suppliers swap the summer specification fuel for winter specification fuels and vice versa.
- RON/ MON samples found to be out of specification in 2010 totalled 59 samples or 0.5 % of the total samples.
- The sulphur content maximum of 10ppm was exceeded in 34 samples or 0.29 % of the total samples, with the highest sample value being 45.9 mg/kg. However the average sulphur content for all Member States remains below the mandatory limit of 10ppm at 5.8 ppm.

The Netherlands has not provided full details of samples found to be out of compliance with the tolerance limits and Germany was unable to provide the details of some non-compliance for RON 91 petrol.

6.2 Diesel

In 2010, only two Member State did not provide details of samples found to be out of specification for diesel (Latvia and the Netherlands – where at least one fuel sample tested in each Member State exceeded tolerance limits). Of the five parameters tested for diesel in 2010, the following were found to be out of specification:

- In spite of the average EU sulphur content remaining below the mandatory 10ppm limit – at 6.5 ppm,- there were 169 samples or 1.26 % of the total samples found to be non-compliant with extreme values of:
 - a maximum value of 500 mg/kg in Bulgaria (where the supplier was fined as a result of the non-compliant fuel sample)
 - One or more samples in Poland were found to be out of compliance – with a maximum sulphur content value of 455 mg/kg. In Poland, where fuel was found to have extremely high sulphur content, it was withdrawn from the market. The Polish authorities also notified the Office of Fiscal Control and Customs Board and the Regional Inspectorate of Environment Protection of the non-compliant fuel.
 - 294 mg/kg in Romania (no details of action taken has been provided) and;
 - 94.2 mg/kg in Cyprus - where contamination at the service station was found to be as a result of mixing automotive diesel with heating diesel. Penal prosecution was instigated against the petrol station.
- A total of 38 samples exceeded distillation limits in 2010.
- In total, 4 samples tested for cetane number were found to be out of specification.

6.3 Summary

Table 5 summarises the compliance of Member States with Directive 98/70/EC for 2010 reporting in terms of the results of the analysis of samples against Tolerance Limits and the reporting format and content. Amendments to Directive 98/70/EC (Directive 2003/17/EC) included the insertion of a paragraph stating “Member States shall determine the penalties applicable to breaches of the national provisions adopted pursuant to this Directive. The penalties determined must be effective, proportionate and dissuasive.”

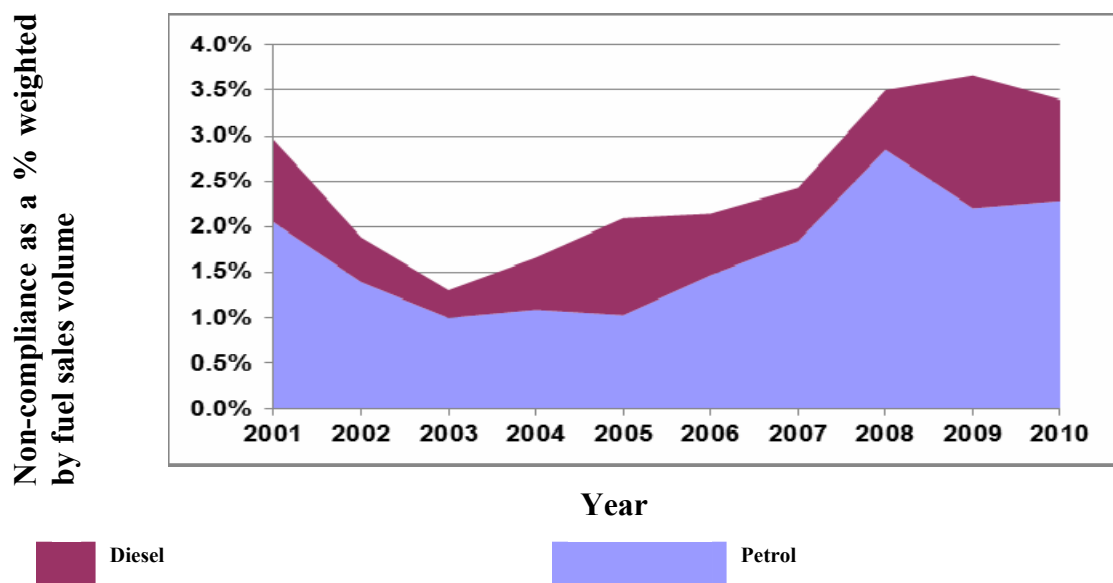
Some Member States have provided an explanation of the remedial actions and penalties imposed by national authorities where samples are found to be out of specification.

In general, of the 11,531 samples tested for petrol in 2010, 411 were found to be out of specification with tolerance limits for one or more parameter – which represents a non-compliance rate of 3.6%. Of the 13,391 samples tested for the 5 mandatory parameters for diesel in 2010, 211 were found to be non-compliant with specified limits – representing 1.6% of all samples reported.

The proportion of samples found to be out of specification is reliant on the number of samples taken – which should be dependant (within each Member State) on the fuel sales volume, and supply sources. However, with Member States using national monitoring systems that may not be equivalent to EN 14274, it is necessary to also consider non-compliance within the Union weighted by volume and by sample numbers. Figure 3 gives the rate of non-

compliance weighted according to sales volume and sample numbers and shows an upward trend to 2010.

Figure 3: Temporal trends in total limit value non-compliances for petrol and diesel fuels



*Excludes France in 2003 - 2005, as no submissions were provided. Excludes Luxembourg in 2007 to 2009 and Malta in 2006 and 2009 as no reports were provided.

Table 5: Summary of Member State compliance with 98/70/EC for 2010 reporting.

MS	Non-compliance with limit values non-compliant samples (NC) / total samples (1)				Incomplete reporting parameters not measured (NM) / total (2)				Late report (3) (months)
	Petrol		Diesel		Petrol		Diesel		
	NC	Total	NC	Total	NM	Total	NM	Total	
AT	6	203	3	100	0	18	0	5	<1
BE	103	2133	79	4985	0	18	0	5	On time
BG	39	427	56	468	3	18	0	5	On time
CY	41	293	1	167	0	18	0	5	<1
CZ	>61	747	29	877	0	18	0	5	On time
DK	0	42	0	22	0	18	0	5	On time
EE	17	350	3	200	0	18	0	5	On time
FI	0	185	1	162	0	18	0	5	On time
FR	56	827	10	395	0	18	1	5	On time
DE	>7	417	1	305	0	18	0	5	<4
EL	0	250	0	120	0	18	0	5	<1
HU	0	120	0	120	0	18	0	5	On time

MS	Non-compliance with limit values non-compliant samples (NC) / total samples				Incomplete reporting parameters not measured (NM) / total				Late report (3)
	(1)		(2)		(2)		(3)		
	Petrol		Diesel		Petrol		Diesel		
	NC	Total	NC	Total	NM	Total	NM	Total	(months)
IE	15	144	1	126	0	18	0	5	On time
IT	2	200	0	200	1	18	0	5	<1
LV	0	438	0	674	0	18	0	5	On time
LT	0	101	>1	100	0	18	0	5	On time
LU	7	47	0	75	1	18	0	5	<1
MT	2	49	3	43	0	18	0	5	On time
NL	>2	100	>1	100	0	18	0	5	<5
PL	15	291	3	229	0	18	0	5	On time
PT	29	236	8	118	0	18	0	5	<1
RO	>5	360	11	210	0	18	0	5	<1
SK	0	168	7	137	0	18	0	5	On time
SI	0	149	0	181	0	18	0	5	On time
ES	6	520	0	264	0	18	0	5	<2
SE	0	553	0	620	6	18	0	5	On time
UK	5	2195	0	2428	2	18	0	5	On time
No. Countries	18		18		5		1		10

#	Column	Explanatory notes
(1)	Non-compliance with limit values (95% confidence limits)	It is not possible to confirm whether limit values have been respected in all samples, where reporting data is incomplete. Where it has not been possible to establish from submissions the number of samples exceeding the limit value a '>' symbol indicates that the number of samples exceeding limits is a minimum and might be greater.
(2)	Incomplete reporting	Some parameters may be sampled in smaller quantities, however all parameters should be sampled to accurately assess fuel quality. Member States should make it clear when sample results have been obtained and provide sample results.
(3)	Late report	Directive 98/70/EC states that Member States should submit monitoring reports by no later than 30 June each year

7. CONCLUSIONS

Fuel quality has a strong link to both CO₂ and air quality emissions, as well as the ease and cost with which pollutant and greenhouse gas emission limits can be achieved by vehicle manufacturers.

The monitoring of fuel quality in 2010 shows that the specifications for petrol and diesel laid down in Directive 98/70/EC are in general met and very few exceedances were identified. The progressive adoption of standard EN 14274 by Member States is leading to greater consistency in the data available for assessment of the various fuel quality parameters and Member States have been making efforts to improve their understanding of reporting requirements.

As exceedances are relatively rare and most Member States take action to remove non-compliant fuel from sale, the Commission is not aware of any negative repercussions on vehicle emissions or engine functioning due to these exceedances. However, the Commission urges Member States to continue to take action to ensure full compliance so that such problems do not arise in the future and to ensure that reports are submitted to the Commission within the requested deadlines.